ABSTRACT

Title of Document: SECONDARY DATA ANALYSIS

INVESTIGATING THE UTILITIES OF

ECOLOGICAL MOMENTARY

ASSESSMENTS TO UNDERSTAND

SMOKING ENVIRONMENTS IN INDIA

Amanda, Strausser, MPH, 2014

Directed By: Dr. Craig S. Fryer, DrPH, MPH, Behavioral and
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In the 21st century, India has become one of the most affected countries by tobacco mortality in the world (Perry, 2009).The aim of this secondary data analysis was to determine the utility of Ecological Momentary Assessments (EMA) to better understand the perceived social and environmental cues that encourage and discourage tobacco use in India. However, published EMA studies have only been conducted in western countries.

This thesis was shaped by three research questions: What are individuals' tobacco behaviors and environments in India, does tobacco use and tobacco environments reported at baseline differ from EMA and end of day (EOD) data, and are there differences by age, gender, education or work status in the average number of completed EMA and EOD? Univariate and bivariate analyses were conducted as

part of the analysis plan. The analysis from this thesis will help direct future EMA

research, particularly in non-western countries.

SECONDARY DATA ANALYSIS INVESTIGATING THE UTILITIES OF

ECOLOGICAL MOMENTARY ASSESSMENTS TO UNDERSTAND SMOKING

ENVIRONMENTS IN INDIA

By

Amanda Strausser

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Advisory Committee:
Dr. Craig S. Fryer, Chair
Dr. Kerry Green
Dr. Dina Borzekowski

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Chapter 1: Introduction

Statement of the Research Problem

In the 21st century, India has become one of the most affected countries by tobacco mortality in the world (Perry, 2009). One of the challenges in global chronic disease prevention is reducing tobacco use, particularly in developing countries with large populations (Perry, 2009). Countries with large populations such as India, with more than 1 billion inhabitants, suffer significantly with the burden of chronic disease from preventable causes. Due to India's large population, tobacco control has proven to be very difficult.

More than 20% of the Indian population smokes daily, according to analyses of the World Health Survey data (Patel, 2011).The number of Indians who smoke a tobacco product accounts for over 17% of all tobacco consumers worldwide. The most current data shows that there are a total of 275 million tobacco users in India (Sarkar, 2012). This total comprises of 164 million smokeless tobacco users, 69 million tobacco smokers and 42 million people using both forms of tobacco (Sarkar, 2012).

The increased prevalence of smokers has resulted in a rise in chronic disease and premature death. More than one million people die every year in India due to tobacco use according to Global Adult Tobacco Survey (GATS), which has been conducted in partnership with the Indian government and the World Health Organization (WHO) from 2009-2010 ("Tobacco Free Initiative", n.d.). Additionally, approximately 5 in 10 adults are exposed to secondhand smoke at home daily and another three in ten were exposed to secondhand smoke in public places that were mostly restaurants and public transport ("Tobacco Free Initiative", n.d.).

Investigating the Utilities of Ecologic Momentary Assessments in India

In India, tobacco use accounts for half of all of the cancers in men and a quarter of all cancers in women (Rani, 2003; Sorensen, 2005). WHO estimates that by 2020, tobacco-related mortality in India will account for over 1.5 million deaths annually (Rani, 2003; "Tobacco Free Initiative", n.d.). While actions have been taken by the Indian government to reduce the amount of new and current tobacco users through detection and prevention, their efforts have not proven to significantly diminish the problem because of the lack of enforcement.

Recently there has been an increase in technology and medical services for treatment of different diseases in India. However, even with the expensive investment in technology to better detect the different health conditions associated with tobacco use, the most cost effective method to tobacco control is prevention (Mackay, 1994). However, even many medical doctors in developing countries are trained on curative health instead of preventative health (Mackay, 1994). There needs to be a total overhaul of the medical system in developing countries which can cost millions and millions of dollars (Mackay, 1994). A deeper understanding of the problem of tobacco use in India is needed. There is limited research of tobacco prevention in developing countries, particularly how tobacco use is related to the environment.

Tobacco use is strongly tied to the environment and culture of India (Hovell, 2009). Tobacco-related behaviors can happen at the home, work or public spaces (Hovell, 2009). Interlocking behavior occurs when a person's behavior, or its consequences, serves as prompt and reciprocal reinforcement for another individual's behavior (Hovell, 2009). Culture and interlocking behaviors influence the social environment of tobacco use. The difficulty of controlling tobacco is due to the perceived idea that tobacco use is ubiquitous as over 80% of Indians are in environments where there is smoking, thus subjecting them to secondhand smoke

(Patel, 2011). Research shows that the environment, specifically in relation to tobacco use, is an important factor in understanding individual tobacco use.

This thesis has created a framework for which a secondary analysis will be conducted to determine how Ecologic Momentary Assessments (EMA) can objectively measure individual environments and the other variables that impact tobacco use and individual socio-cultural environments. The framework developed for this thesis shows the interconnectedness between six different measures including: (1) prevalence of tobacco use in India; (2) the types of tobacco consumed; (3) individual's environment; (4) regulation; (5) health consequences; (6) and the economic cost of tobacco use.

The aim of the research was to determine the possibility of using EMA in developing countries to better understand the perceived social and environmental cues that encourage and discourage tobacco use. EMA involves the repeated sampling of individuals' current behaviors and experiences in their natural environment, in real time (Shiffman, 2008). EMA data is able to address questions about individual differences within particular episodes or situations; about the unfolding of processes over time; and the interactions among these factors (Shiffman, 2008). However, EMA has only been used in western countries, so this study and secondary analysis will help determine if EMA can be applied in a non-Western country.

The data discussed in this secondary analysis was collected as part of a pilot test in two cities, Kolkata and Hyderabad, India. The analysis that will be part of this thesis will help determine how well EMA, in conjunction with other survey data collected during this study, is able to report people's perceptions of their tobacco environments. Appropriate statistical analysis will be used to answer the research questions associated with EMA and smoking environments in

India. In the analysis, there will be comparisons across gender, age, tobacco use, and frequency of use.

Brief Background of India

India has a diverse population, geography and culture. It is the world's largest democracy and is the world's second most populous country, with over 1.2 billion residents (India, n.d.). The majority of Indians are Hindu, representing 80.5% of the population (India, n.d.). The remaining population is Muslim (13.4%), Christian (2.3%) or Sikh (1.9%) (India, n.d.). English is the official language of India, but there is a variety of other spoken and written languages. Nonetheless, only 63% of the population is literate (Statistics, 2013; India, n.d.). The average life expectancy is 67.8 years for the total population, but females live longer (69.0 years) compared to men (66.7 years) (Central Intelligence Agency, 2012).

India is considered a developing nation by the World Bank (India Overview, n.d.). The World Bank defines a developing nation as, "a country in which the majority lives on far less money—with far fewer basic public services—than the population in highly industrialized countries" (Development, 2012).

While it is clear that India continues to make great strides in overcoming many issues, there are still some that affect the country in a severe way, including poverty and health care. India's recent rapid growth and development is considered by the World Bank a major achievement (India Overview, n.d.). However, this growth has done little to reduce the absolute number of poor, leaving India with the largest concentration of poor people in the world. This is especially true in rural areas of India (Development, 2012). Nearly 32% of the population lives in urban settings, with the remaining population living in rural areas (Central Intelligence

Agency, 2012). Twenty two percent of the rural population and twelve percent of the urban population live in poverty (Ghosh, 2002). The decline of poverty has been slow but steady in India. However, the social indicators of well being such as crime rates, unemployment, and GDP growth are all examples of the great history of progress in India (Development, 2012).

The issues surrounding health care in India are complex. The quality of medical care in India varies substantially by region. According to the United States Department of State, medical care in the major population centers approaches and occasionally meets Western standards, but adequate medical care is usually limited or unavailable in rural areas (India, n.d.). India faces levels of high infant and maternal mortality as well as malnutrition (Central Intelligence Agency, 2012; India, n.d.). The risk for infection is very high and most infections are from water borne diseases due to a lack of proper sanitation facilities and clean drinking water (Central Intelligence Agency, 2012). These issues are only exacerbated for most Indians because most of the population pays for health care treatment out of their own pocket. WHO states that less than 15% of the population in India today has any kind of health-care coverage, be it community insurance, employers' expenditure or social insurance (World Health Organization, 2010). Furthermore, the majority of the estimated population of 1.2 billion, spread across 28 self-governing states and seven territories within the federal republic, does not have access to quality health care (World Health Organization, 2010).

This thesis will investigate tobacco use and the environment in which people live in India. There are many factors that contribute to this environment and the health of individuals. Investigating these factors are important in helping to create meaningful policies that shift the focus of health away from just the individual, but to the Indian government and appropriate organizations.

Investigating the Utilities of Ecologic Momentary Assessments in India

Research Questions Using Ecological Momentary Assessments

In the past, Ecological Momentary Assessments (EMA) have been conducted with people who are already addicted to tobacco. Also, there is no literature that indicates that EMA has been used in non-Western studies. As a result, part of the rationale behind this secondary data analysis is to determine if EMA is able to generate valid, real time measurements of the social and environmental cues encouraging and discouraging tobacco use in India. The data for this proposed secondary data analysis is derived from a parent study that examined a range of social and media exposures to tobacco usage experience by adults in public and private spaces. The parent study explored how cues to use tobacco are perceived by both tobacco users and non-users. The research questions for this thesis are outlined below. These questions were designed to determine how well EMA was used for the first time in a non-Western setting. In sum, these questions would help determine the utilities of EMA in a developing country.

Research Question 1: What are individuals' tobacco behaviors and environments in a developing country?

Research Question 2: Are there participant differences by age, gender, education and work status in the average number of completed EMAs and EOD surveys?

Research Question 3: Does the information that people report at baseline in terms of smoking status and smoking environment differ with what they report at EMA and EOD?

Definition of Terms
Some common terms used throughout this thesis are detailed in the following table.

Definition of Common Terms Used Throughout the Thesis	
Term	**Definition**
Developing Country	A term generally used to describe a nation with a low level of material well being. This is not the same as a third world country. Since no single definition of the term developed country is recognized internationally, the levels of development may vary widely within so-called developing countries (Developing

	Country, n.d.).
Ecologic Momentary Assessment (EMA)	Methods using repeated collection of real-time data on subjects' behavior and experiences in their natural environments (Shiffman, 2008).
Incidence	Number of new cases of a disease in a specific population, at a specific time.
Negative Smoking Messages	Messages that inform the public about the negative health effects of tobacco smoking.
Positive Smoking Messages	Messages that reinforce tobacco use in society. They can be messages where people are using tobacco in a positive way.
Prevalence	The total number of cases of a disease in a specific population, at a specific time.
Reactivity	The potential for the behavior experienced to be affected by the act of assessing it (Shiffman, 2008).
Smoking Environment	Refers to the environment of tobacco use in India, which is the home, work and public places.
Social and Environmental Cues Around Tobacco	The range of social and media exposures to tobacco usage experienced by adults in public and private spaces.

Chapter 2: Background

Review of the Research

Description of Tobacco Products

Throughout India there are a variety of tobacco products that are available for

consumption. There are several ways in which tobacco can be consumed and this

versatility enables its use in many different socio-cultural contexts (Sudarshan, 1999). In

India, tobacco is primarily available for domestic consumption in several different forms

for smoking: bidis, cheroots (cigar) and hookahs (water pipe) (Sudarshan, 1999). In India,

one of the most popular types of tobacco products is a bidis, which are small, inexpensive,

unfiltered cigarette-like products. Typically, they are manufactured in small-home based

units (Sarkar, 2012). Bidis are hand-rolled in an unprocessed tobacco leaf and tied with

colorful strings on the ends (Gajalakshmi, 2003). Their popularity has grown in part because they come in many flavors such as strawberry, vanilla, licorice, and grape and often give the smoker a quick 'buzz', which is the release of adrenaline ("Bidis and Kreteks", 2013). The quick release comes from the higher levels of nicotine in bidis than traditional cigarettes ("Bidis and Kreteks", 2013). Bidis also contain larger quantities of other harmful substances, such as tar, ammonia and carbon monoxide (American Cancer Society, 2013).

There are also several types of smokeless tobacco products used in India. The first is called snuff and it is taken through the nostrils (Gupta, 2003; Sudarshan, 1999). There is also gudakhu, mishri or bajjar, which are all names for tobacco that is applied directly to the gums (Gupta, 2003). Khaini is a form of smokeless tobacco that is a mixture of raw powered tobacco and lime that is placed in the mouth (Gupta, 2003). Lastly, betel quid is tobacco mixed with paan or betel and it is eaten (Gupta, 2003). These are the most popular forms of smokeless tobacco among Indians.

Prevalence of Tobacco Use in India

Tobacco manufacturing and consumption has a long history in India. In the 19th and 20th centuries, India was the second largest producer of tobacco worldwide. Tobacco is one of India's main export products along with tea, coffee, spices, cashews, basmati rice, and seafood (India, 2013). Exports from tobacco alone represents around 7.1% of world production (Sudarshan, 1999). Currently, India is the third largest producer of tobacco (Sudarshan, 1999). The principle tobacco growing areas in India are Andhra Pradesh, Gujarat, Karnataka, and Uttar Pradesh (Sudarshan, 1999). The demand for tobacco in developing countries has only continued to

increase, which continues to promote an environment in which tobacco is culturally supported (Sudarshan, 1999).

The most current data shows that there are a total of 275 million tobacco users in India (Sarkar, 2012). This means that approximately 20% of the Indian population smokes daily, according to analyses of the World Health Survey data (Patel, 2011). This total comprises of 164 million smokeless tobacco users, 69 million tobacco smokers and 42 million people using both forms (Sarkar, 2012). The number of Indians who smoke a tobacco product accounts for over 17% of all tobacco consumers worldwide. India monitors tobacco consumption and smoking prevalence through the Global Adult Tobacco Use Survey (GATS) and the National Family Health Survey (Tobacco Free Initiative, n.d.).

There has recently been an increase in smoking tobacco among young people in India, especially in rural areas (Rani, 2003). The New England Journal of Medicine, reported from 1998 to 2005, that the percentage of smokers aged 15-24 years old jumped from 8.6% to 19.2% (Jha, 2008). This age group represents the highest increase in smokers during that time frame. They also represent the highest increase in both smokeless tobacco use and use of any tobacco product (Jha, 2008). There are many environment factors to consider such as parental attitudes and parental use of tobacco products (Muilenburg, 2009).

Not only are there age differences among tobacco users, but also there are significant gender differences among tobacco users throughout India. In the 20th century, tobacco use by women has been on the rise throughout the world, even with the well-known health risks associated with this habit. It is reported by WHO that in India the prevalence of tobacco use of all forms is 65% for men and 33% for women (Rani, 2003; Sorensen, 2005). These reported percentages are based on a few small scale studies, so in all actuality, the rates could be much

higher for India and there could be increased disparities by age, location and gender (Rani, 2003). It is important to understand that the prevalence of tobacco usage is difficult to determine in India. There are few national and international surveys that report data in a meaningful way by using large sample sizes.

In developing countries, the prevalence of smoking is typically between 50-60% for men and 2-10% for women, but in countries where smoking by women is not culturally acceptable, this percentage can be extremely underreported (Mackay, 1994). There are some variations in smoking practices among men and women, but the prevalence of male smokers always exceeds the number of women smokers in India. Smoking practices do vary be region, so the prevalence of women tobacco users does depend on the region. In Bihar and Goa, more women smoke bidis, cheroots and hookah while in most other regions, women use some form of smokeless tobacco (Sudarshan, 1999). It has been reported that the number of women who smoke tobacco may be less than men. However, the number of women who use smokeless tobacco is greater than men in most states in India (Sudarshan, 1999).

Another factor that impacts gender differences in tobacco use is income. According to an article by Sudarshan et al. (1999) that examined gender differences among tobacco consumers, they argued that lifestyle is one of the most important factors in determining who uses tobacco products, what product they use and how much (Sudarshan, 1999). For women, Sudarshan et al. (1999), argue that there is a relationship between women's consumption of tobacco and their income (Sudarshan, 1999). Most tobacco consumption is by rural women who are poorer (Sudarshan, 1999).Thus, income can drive tobacco use among women in two ways in India and other parts of the world. First, some women who use tobacco products do so because they can afford to because of their income level. Upper income women are also more likely to quit or

have access to different health promoting resources like recreation and more nutritious foods. However, for other women, they do so because they live in poverty. They use tobacco because of the prevalence of tobacco use among low income, rural individuals. They are more likely to manufacture the bidis and tobacco use suppresses hunger (Sudarshan, 1999). It is important to look at not only gender differences in smoking, but it is crucial to take into account the location of the population, and their income or socioeconomic status.

Tobacco use not only varies substantially by age and gender in India, but also by socioeconomic status. Indicators of socioeconomic position are often education, occupation, income level and in India and the caste system (Sorensen, 2005). Generally, tobacco use is highest among those with the least education (Sorensen, 2005). But, there are exceptions as described by Sorensen et al. (2009), in an article that discusses the social disparities of tobacco use. The researchers found that cigarette smoking rates are highest among Indians with more education (Sorensen, 2005). This is partially due to the fact that bidis are inexpensive and people of lower socioeconomic status can afford to purchase them. While cigarettes serve as a status symbol of greater financial resources (Sorensen, 2005). In the study by Sorensen et al. (2005), they found that after controlling for several factors, unemployment was the most powerful predictor of tobacco use (Sorensen, 2005). Unemployment is most strongly associated with bidi use among men in India. Sorensen et al. (2005), states that there is a similar socioeconomic gradient that has been observed for the use of smokeless tobacco (Sorensen, 2005).

The caste system in India is a way of defining a person's socioeconomic position in society (Jha, 2008). The caste system in India is one of the areas that some researchers acknowledge as a major factor affecting the number of smokers and access to health care. The

caste system structure exists now as it has for more than 3500 years (Jha, 2008). As of 2008, the Indian government categorizes all castes and sub-castes into six groups listed in descending socioeconomic order: others, other backward class (which includes all "upper-caste" Hindus), scheduled caste, scheduled tribe, Vimukta Jati, and nomadic tribe (Jha, 2008). The schedule caste, schedule tribe, Vimukta Jati and nomadic tribe are the lowest socioeconomic classes, which means that they tend to use tobacco products more than other groups, as poorer people in India are more likely to be tobacco users than wealthier groups (Jha, 2008; Rani, 2003). The problem is that these groups do not have adequate access to health as a result of their socioeconomic status. There is a lack of formal health insurance and insufficient safety nets to assist the poorest of the poor (Jha, 2008). When considering prevention and raising awareness about the problem of tobacco use in India, it is imperative that organizations, governments and public health think about the disparities that exist in India.

Health Consequences of Tobacco Use in India

In India, tobacco use accounts for half of all of the cancers in men and a quarter of all cancers in women (Rani, 2003). Tobacco-related cancers constitute about 50% of the total cancer incidence among men and 20% for women (Sorensen, 2005). WHO estimates that by 2020, tobacco related mortality in India will account for over 1.5 million deaths annually (Rani, 2003). Tobacco use is also a major risk factor for cardiovascular disease (CVD) and chronic obstructive pulmonary disease (COPD) (Rani, 2003). Also, due to the high use of chewing tobacco in India, the country has one of the highest rates of oral cancer in the world (Rani, 2003).

There are health concerns not just for the tobacco users, but also people who are in the vicinity of smoking and they are exposed to secondhand smoke. Secondhand smoke (SHS) is the

combination of smoke from the burning end of a tobacco product and the smoke exhaled by the smoker. There are more than 7000 chemicals in tobacco smoke and 250 of them are toxins. SHS has been linked to lung cancer and COPD. There is some research suggesting it may be linked with childhood leukemia and cancers of the larynx, pharynx, brain, bladder, rectum, stomach, and breast (Secondhand Smoke, 2013). SHS causes more than 600,000 premature deaths per year (Secondhand Smoke, 2013). wHO estimates that across the world, almost half of children regularly breathe air polluted by tobacco smoke in public places ("Why Smoke Free", n.d). WHO also claims that over 40% of children in the world have at least one smoking parent (Why Smoke Free Environments, n.d). In 2004 across the globe, children accounted for 28% of the deaths attributable to second-hand smoke (Secondhand Smoke, 2013).

Millions of deaths each year are attributed to secondhand smoke because people who are chronically exposed can develop COPD. The main concern surrounding SHS is that the people who are exposed are vulnerable because they have no choice in being in that environment. Most of them are exposed to this without any input. The main health consequences are for smokers, although in developing countries, many are not informed of the risk of using tobacco and the impact their use has on others in their environment (Mackay, 1994). There are not enough resources to educate and protect the most vulnerable populations (Sarkar, 2012).

There are gender differences among the health consequences of tobacco use as women are one of the most vulnerable populations for tobacco related diseases and SHS. Disease like COPD and CVD affect men and women equally if they are both tobacco users, but women are vulnerable to other health complications if they use tobacco. Women who smoke or are exposed to SHS are more likely to have a low birth weight baby (Tobacco Free Iniative, n.d.). There is also a link between child mortality and tobacco use by the mother (Tobacco Free Iniative, n.d.).

While the health lobby is in favor of banning or at least strictly regulating tobacco in India, tobacco manufactures argue that the all of these health risks are overstated (Tobacco Free Iniative, n.d.).

In terms of the health consequence of bidis versus cigarettes, it is not known if one is relatively safer than the other (Sarkar, 2012). Some laboratory scientists and toxicologists have shown in several studies that nicotine levels in bidi users are at least as high as in those in cigarette users, and in many cases much higher (Yach, 2003). This indicates that people are probably consuming bidis at similar or higher rates than cigarettes most likely because they are cheaper and more widely available (Yach, 2003).

Tobacco also has a harmful effect on our physical environment, which greatly impacts the physical body. Similarly, tobacco manufacturing is responsible for negatively impacting the environment. Tobacco is manufactured throughout India and in turn, it affects the environment of the entire country. Tobacco production depletes soil nutrients faster than any other commercial crop (Sudarshan, 1999). To grow tobacco hazardous pesticides and chemical fertilizers are needed. They persist in the waterways and are a danger for people who use water that is not properly treated (Sudarshan, 1999). This especially an issue in India where the water is often not treated, therefore people can consume the residual runoff of these chemicals (Sudarshan, 1999). High input from agriculture increases pesticide resistances which causes outbreaks of existing and new human and animal diseases (Sudarshan, 1999). India's environment is already vulnerable to degradation due to the overtaxing of the environment by the large population (Sudarshan, 1999). These concerns need to be taken into consideration when it comes to determining the impact of tobacco on human health.

There has been a recent push to develop culturally appropriate interventions to reduce the prevalence and incidence of tobacco use. Because there is such a strong body of research supporting the high health costs of tobacco use, there is also support of the high economic cost. This has led to serious thinking by governments all over the world to reduce or eliminate tobacco use (Sudarshan, 1999). The potential actions by governments are justified because in many cases, particularly developing countries, it can be assumed that individuals who use tobacco might not know of all of the adverse impacts tobacco use has on their health and the health of others who are in the vicinity of their tobacco use (Sudarshan, 1999).

Economic Cost of Tobacco Use in India

While the health consequences of tobacco use are well understood and documented through a vast body of research, there is also an argument that has been made by supporters of big tobacco that says tobacco in India has helped the economy. Therefore, some people argue that the economic benefits outweigh the health consequences of tobacco use (Sudarshan, 1999). India faces high unemployment, poverty, and complex health issues, but tobacco production has helped industrialize the country as it has contributed to the nation's economic growth through the last three centuries (Sudarshan, 1999).

One of the biggest arguments in favor of the manufacturing of tobacco products is regarding the number of jobs generated by this industry, especially for women. Tobacco processing generates a substantial amount of jobs for women. Yach (2003), estimated that bidi rolling, which is a home-based enterprise, serves as employment for around five million bidi makers, most of which are women (Yach, 2003). India has only experienced an increase in the

sales of bidis throughout the country, which could indicate that even more women are being employed to make bidis (Yach, 2003).

Among farmers in India, tobacco is one of the most popular crops (Sudarshan, 1999). This is largely due to the fact that the demand for tobacco is extremely high in India and farmers are working to meet the market needs (Yach, 2003). It is a crop which is more likely to succeed as it is drought resistant and there is more of an assured market as compared to other cash crops like chilies, cotton, or groundnut (Sudarshan, 1999). These crops can all be grown on the same land, but farmers prefer tobacco because there is more of a guarantee on their investment. Furthermore, the creation of jobs does not just stop with the growth of tobacco, but it also employs individuals who cultivate and distribute the crop. These people are engaged in curing and processing of the tobacco. This employs approximately 1.2 million individuals in India (Sudarshan, 1999). Another 500,000 Indians are employed to trade and distribute the tobacco (Sudarshan, 1999). But, long term perspective is needed that starts with investing in research that is seeks to find alternate high wage jobs for poor rural farmers (Yach, 2003). Without considering this issue, then the tobacco industry will continue to thrive.

There are also economic costs of tobacco on the working industry. While there may be some advantages to tobacco production, there are also several economic consequences. Smoking workers are less productive workers because they are typically unhealthier than non-tobacco using ones (Mackay, 1994). Workers who use tobacco are more likely to miss work than their non-tobacco using counterparts. The loss in productivity due to the absences from work and the cost of the health-related expenses far outweigh the economic benefits the tobacco industry claims (Sudarshan, 1999). Also workers who use tobacco who are skilled and training in their forties and later will die sooner than nonsmokers, which will require new workers to be trained

(Mackay, 1994). Workers also interrupt their work to smoke, which makes less productive then their non-smoking counterparts (Mackay, 1994).

One of the major issues is that tobacco countries greatly exaggerate the economic benefits to countries that sell and grow tobacco products (Mackay, 1994). The economic cost of treating individuals with tobacco-related diseases are enormous (Mackay, 1994). There are years of potential life lost, the cost of health care and the taxing burden these diseases place on the country. In a country that is already struggling to deal with several health conditions related to poor infrastructure, tobacco use is only furthering to diminish the health of not only the tobacco users, but all of those Indians who are in tobacco environments.

Environment of Tobacco Use in India

Culture begins with interwoven behavior across individuals, within and across generations, and shapes an individual's environment (Hovell, 2009). There are many factors that influence the environment in which people exist. The tobacco industry is constantly changing the environment to reshape individual perceptions of tobacco (Hovell, 2009). This makes tobacco highly in demand as its uses are constantly being redefined (Brandt, 2012). However, the spaces and environments in which people use tobacco remain persistent (Brandt, 2012). The environment of tobacco use in India consists of three different but overlapping spaces: home, work and public places. Understanding people's objective measurements of these environments would help shape regulation and understand tobacco use trends.

In India, people are believed to be personally responsible for their own health (Staples, 2012). However, individuals have very little control over their socio-cultural environment (Hovell, 2009). Even with current legislation, tobacco users have the freedom to use tobacco in

most environments. There are health concerns associated with the use of these products in a variety of places, including risks associated with secondhand smoke, increased visibility of tobacco products that fosters social acceptance and increased use. It is clear that environment shapes tobacco regulation, prevalence of users, and increased health risks.

Even when there are public policies that reduce smoking behaviors, these policies have not necessarily transferred to home environments (Muilenburg, 2009). Because governments cannot legislate smoking bans in the home, there are concerns that family members, especially children, will be subject to greater exposure of tobacco smoke (Muilenburg 2009).

The home environment is important when thinking about the characteristics of smoking. Research has shown that among the various influences on child smoking, parental smoking itself appears to be the most obvious and direct (Ditre, 2008). Children and adolescents are exposed to parental smoking most often in the home environment (Ditre, 2008). Studies have shown that parenting styles and parenting attitudes greatly influence adolescent smoking behavior (Ditre, 2008). However, there have been few studies conducted that have looked at different bans of smoking in the home environment. Knowing that children and young adults are exposed to this environment where they see adults using tobacco, understanding how these impacts their likelihood of using tobacco products is important.

Legislation does not typically reach into the home environment. In the studies that have been conducted in western countries, research shows that home smoking bans can reduce the prevalence of smokers (either children or other adults living in the home) (Ditre, 2008; Muilenburg, 2009). Adolescents who live in non-smoking environments perceive a lower adult smoking rate and are more likely to disapprove of adults smoking (Muilenburg, 2009). An adolescent living in an environment where smoking is not allowed in the home and smoking is

not permitted in public places has less exposure to people actually smoking cigarettes than a friend whose parents smoke. Thus, the adolescent may perceive smoking to be a less desirable behavior (Muilenburg, 2009). Enforcement of personal home restrictions can set a precedent of what is expected in terms of smoking behavior (Muilenburg, 2009). Evaluating the home environment in regards to smoking and tobacco use might give more of a context to the individual's socio-cultural smoking environments. It also might help predict their likelihood to use tobacco products.

Culture and interlocking behaviors influence the social environment of tobacco use. This can happen at the home, work or public spaces (Hovell, 2009). According to Hovell et al. (2009), interlocking behavior occurs when a person's behavior, or the consequences of said behavior, services as prompt and reciprocal reinforcement for another's behavior (Hovell, 2009). In terms of tobacco use, this can occur when someone asks another person for a lighter to light his or her cigarette and the person who obliges is vicariously accepting and promoting the behavior. On the other hand, a person who scolds their child in a crowd for smoking cigarettes is vocalizing their disapproval for tobacco use (Hovell, 2009). This all brings public attention to tobacco use. More often, there is interlocking behaviors in these environment that promote tobacco use in India (Hovell, 2009). This further validates the significance of environment when it comes to tobacco use in India.

Even when considering the different influences on tobacco use, it is important to note that the smoking environment varies in India's 35 different regions in country. There are enormous cultural differences between the regions due to variations in wealth, infrastructure and values (Sarkar, 2012). Therefore, while we can generally understand the social and environmental cues of smoking in India, it is important to keep in mind India's heterogeneous geographic, social, and

cultural groups.

The environment of tobacco use is incredibly complicated as you add in the multiple factors that influence tobacco use. One model that seeks to explain the interaction between environment, behavior, biology, choice, and culture is the Behavioral Ecological Model (BEM) (Hovell, 2009). According to researchers, the model presumes that influences from genetics, biology (e.g. immune system), and behavioral learning history (e.g. addiction), interact with influences from the local family, friends and to societal ecology, which all interact with the physical ecology (Hovell, 2009). A copy of BEM can be found in Appendix 1. BEM requires public health, government, and agencies to specifically direct their efforts at the underlying and interwoven culture around behavior. The model requires them to understand how contingencies define cultures, how cultures interact across levels of society, and how to change system factors to promote protective behaviors (Hovell, 2009). BEM can be applied to tobacco use. Hovel et al. (2009) used this model to help explain the environment around secondhand smoke. Their work resulted in recommendations around tobacco control and serves as a 'Trojan horse to counter the tobacco industry' (Hovell, 2009). Research has shown the different ways that environments increase tobacco use, but BEM helps understand the interaction in order to develop the most effective legislation and interventions for India. The government has many areas to overcome in order to address the complex, multilevel environment that individuals and tobacco coexist in.

In developing countries, governments are often preoccupied with other health or general matters, such as high infant mortality, internal or transnational conflict and communicable disease. Few governments of developing countries have the experience or resources to deal with the epidemic of tobacco (Mackay, 1994). While developed countries have a better understanding about tobacco in terms of legislation and allocated resources, developing countries have not been

able to catch up as transnational tobacco companies have only recently penetrated these poorer areas (Mackay, 1994). Such companies use political and commercial pressures to open up markets and promote their varied tobacco products to the most susceptible people leaving countries vulnerable to their manipulation (Mackay, 1994).

Some of the ways that tobacco companies are able to get a hold on developing countries to influence their tobacco practices is through advertising and promotional activities. They spend a significant amount of money to do this, which cannot be matched by funding available in developing country for health education (Mackay, 1994). The only defense that developing countries have in reducing the number of new tobacco users and current tobacco users is through regulation and enforcement.

Current Regulation

The Indian government is currently working to reduce the number of tobacco users through policy. While there are still a significant number of tobacco users, the Indian government's efforts are working to change the normative beliefs around tobacco use. Most policies around tobacco control in India are aimed to raise the price of tobacco products, display health warnings and ban advertising. The aim of these policies is to discourage an increase in smoking that may be attributed to changing lifestyles (Sudarshan, 1999). In the past decade, there has been an increase in support for the creation of laws that regulate tobacco usage in India. One of the most current laws in India that regulates tobacco is called the *Cigarette and Other Tobacco Products Prohibition of Advertisement and Regulation of Trade, Commerce, Production, Supply and Distribution Act*. This law was created after the Supreme Court of India directed the central government to enforce a national ban on smoking in public places in 2001 (Sharma, 2008). This law states that the sale of tobacco products to individuals under 18 years

old is prohibited. Also, there is a ban on smoking in public places and this law loosely defines public place ("Provision of Cigarette", n.d.). However, if public places have a designated area for tobacco users, then tobacco use is allowed in those areas ("Provision of Cigarette", n.d.). This law also bans the sale of tobacco products within 100 yards of an educational institution and leaders may place signs that bring attention to this restriction ("Provision of Cigarette", n.d.). On tobacco products or wherever tobacco products are sold, there should be a display that says 'tobacco kills' or 'tobacco causes cancer' ("Provision of Cigarette", n.d.). Even with this new legislation, which is considered by some organizations to be steps in the correct direction for controlling tobacco use in India, researchers and many other organizations are skeptical (Sarkar, 2012; Yach, 2003). Finally, in 2004, the Health Ministry of India recognized that this law "could not be enforced because the definition of a public place was ambiguous and a mechanism for enforcement was absent" (Sharma, 2008).

In October 2008, India's health ministry decided to enforce a national ban on smoking in public places (Sharma, 2008). A new set of comprehensive rules was established to prohibit smoking in public places. This ban defines public places where smoking is absolutely prohibited to be railway stations and work places (Sharma, 2008). Hotels with more than 30 rooms, restaurants with seating capacity for more than 30 people and airports must have physically segregated smoking areas (Sharma, 2008). Even with this new law, this is the only way that public places are defined. These rules were originally apart of the *Cigarette and Other Tobacco Products Prohibition of Advertisement and Regulation of Trade, Commerce, Production, Supply and Distribution Act* of 2003. India actively participates in the Framework Convention on Tobacco Control (FTCC). There are many countries that participate in the FTCC, but India was

the first to have ratified these new rules regarding tobacco control. The FTCC provides framework and guidance to countries that want to increase their tobacco regulation.

However, even with this new legislation, India faces many obstacles in implementing and enforcing tobacco control regulation. One of the issues is that in India, there are few examples of success in reducing the consumption of smokeless tobacco among poor populations (Yach, 2003). According to one article that investigated the regulation of tobacco products in India, Yach (2003), argues that there are no examples of successful efforts to reduce bidi consumption (Yach, 2003). Yach sites a few examples of this poor regulation among these products by India. First, bidis and smokeless tobacco are currently taxed at very low levels to 'protect the poor' as they represent the largest number of consumers of this product (Yach, 2003). If bidi taxes are kept very low and other tobacco products like cigarettes are taxed at higher rates, then people would be more likely to switch from cigarettes to bidis (Yach, 2003).

The two aspects of the *Cigarette and Other Tobacco Products Prohibition of Advertisement and Regulation of Trade, Commerce, Production, Supply and Distribution Act* that are most relevant to understanding the tobacco environment in India are the prohibition of smoking in public places and the regulation of tobacco promotion and advertising. However, according to surveys and research, there is little evidence that this law is being enforced, particularly in rural areas where tobacco use rates are highest (Yach, 2003). First, this law does not impact smokeless tobacco use because these products cannot be regulated in this way. The bans on tobacco advertising and promotion included in these new laws do not impact bidi or smokeless tobacco as these are usually produced by smaller companies that use more point of sale advertising to promote these products (Yach, 2003).

Regardless of the laws regulating where smoking can occur and through the media, there is still extensive point-of-sale advertisement and use of cigarette packaging (Sarkar, 2012). These are just some of the ways that tobacco companies can bypass these regulations set forth by the government. Another new area of tobacco advertisement that is penetrating developing countries is through social media (Sarkar, 2012). This is a fairly recent advancement by tobacco companies. The research regarding the full impact of tobacco promotion via social media in developing countries is such a new area of investigation that there has been little research conducted (Sarkar, 2012).

One of the biggest challenges that India faces is that different departments within the Indian government have different objectives for tobacco control. For instance, the Health Department does not have the same goals as the Ministry of Agriculture. The health department is more concerned with the health consequences of tobacco use and the Ministry of Agriculture is interested in the needs of farmers and producing sufficient numbers of exports for economic growth (Sudarshan, 1999). By discouraging and prohibiting tobacco use there is a significant potential loss of revenue and jobs lost. These are the primary causes behind the half-hearted measures to control tobacco in developing countries (Sudarshan, 1999).

Developing nations need support when facing the epidemic of tobacco usage. Statements and support from international organizations like WHO, the International Agency Against Tuberculosis and Lung Disease and the International Union Against Cancer can encourage their members to take a public and political stand against tobacco industries in these developing countries (Mackay, 1994). Agencies can form partnerships with other organization that can generate support and funding for educational programs to build infrastructure (Mackay, 1994).

Organizations can also help support new laws to address the underlying issues surrounding tobacco country. The best ways to reduce the tobacco use in developing countries is through a vibrant movement by non-governmental organizations (NGO) (Yach, 2003). NGO's can advocate for laws not to just be passed, but to be fully implemented and enforced (Yach, 2003). Some believe that smoking bans have caused an increase in tobacco chewing in men, children and adolescents (Yach, 2003). There also has been a shift by the tobacco industry to promote smokeless tobacco products. Developing nations need to be creative in combating this issue and with the support of NGOs and by following the example of developed nations who have successfully reduced tobacco usage. They can begin to address this problem through better understanding of the current tobacco environments. More reliable measures must be obtained to understand which, if any, policies are successfully reducing tobacco use. Through objective measures of real-time incidents of the smoking environments, countries will be able to work with NGOs and other governments to develop appropriate strategies. One way of collecting these objective measures is through ecologic momentary assessments.

Ecological Momentary Assessments

Human behavior can rarely be captured as it unfolds in the individual's environment, in real time (Shiffman, 2008). However, Ecological Momentary Assessment (EMA) studies allows for researchers to capture real-time behaviors. They no longer have to rely on global, summary or self-recall data to understand behavior and environment (Shiffman, 1997; Shiffman, 2008). Saul Shiffman from the Department of Psychology at the University of Pittsburgh, Pennsylvania, has written extensively on the methodology of EMA. According to Shiffman et al. (2008), EMA data is "able to address questions about individual differences about particular episodes or situations, about the unfolding of processes over time and about the interactions among these

factors" (Shiffman , 2008). Table 2 lists some of the common key features of EMA as they have

been identified by Shiffman et al. (2008).

Table 2: Some Key Features of EMA (Shiffman, 2008)
1. Data are collected in real world environments
2. There is an ecological aspect of EMA that allows generalization to the subjects' real lives
3. Assessments focus on subjects' current state, which avoids bias related to retrospective recall
4. Moments are strategically selected for assessment, whether based on particular features of interest, by random sampling, or by other sampling schemes
5. Subjects complete multiple assessments, illustrating their experiences and behavior varies over time and across situations

Clinicians and behavioral scientists rely on participants' retrospective reports for their

data, which are subject to bias (Shiffman, 1997). According to Shiffman et al. (1997), research

often requires respondents' behavior to generate estimates of event frequencies or accounts of

typical behavior (Shiffman, 1997). However, participants may not be able to accurately recall

information that occurred within a specific time period. Shiffman et al. (2008) argues that

according to the process of memory retrieval is itself subject to bias by the person's context and

mental state at the time of recall (Shiffman, 2008). According to Shiffman, EMA measures may

sometimes mirror the findings of recall measures, but EMA may be able to capture the research

questions with less 'noise' and greater sensitivity (Shiffman, 2008). This is considered one of

the greatest utilities of EMA.

The development of EMA came from the combination of several historical traditions

such as diaries, self-monitoring, experience sampling, and ambulatory monitoring (Shiffman,

2008). Shiffman et al. (2008) claims that the central development of current EMA methods came

from Czikszentmihalyi et al. and their development of the Experience Sampling Method

(Shiffman S, 2008). Czikszentmihalyi et al. demonstrated the innovation of randomly sampling

experience where participants were randomly paged to prompt them to complete a diary in which

they reported their mood, activity and thoughts (Shiffman, 2008). Mostly this research focused on physiological parameters (Shiffman, 2008). EMA attempts to encompass all of these areas to form one methodological framework (Shiffman, 2008).

Ecologic Momentary Assessment (EMA) involves the repeated sampling of individuals' current behaviors and experiences in their natural environment, in real time (Shiffman, 2008). EMA studies assess particular events in subjects' lives or EMA assesses subjects at period intervals, often at random times (Shiffman, 2008). EMA data is not only used to characterize between-person differences, but also to characterize within-person variations over time (Shiffman, 2008). This is done using several techniques.

EMA is unique and innovative for several reasons. First, EMA uses two types of sampling techniques: event-based and time-based sampling (Shiffman, 2008). Shiffman defines event-based sampling as a method of data collection whereby a recording is made each time a predefined event occurs. He defines time-based sampling as a method of data collection whereby a recording is solicited based on a time schedule, which is often based at random time intervals. Time-based sampling occurs either at random intervals or fixed intervals. Random intervals is any time a subject could be asked to do an EMA, where in a fixed interval, they are asked to do an EMA at certain times of the day or over certain days. Although specific events can be captured at the subject's initiative like in the case of event based sampling, continuous phenomena typically have to be sampled using a suitable time-based sampling scheme (Shiffman, 2008). How the scheme and timing is determined depends on the study's research questions.

EMA is not a single research method, but it is range of methods and methodological traditions (Shiffman, 2008). There are variations of EMA across different studies. The

technologies used to collect the data might be different, the populations studied might differ, the schedules of data collection may be different, but all of the measures collect data in real time in the subject's real environment. The construction of EMA for each study may be influenced by the technology that is used to collect the data (Shiffman, 2008).   The technology used may also be determined based on the needs and preferences of the population being studied (Shiffman, 2009b). What is important to considering when constructing an EMA study is how many times and on what medium will people be asked to respond to questions about their environment (Shiffman, 2008). According to Shiffman et al. (2008), subjects will usually be assessed a significant number of times (Shiffman, 2008). Shiffman (2008) warns that participant burden is a concern of EMA. Researchers need to be careful not to irritate the subjects, which could deter them from answering all of the questions in the assessment or answering them truthfully (Shiffman, 2008). Therefore, doing pilot studies and/or proper research about the subjects being studied is crucial (Shiffman, 2008).

Tobacco smoking can be a good target for EMA, as it involves behavior with clearly discernible small-scale events (Shiffman, 2008). Shiffman has used EMA to examine if smokers engage in negative affect smoking and how likely they would be to relapse after they quit smoking (Shiffman, 2009b). This work offered EMA data showing how a participant's attitudes and actions can lead to smoking relapse. This study allowed the researchers to make recommendations for cessation programs because they were able to more accurately determine when past smokers need the most support to increase the successful quitting for a longer period of time. Waters et al. (2008) also used EMA to understand the cognitive processes surround drug use (Waters, 2008). In contrast to previous work done in laboratory settings, EMA

provided more detailed and ecologically valid data. They found that EMA does in fact work to understand the cognitive processes of drug use (Waters, 2008).

These studies have focused on using repeated measures to characterize the subjects' "typical state", aggregating the repeated assessments to better characterize the subject's average state across situations (Shiffman, 2008). EMA usually studies the temporal resolution, which is established by multiple measures. These multiple measures allow investigation of within-subject changes in behavior and experience over time in different contexts (Shiffman, 2008). EMA studies have focused on depression, social support, work activity and satisfaction, sexual behavior, psychotherapy, drug use, allergies, psychological stress, adverse effects of medications, self-esteem and asthma (Shiffman, 2008). EMA has also been used to study clinical disorders such as addictive disorders, eating disorders, anxiety disorders, depression bipolar disorder, schizophrenia, sexual dysfunction and ADHD (Shiffman, 2008).

While there are a variety of positive utilities for EMA, there are also some methodological considerations when designing studies. Shiffman identifies several of these concerns throughout his vast work in the development of EMA. First, he states that reactivity could be an area of concern. Reactivity is defined as the potential for behavior experience to be affected by the act of assessing it (Shiffman, 2008). Compliance can also be an issue as people are required to complete assessments in a timely fashion (Shiffman, 2008). Failure to complete these assessments can bias the results especially if the missing data are nonrandom (Shiffman, 2008).

Another methodological consideration is with the data analysis. EMA data usually consists of a large number of observations from each subject. The number and timing of observations often vary between subjects (Shiffman, 2008). Therefore, EMA data does not lend

itself to the basic approaches of data analysis. Typically more sophisticated analysis is required and should be considered when designing the study (Shiffman, 2008).

The other considerations with EMA regard the technology used and the cost of doing this type of data collection. Often EMA is collected on mobile phones or beepers. These technologies can be faulty or human error may occur as people may be unsure of how to work them, forget to charge the device or there could be power or data outages (Shiffman, 2009a). The technologies have become more advanced, but proper steps still need to be in place to account for these issues. Also, these technologies are expensive as is training subjects to use them and asking them to do EMA (Shiffman, 2008). When designing the study, these costs and challenges need to be addressed.

Conceptual Framework Incorporating the Literature Review

Despite the challenges of EMA, there are numerous advantages. It is believed to be one of the best ways to capture data in an objective and real-time manner. To date, there are no published studies that report the use of EMA in non-Western countries. All of the studies mentioned above were collected in Western countries. It is important to determine if EMA works in developing countries because research could better understand some of the biggest challenges in these ares. Research shows that environment, specifically in relation to tobacco use, is an important factor in understanding individual tobacco use. Due to EMA's ability to better capture environmental cues regarding tobacco use, this could be a viable way of collecting valuable that would provide insight into this major public health issue.

The following framework illustrates the interconnectedness between the different variables mentioned in the literature review. The variables are prevalence of tobacco use in India, the types of tobacco consumed, individual's environment, regulation, health consequences

and the economic cost of tobacco use. This framework incorporates EMA as it encompasses an individual's environment and can be used to measure the above variables. The lines drawn between each of the variables represents the interconnectedness of these different variables and how that factors into the individual's environment.

In India, the type of tobacco a person uses influences the prevalence of different tobacco products. There are specific health consequences for different populations who use different tobacco products. This then impacts regulation and the environment of tobacco, as well as the economics of tobacco. Regulation and legislation of tobacco control typically develops from an increase in prevalence of tobacco products. Then depending on the law, individuals make choices on which tobacco products to use or it deters them from engaging in this behavior. If there are laws that prohibit tobacco use, specifically in terms of where people can consume tobacco, then the environment and economics of tobacco has changed.

Figure 1.1: *Conceptual Framework*

31
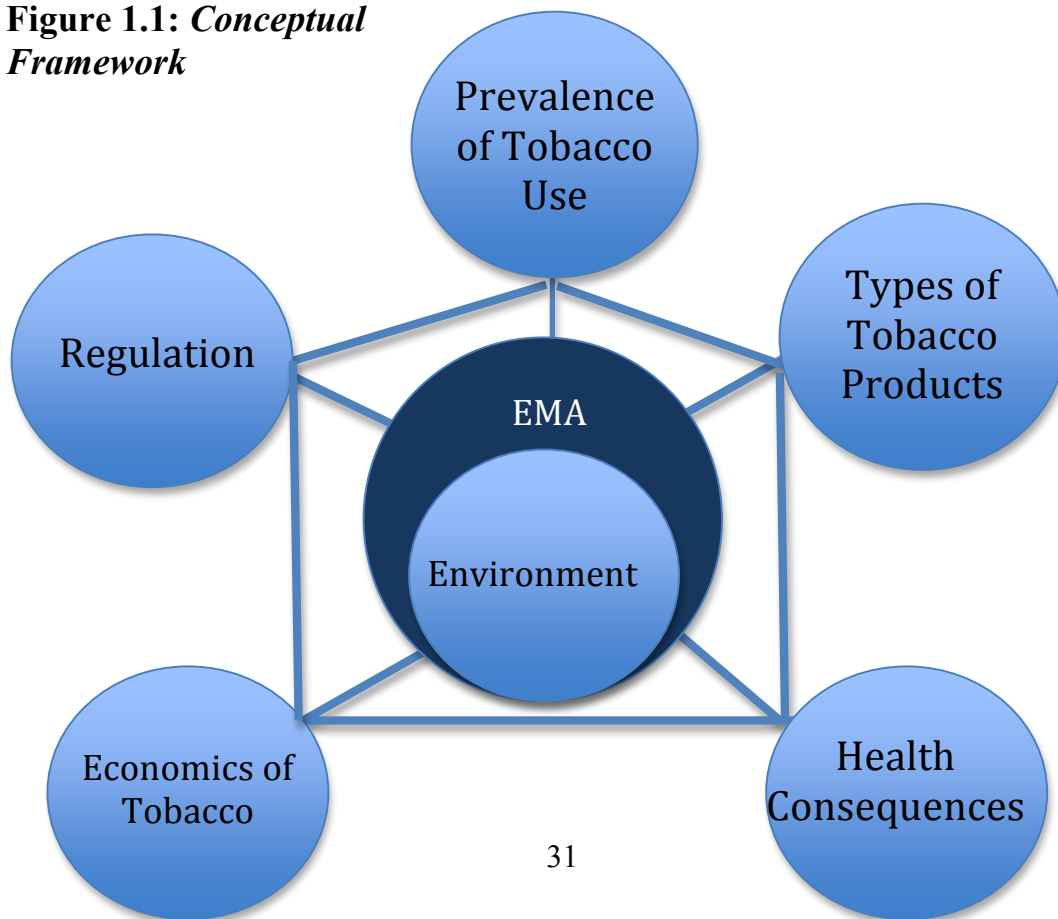
Chapter 3: Methods

Background Information of the Pilot Study

This secondary data analysis was conducted using data collected from the pilot study, "Ecological Momentary Assessments to Examine Cues to Use Tobacco in India and Bangladesh". Johns Hopkins University School of Public Health's (JHSPH) Institute of Global Tobacco Control (IGTC), Baltimore, Maryland, funded this study, which was conducted by the Principal Investigator (PI) Dr. Dina Borzekowski (now at the School of Public Health and the University of Maryland College Park). The primary aim of this study was to use ecological momentary assessment (EMA) to examine the social and environmental cues encouraging and discouraging tobacco use in India and Bangladesh. Additional aims of the study included:

- Examine in Hyderabad and Kolkata the range of social and media exposures to tobacco usage experience by adults in public and private spaces;
- Determine tobacco use habits among those of different genders and ages;
- Assess whether individual awareness of tobacco policy, such as smoking rules in public spaces, varies between tobacco users and non-users;
- Examine variations between data collection instruments;
- Highlight important differences between resulting data from EMA versus traditional respective response surveys;

For this work, the PI Dr. Borzekowski and her research team subcontracted with the public health research organization, Policy Innovations, which is based in India. Policy Innovations led the recruitment and data collection.

The pilot study was conducted in two cities in India, Hyderabad and Kolkatta. Participants completed three types of data collection 1) a baseline survey, 2) ecological momentary assessments (EMA) and 2)end of day (EOD) surveys. The duration of the study was 10 days. The data from all surveys were stored in a secure, password protected location.

Information Regarding Locations Selected for the Pilot Study

Hyderabad

Hyderabad is the capital of the state of Andhra Pradesh, which is located in the northeast region of the country. Attached in Appendix 2 is a map of India with the city circled. In 2001, according to *Hyderabad Urban Development Authority*, the city's estimated population was 6.5 million, spread over an area of about 1864 square kilometers (Hyderabad Demographics, 2011). In 2008, the population broke past the 8 million mark, making Hyderabad the 4th largest city in India (Hyderabad Demographics, 2011).

Throughout India, Hyderabad's media and telecommunications infrastructure is among the most developed and fastest growing (Hyderabad Demographics, 2011). This enables Hyderabad to be one of the country's prominent information technology cities as well as a center of scientific and technological development. People from different parts of the country have migrated there to take advantage of the vast opportunities (Hyderabad Demographics, 2011). However, there are still urban and rural areas around this city, which only contributes to its diversity (Hyderabad Demographics, 2011).

The Andhra Pradesh region is experiencing an epidemiological transition as more people are dying from chronic disease than infectious diseases, according to recent research by Joshi et al. (2006) (Joshi, Cardona, Lyengar, Sukumar, Raju, Raju, Neal, 2006). Researchers argue that this is largely due to preventable conditions brought on by addictive behaviors, poor nutrition and poor quality of health care (Joshi et al., 2006). Tobacco significantly contributes to the disease burden faced by Andhra Pradesh. In a recent cross sectional study by Corsi et al. (2013), examining tobacco use and quit rates in Andhra Pradesh, 50.3% of men use smoke and/or

smokeless tobacco products in Andhra Pradesh (Corsi et al., 2013). In contrast, only 4.8% of women reported using either type of tobacco products (Corsi et al., 2013).

Kolkata

Kolkata is a city located in West Bengal, India which is in the southeast region of the country (Appendix 2). In 2011, Kolkata had a population of approximately 4.5 million, making this the 7th largest city in India ("Kolkata District", n.d.).

Kolkata is exclusively an urban area. The entire population for the 2011 census reported living in urban regions ("Kolkata District", n.d.). The central city of Kolkata remains one of the densest on earth, with a population density of 63,000 per square mile (Kundu, 2010). The expanding suburbs of Kolkata have a population density of 25,000 per square mile (Wendell, 2012). Kolkata's spreading urbanization has been occurring for over half a century (Kundu, 2010). Since the 1951 Census, the central city of Kolkata has accounted for only 19% of the urban area population growth of India ("Kolkata District", n.d.). The central city has added nearly 1,800,000 people while the suburbs have added approximately 7,650,000 to India's total population(Wendell, 2012).

The high population density brings serious health issues to this region. One third of the center city population, approximately 1.49 million people, live in slums and shantytowns (Kundu, 2010). The same population lives in an area of approximately 5 square miles (Wendell, 2012). Slums represent the worst forms of health conditions as infectious and chronic diseases run rampant (Kundu, 2010). Also, malnutrition in children, high infant and maternal mortality and poor hygiene causing hepatitis, encephalitis, typhoid and rabies are a result of these living conditions (Kundu, 2010). Tuberculosis is ten times higher, viral infections are two times

higher, respiratory diseases are over two times higher, and heart and circulatory diseases are ten times higher in slums than in the rest of the city as a whole (Kundu, 2010). These slums present a variety of health conditions that are serious, yet there are many other health concerns in the city as a whole.

One of the most serious health concerns is related to the pollution created by the city. Kolkata has the highest number of people suffering from lung cancer in the world (Sehgal, 2011). Researchers estimate that 70% of the Kolkata population suffer from respiratory symptoms including cough, sinus, wheezing breath, upper and lower respiratory symptoms (Sehgal, 2011). Tobacco use is also a major contributor to the prevalence and incidence of lung cancer. In a study done that assessed youth smoking rates, over 40% of the population is believed to consume tobacco in this region of India (Chatterjee, 2011). This coincides with many of the estimates related to rural tobacco users. This study also found that many of the women used smokeless tobacco and most people consume bidis (Chatterjee, 2011).

Study Design

EMA studies are unique, as they do not fall into traditional categories of study designs. An EMA study is not a single research method; it encompasses a range of methods and methodological traditions (Shiffman, 2008). This pilot study is no exception. The baseline study is a traditional methodology because it captures sample characteristics and behaviors using recall measures. As this pilot study utilizes both EMA and EOD surveys, it is considered a temporal combination design (Shiffman, 2008). This design is characterized by combining different survey schedules to assess participants' environments and behaviors.

For this study, EMAs involved randomized surveys occurring five times daily. Due to the randomization, this is considered a variable schedule. The alternative is a fixed interval

schedule, which occurred at a specific, predetermined time. The variable schedule is considered better at achieving a representative sampling of subjects' state (Shiffman, 2008). EOD was a fixed, once daily, interval schedule.

Study Sample

Announcements for the study were posted throughout the community, schools, work places and popular area establishments in both Hyderabad and Kolkata. Well-known community members were contacted to disseminate information to generate support and local community trust.

Interested individuals were asked to come to information sessions to hear more about the study, but were not required to participate if they attended these sessions. If individuals were interested, then the individuals would complete active consent. They would then complete a baseline survey and a training session on how to use their mobile phone to complete the EMAs and EODs.

Inclusion criteria for this study included:

- Participants must possess an Android-series mobile phone or one with similar functions and application capabilities.
- Participants who are either tech savvy or eager to learn. There was an extensive training that occurred to teach participants about their mobile phone and how to complete the EMA and end of day surveys.
- The participants must be literate, as they were required to read and complete surveys on their mobile phones.
- If they were 16 or 17 years old, parental consent must be obtained for them to be apart of the study.
- Consent must be obtained in order to participate in this study.

Study risks were minimal. The participants could be embarrassed to report tobacco use or being in environments were tobacco was being used. To minimize this embarrassment, baseline information was collected in private between the researcher and participant. The participants

were also matched with researchers during this process of the same gender. To minimize the harms associated, the EMA and EOD surveys were created to be brief. This also minimizes the research burden. Even though they would complete several surveys throughout the day, the surveys are brief and should not place a significant burden on the participants. If any unanticipated problems or adverse events occurred, then the local team and PI/JHSPH IRB would be notified.

Incentive for participation was payment in the form of prepaid mobile data credits. At the start of the study, participants received a month's worth of unlimited data usage so they could complete the EMA surveys, which would also ensure participation. The cost of this prepaid data was approximately $5 USD. At the end, those participants who completed the study received a small gift such a pen drive or Bluetooth headset, which cost approximately $10-15 USD. There were no consequences for any participants who did not complete the study.

Data Collection Procedures

Participants were asked to complete three types of surveys—Baseline, EMA and EOD. Many of these questions for these surveys were drawn from the GATS (described earlier in this thesis).

The first data collection was the baseline survey. This survey asked a variety of descriptive questions about the participants such as their age, tobacco use, perceptions of the health risk of tobacco use, etc. They were asked these questions by a trained interviewer. This provided the demographic and descriptive statistics for the analysis of the data. This also provided a baseline to determine their reported habits and if that corresponded with what they reported at EMA and at the end of day survey.

Over ten days following the baseline survey, participants were randomly signaled 5 times per day during waking hours (8am-10pm) on their Android mobile phones. They were prompted to take an EMA survey. Each EMA took approximately 2-3 minutes to complete. The same set of questions was used each time they were beeped, but the order of the questions might change. Participants were asked to keep their phone turned on from 8am-10pm and they were asked to charge their phone every evening. If the participants were beeped and they were unable to take complete the EMA, they were able to press a 'snooze' button and the EMA application would remind them 5 minutes later to take the survey. If they did not complete the survey at this time, then the EMA survey would expire. The participants had 20 minutes to complete the survey. If they did not complete the survey at that time, the survey would expire.

For the EOD survey, participants were signaled at 10pm for each of the ten days of data collection. The same rules for expiration of surveys applied to EMA and EOD. Surveys asked participants to recall tobacco events that occurred throughout the day. This approach was used to compare EMA survey methods and traditional retrospective recall that happened during the end of day survey.

Variables

Dependent Variables

The primary dependent variable is the frequency of times that participants saw social cues around smoking by self or others and environmental messages or advertisements of tobacco. This was calculated using the number of responses over the total number of completed surveys by the participants (N=3277 for EMA and N= 987 for EOD). Another dependent variable is the social and environmental cues that encouraged or discouraged smoking behaviors.

Independent Variables

The thesis examines the following independent variables. Within each of these variables, other items are measured. The variables are:

- Smoking Status—Daily smoke tobacco user, non-daily or sometimes smoke tobacco user, daily smokeless tobacco user, and non-daily or sometimes smokeless tobacco user
- Gender
- Age
- Level of Education
- Work status
- Work and home smoking exposure

Measures and Coding of Survey Variables

For this thesis, numerous variables were measured using the three data collection points, baseline, EMA and EOD (Appendices 6-8). There are many related variables between EMA and EOD surveys, which allow for the determination of the consistency of participants' response. These measures were developed to track dynamic and rapidly shifting phenomenon as they occur in real time. For EMA studies, it is important that assessments be reliable, which can be achieved through aggregation across multiple assessments rather than across multiple items within a single assessment, as in traditional methodological approaches (Shiffman, 2008).

The different variables used in this secondary analysis are discussed in each following corresponding type of survey.

Baseline Survey Variables

At baseline, participants reported background characteristics such as age, gender, educational level, work status, and possession of household items (i.e. flush toilet, electricity,

car, refrigerator, etc). Gender was measured as male=1, female=2. Some of the other descriptive statistics such as age (in years) was self-reported by the participants. Work status, as well as educational status, was coded as nominal variables. Participants were also asked if they possessed any of the household items mentioned on the survey (no=0, yes=1).

The second major baseline section examined tobacco smoking behavior. The first variable collected was how often the participants identified using smoke tobacco: coded as 1=daily, 2=less than daily, 3=not at all. Daily smokers and non-daily, also defined as sometimes smokers, answered similar questions and individuals who never used smoke tobacco had separate questions. Daily and non-daily smokers identified types of tobacco product used (coded based on type of tobacco product smoked) and the frequency of use. Age (in years) of when the participant first tried smoke tobacco and when the participant first started using smoke tobacco daily or less than daily.

Similar questions with the same coding were asked of smokeless tobacco users, with the possible types of product used differing. The number of times used as an interval variable and frequency (daily or less than daily) was asked and coded the same as smoke tobacco users. The survey differentiates the variable of tobacco user as either being smoke tobacco user or a smokeless tobacco user. These variables are consistently referred to in this way across EMA and EOD data collection points.

The last sets of questions are regarding the reported tobacco environments of participants, including questions about second hand smoke and rules about smoking at home and other locations. Participants were asked if tobacco use was allowed in a variety of locations in and around their residence. Their responses were dichotomous—no, yes (no=0, yes=1). To measure the work smoking exposure, the researcher will analyze the questions, D4-6, that ask if the

participant works or goes to school outside of the home (no=0, yes=1, I work at home and I don't work at all response), and if they work at a government building (no=0, yes=1). Finally, there is a series of questions that asks where people are permitted to use tobacco and if there are tobacco policies.

The final section of the survey asked about exposure to anti- and pro-tobacco media and advertising.   All participants, regardless of reported tobacco use, were asked to recall in the past 30 days if they saw any information in different types of media such as newspapers, television, radio and billboards regarding the dangers of using bidis, cigarettes or smokeless tobacco. For example, participants would be asked if they saw information regarding the dangers of using bidis in newspapers and the respondent would answer, no, yes or DKCS/don't remember (no=0, yes=1, DKCS=99). Participants were also asked a variety of questions regarding health warnings on cigarette packages.

Daily and sometimes smokers and smokeless tobacco users were asked if the health warnings on the packages made them think about quitting. To answer this question participants responded on a scale that ranged from completely disagree (=-3) to completely agree (=+3). Besides exposure, participants were asked about their perceptions of anti-smoking messages. They were able to type in their responses. These questions were not used in this analysis.

The pro-tobacco media and advertising questions were asked and coded the same way as the anti-tobacco media and advertising questions. All participants, regardless of reported tobacco use, were asked to recall in the past 30 days if they saw any advertisements or signs concerning the promotion of bidis, cigarettes and smokeless tobacco in locations (in a store, cinema or on the internet) and in different media (newspapers, television, radio, billboards and tobacco packaging). Participants would respond yes or no (no=0, yes=1). The other questions were

regarding the promotion of tobacco products through free samples, coupons, specials, etc. However, this set of variables was not analyzed for this thesis.

Finally, the last section of the survey asked about knowledge, attitude and perceptions of tobacco use.   These sets of variables were also not included in the analysis for this thesis.

EMA Variables

The first set of questions were demographic and included: participants' current location, social setting, and tobacco use. The locations included home, workplace, other's home, bar/restaurant, vehicle, outside, store/shopping place, place of worship and other. These were coded as public or private. The following table shows how it was coded and distinguished as public or private.

Response	*Code*	*Public or Private*
Home	1	Private
Work place	2	Public
Other's home	3	Private
Bar/Restaurant	4	Pubic
Vehicle	5	Private
Outside	6	Public
Store/Shopping Place	7	Public
Place of Worship	8	Public
Other	9	--

Participants had to describe who they were with in each of these social settings. Finally participants answered if they or others were using a tobacco product.

All participants were asked if at that moment there was evidence of tobacco use and rules about tobacco use. The first set of questions asks if people are using tobacco in participants' current environment. Individuals could report no one was using tobacco in their view, that someone in the participant's group is using tobacco or someone in their view, but not in their group was using tobacco, coded as 1, 2 or 3 respectively. They are asked to identify

what product being used by person/people they see. Next, participants were asked to report if they saw evidence of tobacco use—cigarette butts, bidi butts, ashtrays, spit from oral tobacco or if they smell tobacco. The final two questions in this group are about both smoking and smokeless tobacco rules in the participant's current environment. The responses for these two variables were allowed=1, not allowed, but with exceptions=2, never allowed=3, no rules=4 and don't know=5.

The remaining EMA variables are about anti- and pro-tobacco smoking media (newspapers, television, radio and bulletin boards) in the participant's current location. The questions are about pro- and anti-tobacco messages, and are dichotomous (no=1, yes=2). If they answered yes, they were asked to identify which product (cigarettes, bidis and smokeless tobacco) they saw in the pro- or anti- tobacco media.

EOD Variables

EOD questions are similar to EMA, but participants are asked to recall specific details about their day, as opposed to their current environment. The sample characteristics for EOD were slightly different than EMA. The first EOD variable reported is about tobacco use over the course of the day, with responses coded as no=1, yes, smoke tobacco=2, and yes, smokeless tobacco=3. If they selected yes for smoke or smokeless tobacco, they were asked which products they used. The next related variable asks how many times the individual used tobacco that day.

The next sets of variables examined for this thesis were similar to EMA,, were about the individual's tobacco environments. These variables include observing anyone in a social group or otherwise using tobacco and evidence of tobacco use. The first set of questions asks if the participant observed people using tobacco throughout the day. The response was a dichotomous

variable as the participant would answer, no I did not see anyone using tobacco=1 or yes, I did see other people using tobacco=2. If the participants report that someone is using tobacco, the EOD survey asked the participant to report who was using tobacco (spouse, friends, family, co-workers, or people they did not know). The questions regarding evidence of tobacco use are similarly asked and coded as EMA. Participants were asked if they saw evidence of tobacco use (cigarette butts, bidi butts, ashtrays, spit from oral tobacco) and if they smelled tobacco at any point during the day.

The final set of variables was about anti- and pro- smoking media and messaging reported at EOD but they are set up differently than their EMA counterparts. Participants were asked if they saw/heard pro-tobacco messages, as well as, if they saw/heard anti-tobacco messages throughout the day. Both variables were coded as no=1, yes=2= dichotomous variables; if they selected yes for either then they chose which media they saw/heard the respective message.

Transformation of Variables

For the secondary data analysis, several variables were transformed (See Table 3.1 below). The transformation of variables means that different constructs can be addressed then what was originally measured.

Table 3.1: Transformation of Select EMA and EOD Variables

Original Variables in EMA	Original Variables in EOD	New Variable
• Saw others using tobacco • Used smoke or smokeless tobacco yourself	• Saw others using tobacco • Used smoke or smokeless tobacco yourself	• Saw a Tobacco User (SATU)
• Saw others using tobacco • Used smoke tobacco yourself	• Saw others using tobacco • Used smoke tobacco yourself	• Saw a Smoker (SAS)
• Saw evidence of tobacco use • Smelled tobacco smoke	• Saw evidence of tobacco use • Smelled tobacco smoke	• Exposure To Smoking Evidence (ESE)

• Saw pro tobacco message in magazine or newspaper • Saw pro tobacco message on television • Heard pro tobacco message on radio • Saw pro tobacco message on billboard/poster	• Heard or saw messages that it was good to use tobacco	• Saw a Pro-Smoking Message (SPSM)
• Saw anti tobacco message in magazine or newspaper • Saw anti tobacco message on television • Heard anti tobacco message on radio • Saw anti tobacco message on billboard/poster	• Heard or saw messages that it was bad to use tobacco	• Saw an Anti-Smoking Message (SASM)

Analyses

Overview

The analysis of this data was conducted using baseline, EMA and EOD survey data. All of the statistical analyses were done using SPSS 22.0. Research questions were first developed based on previous research regarding EMA studies. These research questions, along with appropriate analyses enable a better understanding of the perceived social and environmental cues that discourage and encourage smoking in India. These analyses will result in preliminary data about the participants' EMA and EOD response rates. Through the combined reports regarding response rates and the research questions, the utility of EMA for tobacco studies in developing countries will be better understood.

The analysis plan includes the following research questions:

Research Question 1: What are individuals' tobacco environments in India?

Research Question 2: Are there participant differences by age, gender, education and work status in the average number of completed EMAs and EOD surveys?

Research Question 3: Does tobacco use and tobacco environments reported at baseline differ from EMA and end of day (EOD) data?

Data Preparation

Before the analysis could begin, the data had to be checked for accuracy and consistency. The first step in this process was to go through the data sets with a member of the JHSPH research team. We met and discussed data entry and some of the decisions that were made with the initial data sets. After our meeting, I was presented with the research team's initial versions of the baseline, EMA and EOD data sets, as well as the codebooks for all of the data sets. Each of the three data sets were in individual SPSS files.

To answer many of the research questions, the data sets needed to be merged into one data set. The merging process revealed some inconsistencies in the data. The first issue revealed during the merging process was regarding study participation. In the initial phase of this process, it seemed that there was not a clear definition of participation as the EMA application did not automatically stop recording responses after a set number of days. This issue was found when trying to determine how many times per day a person was prompted to take an EMA survey. The application only recorded the responses if a person completed the entire survey or if the survey was delayed and then subsequently expired. However, when reviewing the data during the merging process, it was clear that the participants did not take a consistent amount of surveys. The participants with the highest number of completed surveys were examined first. Upon initial review, it appeared that full participation was five EMA prompts a day as it was determined that no one took more than that.

During the instruction phase of the baseline survey, participants were asked to uninstall the application to stop being prompted to take the surveys. However, some participants did not do this and they had many additional completed surveys for both EMA and EOD that extended beyond the period of the study. After examining all responses, most participants took or snoozed surveys for approximately ten days.

The final step in defining participation during the merging process was to review IRB protocol along with baseline instructions. The IRB indicated that participants could be prompted five to eight times per day. Also, in the original IRB it was indicated that full participation would be for 10 days. Therefore, after reviewing the dataset, the approved IRB and discussing with the PI, full participation was defined as five EMAs a day and one EOD survey for each of the ten days of the study period. Any surveys that were taken beyond the period of the study were removed. For any participants who did not complete all 50 EMA surveys or all 10 EOD surveys, blank entries were used for the variables added during the merging process for any missed surveys. These blank responses enabled a better understanding of how many people took all of the surveys and how many surveys were actually completed compared to all of the surveys that could be completed. This was just one more step in the process of considering the utility of this EMA study.

The EMA data was reviewed for inconsistencies, issues and to gain familiarity with how the research team entered the data. Preliminary frequencies were conducted on every variable in each type of survey. The results of these frequencies indicated inconsistencies with the data entry. Participant responses were reviewed and decisions were made with the research team regarding each inconsistency. Appropriate adjustments were made for any participant responses that were entered incorrectly.

Most of the inconsistencies came with the entry of '99'. At baseline, 99 meant 'DKCS'—don't know, can't say—but at EMA and EOD, 99 was entered if their survey expired (they delayed the survey and did not complete it) or if the question was part of a skip pattern. Therefore, each 99 at EMA and EOD was carefully examined to see if it seemed to indicate DKCS or if they truly did not answer the questions for that survey. It is important for the analysis of the merged data set to have consistency in coded responses. Therefore, this issue was discussed with the PI. It was decided that all of the entries with a 99 that were defined as not answering that question—in baseline, EMA and EOD—for whatever reason as mentioned above were all changed to blank entries.

The last phase of the data preparation was generating frequencies of the nominal and ordinal variables and calculating mean and standard deviation of interval variables. The frequencies and mean and standard deviations were generated in SPSS then converted to a excel file. Each question was decoded back to its original version and was presented in its own output table. Any frequency that seemed skewed was checked in the data to be sure it was correct. Some issues were discovered and corrected during this process. This ensured the data was clean and was ready for any future analysis. These output tables were given back to the JHSPH team.

Descriptive Statistics

The first step of the secondary data analysis was to analyze the descriptive statistics to better understand the sample. The descriptive statistics were completed using baseline survey data and univariate analysis was conducted. Frequency tables were created to display participant demographics for variables such as age, gender, location or residence, highest level of education, work status, household items and tobacco use that were collected at baseline. The frequencies analysis was run to determine the total number and percent of participants' responses for each

variable. Only individuals who completed the baseline survey in its entirety were included in the analyses. Grouping all participant characteristic questions together created a frequency table. When appropriate, means and standard deviations were calculated for the interval variables.

Univariate Analysis

The analysis plan illustrated below uses univariate analysis of baseline, EMA and EOD data to answer the first research question.
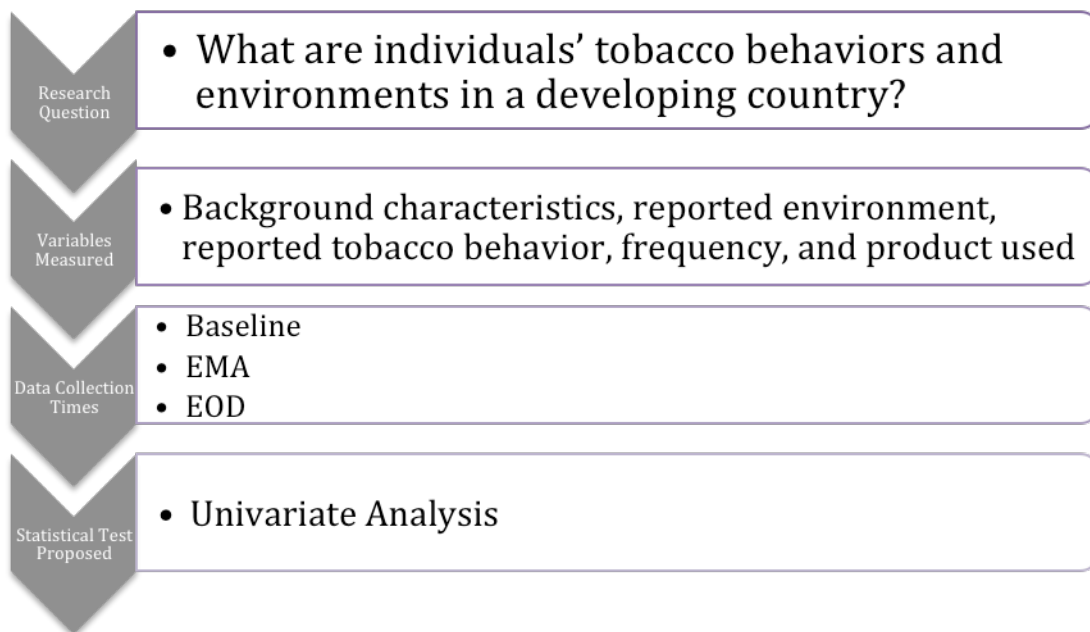
Previously, frequency tables had been generated and recoded for individual variables during the data preparation stage. These questions were in individual tables in the order they were asked. For this portion of the data analysis these questions were regrouped to create logical frequency tables by collection method—baseline, EMA, EOD.

Two frequency tables were developed to show the tobacco behaviors and characteristics reported between daily and sometimes (non-daily) tobacco users side-by-side. The tables are

separated by tobacco type (smoke or smokeless) and the values are the total number of
participants reporting at baseline.

Additional frequency tables were created that show the number of times participants
report different locations, different social settings, personal tobacco use and types of tobacco
products used at both EMA and EOD. Similar sets of tables were also created to show
individuals' tobacco environments. These tables aggregated the number of times individuals
reported observing smoking, saw evidence of tobacco use and rules of tobacco use for both
survey types. All four tables display results out of total possible surveys of the given type (EMA
or EOD).

Additional frequency tables were created to display data related to anti- and pro-tobacco
media reported in participants' environment at EMA and EOD. These frequency tables display
not only the number of times participants report seeing a given variable at EMA, but also how
many participants reported seeing each variable. The numbers of responses are from all possible
responses for the respective survey type and the number of reporting participants is out of the
total number of participants.

Finally, univariate analysis was conducted for the transformed variables discussed in
detail earlier in this chapter. Frequencies (from total possible responses) and percentages (from
the total number of participants) were calculated for each of these questions in the same manner
as the other univariate analyses. These tables show the number of times each variable was
reported and also how many people reported them at both EMA and EOD. The transformed
variables were also used for bivariate analysis.

Bivariate Analysis

For the second research question, bivariate analysis was conducted using ANOVA. To illustrate this process, the following diagram presents the analysis plan:

Research Question
- Are there participant differences by age, gender, education and work status in the average number of completed EMAs and EOD surveys?

Variables Measured
- Education, Work Status, Age, Gender

Data Collection Times
- Baseline
- EMA
- EOD

Statistical Test Proposed
- Univariate
- ANOVA
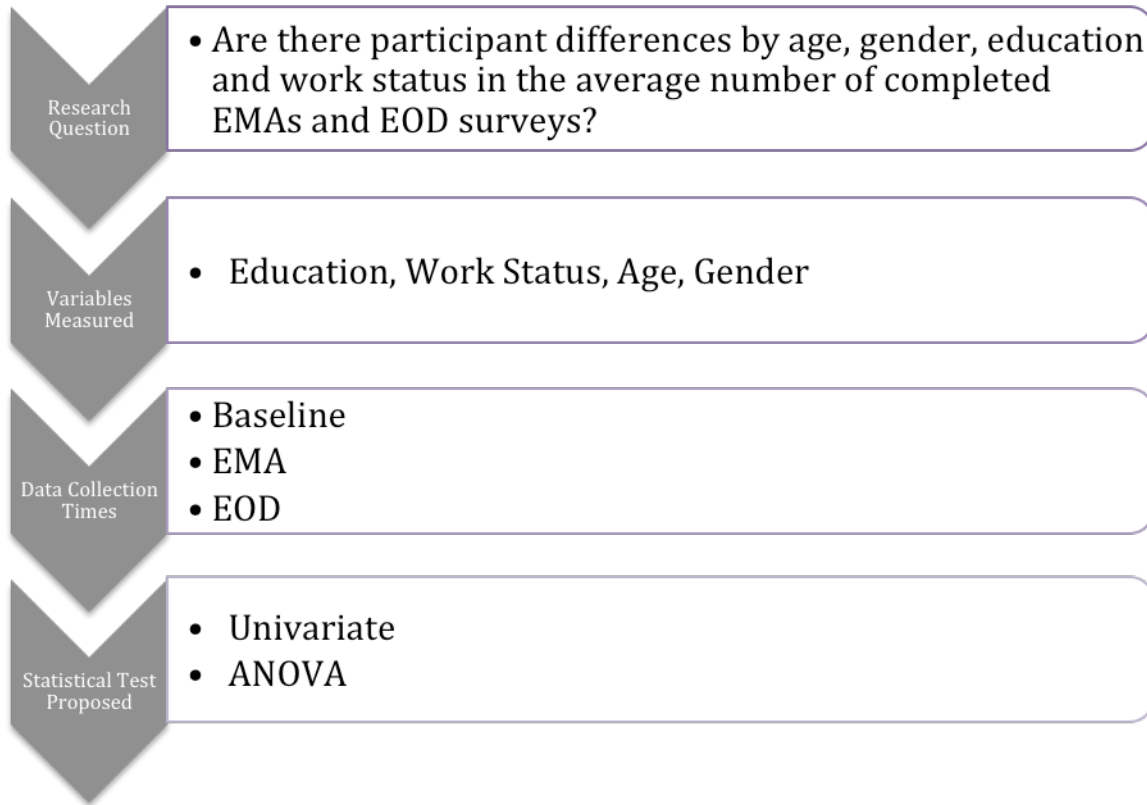
Using the univariate analysis from the previous section, information regarding age, gender, education and work status was calculated as a frequency and percentage. The frequency of people for each age was found and these frequencies were then used to form appropriate age groups. The age groups were: (a) 16-20 (b) 21-25 (c) 26-30 (d) 31-35 and (e) 36-40.

To answer this research question, it was imperative not only to calculate how many people were in each group (age, gender, education or work status), but also the number of EMA and EOD surveys completed on average for each group. To do this, new variables were created. If any person had a valid completed date after a survey entry, then they were recoded as completed. All others were coded as incomplete. This information was then presented in bar

charts with the average number of completed EMA and EOD surveys next to each other for each group. Weighted averages were calculated because there was different number of participants in each group. After consulting with the research team, this was determined as the most appropriate manner to display this information. ANOVA was then used to see if the average number of EMA and EOD surveys completed by each group was statistically significant.

For the last phase of the analysis, the third research question was addressed. The research question and analysis plan for this phase are detailed below:

Research Question	• Does tobacco use and tobacco environments reported at baseline differ from EMA and end of day (EOD) data?
Variables Measured	• Reported tobacco use
Data Collection Times	• Baseline • EMA • EOD
Statistical Test Proposed	• Chi square • Cross tabulation
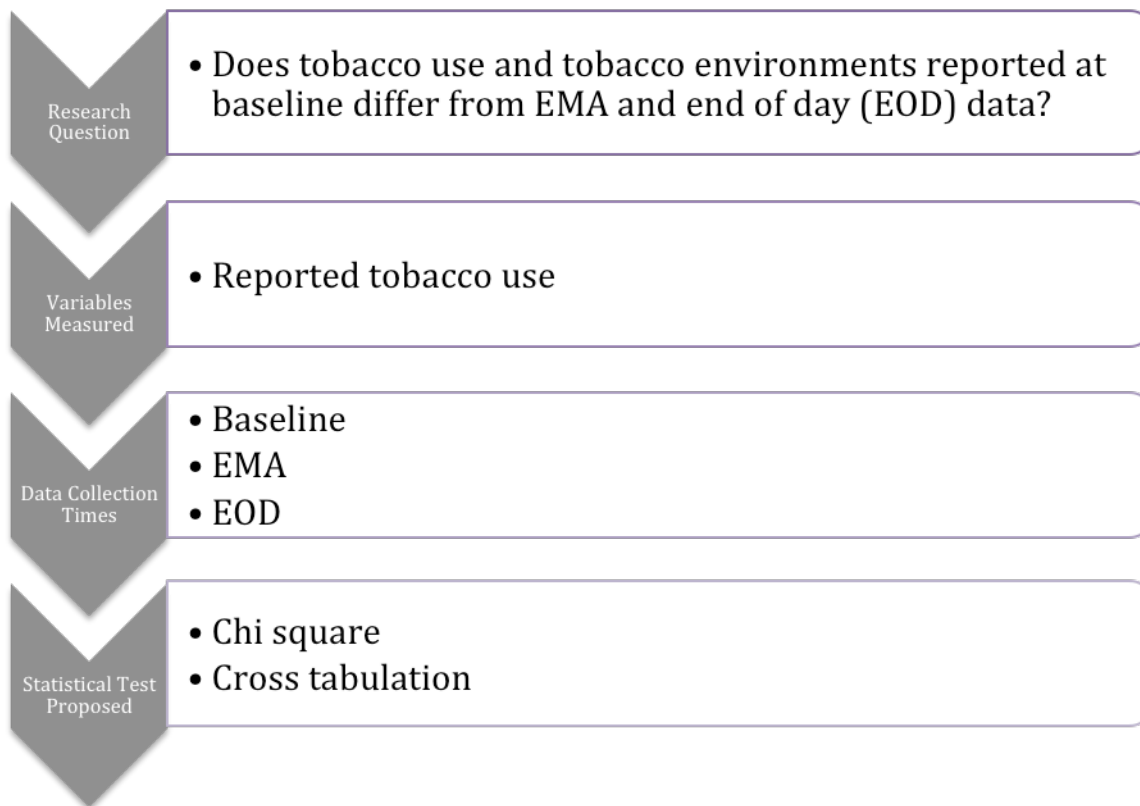
In order to complete this analysis, the following variables were created

New Variables for Multivariate Analysis
EMA ever reported smoking
EOD ever reported smoking
EMA ever reported using smokeless tobacco
EOD ever reported using smokeless tobacco
Baseline reported smoking
Baseline reported using smokeless tobacco

These were dichotomous variables. Therefore, if they ever reported using smoke or smokeless tobacco at least once at EMA, then they were categorized as a smoke or smokeless tobacco user. The same procedure was done for EOD. New variables were also created for baseline data. If they reported using smoke or smokeless tobacco either every day or sometimes (non-daily) then they were coded as being a smoke or smokeless tobacco user. These new variables were grouped together to answer variations of the research question. A chi square was calculated for both smoke and smokeless tobacco users to test the relationship between tobacco use reported at 1) baseline and EMA, 2) baseline and EOD, 3)EMA and EOD. Three variable cross tabulations were calculated to better understand the relationship between reported tobacco use at baseline, EMA and EOD simultaneously. For example, if they reported being a tobacco smoker at baseline, did they also report that at EMA and EOD?

Ethical Considerations

Public health research increasingly uses electronic sources and devices to acquire, use, maintain, and store personal health information (Myers, 2008). Electronic data formats can improve performance of core public health functions, but potentially threaten privacy because confidential and sensitive personal health information can be easily duplicated and transmitted to unauthorized people (Myers, 2008). There could be possible ethical issues with this kind of study because EMA and EOD surveys are done completely on electronic devices. Although the information is not very sensitive, people may feel embarrassed if others see their responses. This could alter participant responses. Participants could also consider the possibility of the information becoming compromised, which could alter the participation rates and responses.

There can also be ethical concerns when asking participants questions that capture their environment. For EMA studies there should be special ethical considerations. EMA studies are relatively new, but it is the responsibility of the researcher to think about ethics when asking participants to capture the environment around them. Questions should be written in such a way that they do not violate the rights and privacy of individuals who did not consent to be in the study, but exist in the environment the study participants are assessing.

In just the last few years, the new digital age has proven to be safer than ever. While the rare security breach does occur, electronic data can be better secured than paper records, because authentication, authorization, auditing, and accountability can be facilitated through various means (Myers, 2008). Researchers can collaborate with information technology professionals to assess possible digital threats, implement updated policies, train staff, and develop preventive engineering measures to protect information (Myers, 2008).

There is a significant body of research regarding text messaging, which is a new field of electronic data collection in public health. This type of study most closely resembles EMA studies. In a study by Siedner et al. (2012) regarding text messaging individuals to communicate laboratory results with HIV-infected patients in rural Uganda, they asked participants how they felt about receiving these types of messages. Among the study participants, over 90% found it acceptable to receive their laboratory results via voice message, phone call and text messaging (Siedner, 2012). There have been many other studies that have demonstrated other health applications for text messaging, including public health emergency preparedness, smoking cessation programs, physical activity promotion, medicine adherence, and other health-related protection, promotion behaviors, vaccine uptake and appointment reminders (Banks, 1997; Karasz, 2013). Due to the success of these public health efforts, it can be concluded that

individuals feel comfortable recording and receiving health information even if it is sensitive or stigmatized information being communicated.

Protection of Human Subjects

All IRB forms for the pilot study and secondary analysis are attached as Appendices 3-5. One IRB form was submitted to JHSPH to have the author of this thesis added to the original pilot study. A separate IRB form was submitted to the University of Maryland, College Park (UMCP) for an expedited review, as all of the data for this secondary analysis was completely de-identified. The author was approved to do this research under both the JHSPH and UMCP IRBs.

Chapter 4: Results

<u>Sample Characteristics</u>

The sample for this analysis consisted of 282 participants, representing those who completed a baseline survey in its entirety at the initial study meeting. The sample characteristics are shown in Table 1 (Appendix 9). The average age of participants was 25.8 years old with a standard deviation of 7.0. Most (70.9%) of the participants were male. Nearly half of the participants were from Hyderabad and Kolkatta. The majority of the sample, 70.2%, completed more than a high school education and 25.25% of the sample only completed high school. Most of the sample was comprised non-government employee (23.0%), self-employed (19.5%) and of students (9.3%). The majority of the sample reported having the following items in their home: electricity, cell phone or mobile telephone, television, refrigerator and a flush toilet.

Out of the 282 participants, 17 (6.0%) reported using tobacco daily and 36 (12.8%) reported using tobacco sometimes (non-daily) at baseline. Also, 11 (3.9%) participants reported using smokeless tobacco daily and another 2 (0.7%) said they used smokeless tobacco sometimes or non-daily. In this sample at baseline, 229 (81.2%) reported they do not smoke at all and likewise, 262 (92.9%) said they do not use smokeless at all.

Univariate Analysis of Daily and Sometimes (Non-Daily) Smokers

Most of the univariate analysis was focused on describing the tobacco habits of participants. Table 2 (Appendix 10) shows a side-by-side comparison of tobacco smoking characteristics between daily and non-daily smokers at baseline. The mean age that daily smokers report smoking daily was 21.2 years old with a standard deviation of 4.0. Similarly, the age they first tried smoking was 21.3 years old, also with a standard deviation of 4.0.[1] However, sometimes smokers report first trying smoke tobacco at an earlier age (20.3 years), but report regularly smoking at a later age (23.8 years) than daily smokers.

On average, daily smokers report smoking 6 cigarettes a day. Both daily and sometimes smokers report primarily smoking manufactured cigarettes. However, 11 (3.9%) of sometime smokers report smoking rolled tobacco in paper. One daily smoker also reported smoking hukkah/hookah daily. No participants reported smoking bidis or cigars or cigarillos daily.

When daily smokers were asked if they had seen a doctor in the last 12 months, only 2 (0.7%) said they had seen a doctor, but 4 (1.4%) daily smokers reported that the medical

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[1] The age daily smokers first tried tobacco is older than when the participants first report using tobacco. There are 3 individuals who report an older age of trying tobacco, which accounts for the age difference in these questions. The ages were not switched in the data set because it is impossible to determine which reported age is correct.

provider had asked them if they use smoke tobacco and 4 (1.4%) individuals had been asked to quit using smoke tobacco.

Univariate Analysis of Daily and Sometimes (Non-Daily) Smokeless Users

Out of the 282 participants, 11 (3.9%) reported using smokeless tobacco daily and 7 (2.5%) reported using smokeless tobacco sometimes (non-daily) at baseline. Table 3 (Appendix 11) illustrates the univariate analysis of these variables. The average age the daily smokeless users started using smokeless tobacco daily was 22.8 years with a standard deviation of 4.9. The average age they report first trying smokeless tobacco is the same as when they first started using daily.

Daily smokeless tobacco users report using a wide variety of products. Seven (2.5) of daily smokeless tobacco users report using ghutkha or tobacco lime areca nut mixture and another 3 (1.1%) use khaini or tobacco lime mixture. The rest of the daily smokes tobacco users report using betel quid with tobacco (0.7%), oral tobacco with panmasal and betel quid without tobacco (0.7%) and oral tobacco (0.4%). The products the sometimes smokeless tobacco users is different than the daily users. Four (1.4%) sometimes smokers report using ghutkha or tobacco lime areca nut mixture, and 0.7% report using khaini or tobacco lime mixture, but no sometimes smokeless tobacco users reported using betel quid with tobacco, oral tobacco. Neither daily or sometimes smokeless tobacco users reported using nasal snuff.

Univariate Analysis of EMA Data

For this study, there was a possible of 14,100 EMA surveys that could have been take by all participants. That is, if every person took 5 surveys a day for the 10 days of the study. However, all 282 participants completed 3,277 EMA surveys. That means there was a response

rate of 23.2%. On average, each person completed 11.6 EMA surveys, but there were different rates of participation throughout the sample.

Table 4 (Appendix 12) shows the sample characteristics of all completed EMA surveys. For most EMAs, participants report being at home when taking EMA surveys (2108, 64.3%) or at their workplace (571, 17.4%). In the majority (56.4%) of EMAs, participants report being alone. The other two most common reported were with family members/relatives and with friends.

In almost all, 97.7% of EMA surveys, people reported not using any tobacco—smokeless or smoke. However, 60 times people reported using smoke tobacco, and 17 times people reported using smokeless tobacco during EMAs. Tobacco product usage is evenly distributed across the surveyed products, with cigar cheroots or cigarillos being the most commonly reported product used (24, 0.7%) and hookah or water pipe being the least (4, 0.1%) used, among all completed EMA surveys. Table 4 (Appendix 12) shows all of the products that participants' reported using during the EMA surveys.

Table 5 (Appendix 13) details individuals' tobacco environments reported at all completed EMA surveys. Out of all 3277 EMA surveys complete, individuals reported someone in their social group using tobacco 33 (1.0%) times and reported seeing someone using tobacco in their view 108 (3.3%) times. Many times participants reported seeing no evidence of tobacco use. Participants did report seeing evidence of tobacco use 106 (3.2%) times. Out of all of the times they saw evidence of tobacco use, they reported seeing cigarette butts 73 times, bidi butts 26 times, they spit from oral tobacco 19 times, and a used ashtray 16 times. Also, 2930 times (89.4%) people reported not smelling any tobacco during an EMA survey. They reported smelling tobacco 347 times (10.6%).

While participants did not see any evidence of tobacco use or smell any tobacco being used, they reported being in environments where smoke and smokeless tobacco was allowed. Participants reported 1360 times (41.5%) being in environments were smoke tobacco was allowed. Likewise, they reported 1367 times (41.7%) being in environments where smokeless tobacco was allowed. However, in approximately one quarter of the completed surveys, participants reported that smoke and smokeless tobacco is never allowed in their current environment. Table 5 (Appendix 13) provides information regarding rules about tobacco use in the participants' environments.

The final phase of EMA univariate analysis is regarding anti- and pro- smoking media. Table 6 (Appendix 14) reports responses regarding this set of variables. 93.6% of the completed EMA surveys report seeing no anti-tobacco advertisements. This was reported by 59.2% of the participants. Also, 94.3% of EMA surveys report seeing no health warnings on cigarette or smokeless tobacco packaging, which was reported by 63.8% of the sample. 46 individuals report seeing anti-tobacco advertisements in magazines 65 times and 50 individuals report seeing them on television 77 times. Likewise, between 8.2-9.2% of the sample report seeing anti-tobacco advertisements on radio 34 times (1.0%) and on billboards 35 times (1.1%). There were similar rates of EMA surveys of seeing anti-tobacco messages on cigarette packages and smokeless tobacco packages.

202 individuals reported at EMA that they saw no pro-tobacco messages 3191 times (97.4%). If they did see pro-tobacco messages, it was in magazines/newspapers or on television.

Univariate of EOD Data

For this study, there was a possible of 2,820 EOD surveys that could have been taken by all participants. That is, if every person took 1 EOD survey a day for the 10 days of the study.

However, the 282 participants completed 987 EMA surveys. That means there was a response rate of 35.0%. On average, each person completed 3.5 EOD surveys, but there were different rates of participation throughout the sample.

Table 7 (Appendix 15) shows the sample characteristics reported at all completed EOD surveys (n= 987). Out of all 987 EOD surveys, participants reported not using tobacco 850 times (86.1%). However, for 122 (12.4%) EOD surveys, individuals reported using smoke tobacco and 15 times (1.5%) they reported using smokeless tobacco. The type of tobacco products individuals' reported using at EOD were manufactured cigarettes 44 times (4.5%), rolled tobacco in paper 13 times (1.3%), bidi 14 times (1.4%), cigar cherrots or cigarillo 16 times (1.6%) and hookah 16 times (1.6%). Similar to EMA, ghutkha or tobacco lime areca nut mixture was the most commonly reported smokeless tobacco product used.

The frequency of tobacco use was also collected at EOD. While 86.1% of the EODs reported never using tobacco, there are individuals who reported at EODs that they did use tobacco throughout the day. The most common response to how many times individuals used tobacco was 2-5 times as individuals reported this 70 times (7.1%), followed by 35 times (3.5%) individuals 6-10 times they used tobacco and 23 times people said they used tobacco just once throughout the day. However, 4 times people reported using tobacco more than 20 times, but there were only 2 different individuals who reported over 2 days of EOD surveys that they used tobacco more than 20 times. These individuals also used tobacco consistently through their reported EMA surveys.

The next phase of univariate analysis examined individuals' reported tobacco environments that were reported at all completed EOD surveys. This is indicated in Table 8 (Appendix 16).   Out of all completed EOD surveys, participants indicated 57.2% of the time or

565 times that they did not observe smoking. However, 186 times (18.8%) participants reported

seeing people nearby smoking over the course of the day and 134 times (13.6%) they report

friends smoking.

Most EOD surveys reported that participants did not see any evidence of tobacco use

over the course of the day. But, 258 times (26.1) individuals report seeing evidence of tobacco at

EOD compared to 729 times (73.9%) they did not see evidence. Similar rates were reported for

smelling tobacco. Out of all completed EOD surveys, participants reported not smelling tobacco

720 times (72.9%). The most commonly reported product participants reported seeing was

cigarette butts. More participants saw spit from tobacco—119 times (12.1%) than they saw bidi

butts—102 times (10.3%). They reported seeing a used ashtray the least amount of times.

The final phase of EMA univariate analysis is regarding anti- and pro- smoking media.

Table 9 (Appendix 17) reports responses regarding this set of media variables. In the first set of

questions regarding anti tobacco advertisements, 57.4% of the completed EOD surveys (n=987)

report seeing no anti-tobacco advertisements compared to 93.6% of EMA surveys where

participants reported seeing no tobacco advertisements. 193 individuals report seeing no pro-

tobacco advertisements 900 times (91.2%) at EOD. At EMA, they report not seeing pro-tobacco

messages 97.4% of the time.

The mostly commonly reported place to see or hear an anti-tobacco message was on

television, which was reported 157 times by 67 individuals.   This was also the most common

place to see pro-tobacco advertisements, which was reported by 16 individuals 25 times. The

second most common place to see pro- and anti-tobacco advertisements was on tobacco

packaging. 57 participants saw anti-tobacco advertisement on the packaging of a tobacco

product 142 times and 13 individuals saw pro-tobacco messages here 14 times.   The least

common places that participants reported seeing or hearing anti- and pro-tobacco messages were in print and on the radio.

Univariate Analysis of Transformed Variables

The final univariate analysis was focused on generating frequency and percentages for the transformed variables. The transformed variables were: saw a tobacco user, saw a smoker, exposure to smoking evidence, saw a pro-tobacco message and saw an anti-tobacco message. Table 10 and 11 (Appendix 18) show the frequency and percentage of these variables. Table 10 (Appendix 18) shows how many times each of these variables were reported at EMA and EOD surveys. Table 11 (Appendix 18), however, illustrates the number of participants who answered yes to any of the transformed variables during any point of EMA and EOD surveys.

Table 10 shows the tobacco characteristics reported in all complete EMA and EOD surveys by percent. The most common variable reported at EMA was exposure to smoking evidence, which was reported 12.5% of the time. The second and third most commonly reported variables are saw an anti tobacco message (26.8%) and saw a tobacco user (5.4%). The least common reported variable was seeing a pro-tobacco message, which was reported 1.9% of the time. For EOD, this was also the least common reported variable at 5.0% of all completed EOD surveys. For EOD surveys, all of the other transformed variables were reported at similar rates, which the most commonly reported variable also being exposure to smoking evidence (32.7%).

To better understand if just a few people were reporting these variables, Table 11 was created. This table shows how many participants report answering yes one time to any of the transformed variables during EMA and EOD surveys. Like in the previous table, most people reported exposure to smoking evidence at both EMA and EOD. However, the most common responses for people during EMA surveys were saw an anti-tobacco message, which 90 people

(31.9%) in the sample reported, and saw a tobacco user was the third most common response with 60 participants answering yes. EOD responses vary slightly. Two variables were the second most frequently responded at EOD. They were saw a tobacco user and saw a smoker. Saw a pro-tobacco message is the least frequently reported (13.5% of the sample) variable at EOD, but saw a smoker is the most frequent response for EMA (12.1% of the sample).

Bivariate Analysis

First, bivariate analyses were conducted to determine participant differences by age, education, work status and gender in terms of the number of completed EMA and EOD surveys. Graphs (Figures 4.1-4.6 in Appendices 18-22) were created to show the average number of completed EOD and EMA surveys by each group. Each graph shows the p-value for EOD and EMA surveys.

The first figure 4.1 (Appendix 4.1) shows average number of completed EOD and EMA surveys by age group. On average, 16-20, 21-25, and 26-30 year olds completed approximately 12 EMA surveys. 31-35 year olds completed the least amount of EMA surveys, which was around 6 on average. In contrast, 36-40 year olds completed nearly 14, which was the most. The difference between all of these groups is statistically significant ($p<.05$).

For EOD surveys, each of the age groups is not statistically significant. The average number of completed EODs range from around 4 to 2.5. Similar to EMA, 36-40 year olds completed the most and 31-35 year olds completed the least on average.

The second figure (4.2 in Appendix 20) shows the average number of surveys completed by education level. Participants who completed only primary school completed the least amount of both EMA and EOD surveys.   On average, this group completed around one EMA survey and less EODs. The two groups that represent less than high school complete and high school

complete each completed very similar number of EMA surveys—around 8.5. Participants who completed intermediate school completed the most EMAs. However, participants with a completed diploma completed almost as many. Also, the group that has their diploma completed the most EODs. All education groups completed around the same number of EODs, which was around 3.75 with the exception of the primary school completed group. For EMA surveys, the groups are statistically significantly different ($p<.05$). The groups are not statistically significantly different by completed EODs.

Figure 4.3 in Appendix 21 shows the average number of completed EOD and EMA surveys by work status. Each of these groups varies in terms of the number of completed EMAs, but completed similar numbers of EODs. On average, government employees completed over 16 EMAs and over 4 EODs. Students completed around 14 EMAs and nearly 4 EODs on average. These two groups completed the most EMAs and EODs. Non-government employees, self-employed and those who are unemployed by able to work completed similar numbers of EMAs and EODs. These groups completed between 8.25 and 8.75 EMAs and between 2.5 and 2.75 EODs on average. There were no retired individuals in this sample. These groups are only statistically different by the average of completed EMAs ($p<.05$) and they are not statistically significantly different by EODs.

The last figure that shows the average number of completed EMA and EODs surveys by gender. Males and females are not statistically significantly different in terms of the number of completed EMAs or EODs. Females completed slightly more EMAs and EODs than males.

The final question this thesis has attempted to answer was regarding participant behavior between baseline and EMA and EOD in regards to smoking status. Two different bivariate analyses were conducted using chi square and cross tabulations.

Reported smoking status at baseline is not significantly associated with reported smoking at EMA (X^2=.599, NS). 82.4% of the sample report being a nonsmoker. 88.8% of participants, who reported being a non-smoker at baseline, also reported not smoking at EMA. 7.1% of people who reported being a smoker at baseline ever reported smoking at EMA.

Reported smoking status at baseline is also not significantly associated with reported smoking at EMA (X^2=.472, NS). 82.1% of the sample who took at least one EOD report being nonsmokers at baseline. Out of all participants, 74.9% reported being a nonsmoker at baseline and also being a nonsmoker at EOD. Also, 80.0% of the individuals who report being a smoker at baseline, reported not smoking at EOD. Thus, 20.0% of the sample reports being a smoker during both surveys.

Lastly for smokers, reported smoke tobacco use at EMA and EOD was examined to see if there was an associated between these two groups. These two groups are significantly associated (X^2=44.08, p<.001). Out the 185 participants who reported not using smoke tobacco at EMA, 82.7% of them also reported not using smoke tobacco at EOD. Out of the 24 individuals who report using smoke tobacco at EMA, 79.2% they also report smoking tobacco at EOD.

To understand if there is an association between reported smokeless tobacco use among different survey methods, chi square was calculated. Just as smoke tobacco, smokeless tobacco use reported at baseline and EMA (X^2=.315, NS) and baseline and EOD (X^2=2.12, NS) are not statistically associated. However, reported smokeless tobacco use at EMA is statistically associated with smokeless tobacco use at EOD (X^2=20.18, p<.001).

For the first chi square cross tabulation, smokeless tobacco status at baseline was compared to reported smokeless tobacco use at EMA. 96.0% of the sample who answered at

least one EMA survey, reported not using smokeless tobacco at baseline and EMA. 90.0% of the sample also reported being a smokeless tobacco user at baseline, but not a smokeless tobacco user at EMA.

Reported smokeless tobacco use and EOD was also examined. Similarly to smokeless tobacco use at baseline and EMA, 95.8% of the sample reported not using smokeless tobacco at baseline and at EOD. 10.0% of the sample (1 participant) reported using smokeless tobacco at baseline and EOD.

Lastly for smokeless tobacco users, reported smokeless tobacco use at EMA and EOD was examined to see if there was an association between these two groups. These two groups are significantly associated. 95.0% of participants who completed at least one EMA and one EOD, reported not using smokeless tobacco at EMA and at EOD. Similarly, 23.1% of the sample reported being a smokeless tobacco user at both EMA and EOD.

While the previous cross tabulations allowed for the different collection methods to be investigated for associated, three variable cross tabulations were also created to understand participants' behavior when reporting tobacco use at all three data collection methods. The first cross tab, Figure 4.5 (Appendix 23), details individuals who reported using smoke tobacco at baseline.

For this cross tabulation in Figure 4.5, the total number of participants is 209 instead of 282 because some individuals did not complete EMA and EOD surveys regarding these sets of question. For this cross tabulation, the participants are coded as smoking if they reported smoking at least one time at EMA and/or EOD. It is important to note that this cross tabulation does not capture trends in individuals' behavior. Someone who reported smoking at least one day is coded as a smoker. The same is true for smokeless tobacco users.

This cross tabulation illustrates that of 172 people who said they did not use smoke tobacco at baseline, 123 individuals never reported using smoke tobacco at EOD and EMA. Also, out 37 people who report using smoke tobacco at baseline, three of those people did report using smoke tobacco at EMA and EOD. However, no individuals claim that they were smokers at baseline and said they smoked at EMA and did not smoke at EOD. Also, 32 individuals reported using smoke tobacco at EOD, but not EMA, and of those, only 4 reported being smokers at baseline. Also, 30 individuals said they were smokers at baseline, but reported not smoking at both EMA and EOD. Finally, 5 individuals reported smoking at EMA but not at EOD, and they each reported not being smokers at baseline.

The second cross tab, Figure 4.6 (Appendix 24), details individuals who reported using smokeless tobacco at baseline. For this cross tabulation the total number of participants is 207 instead of 282 because some individuals did not complete EMA and EOD surveys regarding this question. Also, for this cross tabulation, the participants are coded as using smokeless tobacco if they reported using it at least one time at EMA and/or EOD.

To begin, this cross tabulation shows that out of the 199 people who said they did not use smokeless tobacco at baseline, 184 individuals never reported using it at EOD and EMA. Also, out of the 8 individuals who said they use smokeless tobacco at baseline, only 1 person reported using smokeless tobacco at EOD and EMA. Only 3 individuals reported using smokeless tobacco at EOD but not at EMA. Likewise, 10 individuals reported using smokeless tobacco at EMA bot not at EOD. Incidentally, both groups were comprised solely of individuals who reported not being smokeless users at baseline.

Chapter 5: Discussion

Central Findings and Their Implications

Overview

The aim of this secondary data analysis was to determine if this EMA study generated valid, real-time measurements of the social and environmental cues encouraging and discouraging tobacco use in India. The data for this secondary analysis is especially novel because of its reliance on different assessments methods. Each of the assessment methods 1) baseline, 2) EMA, and 3) EOD utilize distinct ways of capturing information regarding the reported tobacco use behavior and environment of participants. These methods are used to understand the social and environment cues as they unfold, as opposed to solely relying on traditional methodology requiring individuals to recall their thoughts, feelings and experiences. This secondary data analysis examined how these methodologies work in unison and if there is a particular methodology that was more useful in India.

Understanding Reported Tobacco Use at Baseline, EMA and EOD

To better understand how the methodologies relate, chi square analyses were conducted to examine the relationship between reported tobacco use at different survey points. Smoke or smokeless tobacco use reported at EMA was similar to what was reported at EOD. It was found that neither tobacco use reported at EMA nor EOD was similar to smoking status reported at baseline. This indicates that asking participants in India to recall tobacco use through traditional recall methods might not be the most reliable method. This finding is similar to other studies where participants were asked to report drug use (Shiffman, 2009 b; Koblitz, 2009). Results from

comparable EMA studies demonstrate that behavior and experience are much more dynamic and influenced by immediate context than researchers sometimes consider when relying on retrospective recall (Shiffman, 2008).

To understand some of the discrepancies between what is reported at baseline, EMA, and EOD, research that examined definitions of tobacco use behaviors was reviewed. Investigators in this area of tobacco control research study not just daily and intermittent (non-daily use), but also light smoke and smokeless tobacco use (Fagan, 2009; Schane, 2010; Shiffman, 2009c). This study asked if individuals were current or intermittent, but there were no other tobacco use behaviors included in the baseline survey. Light smoking is often defined as smoking less than 10-15 cigarettes/day, but there is no consensus in the definition of a light smoker (Schane, 2010). Light smoking has also been classified as smoking <1 pack, <15 cigarettes, and <10 cigarettes per day, as well as 1 to 39 cigarettes per week (Schane, 2010). Light smokeless tobacco use is based on the nicotine level of users as people tend to use different amounts of tobacco each time (Schroeder Kl, 1988; Warnakulasuriya, 2004). In the United States, heavy smoking has been declining, but intermittent and light smoking has been increasing (Schane, 2010). There is currently no published researched examining light tobacco use in India. However, many smokers, especially those in low- and middle-income countries such as India, may be light smokers (Fagan, 2009). This may explain why they did not report using tobacco at baseline. Participants may have self-identified more as light smokers, not current daily or non-daily users.

Although the baseline survey may not have captured all tobacco use behaviors, during EMA and EOD they were only prompted to report their behavior; not their smoking identity. Additionally, at the time of the baseline survey, they may have personally identified as being more of a light smoker as they did not use tobacco frequently enough over the course of they day

or in the past week to report being a part of one of the other tobacco use categories. Light and intermittent smokers pose a serious challenge to public health because they tend not to consider themselves tobacco users and consequently are under identified (Fagan, 2009). The inclusion of more tobacco use behavior categories might better capture tobacco related behaviors at baseline, which will consequently be reported more often at EMA and EOD. How individuals report tobacco use is an important area of investigation to further tobacco and EMA research in India.

Moreover, these results indicate that EMA and EOD surveys might be better at capturing tobacco behaviors, as there were discrepancies between baseline and EMA and EOD. It is difficult to determine if what was reported smoking status at baseline or what participants report during EMAs and EODs is inaccurate. Several of the questions in this study ask participants to recall a behavior over the last 12 months. Additionally, the tobacco use questions at baseline ask if participants are currently a daily or non-daily user, not if they used tobacco in the last 12 months. The vague way these questions were asked and the fact that they were asked by interviewers may have contributed to why some participants reported not being a tobacco user at baseline, but then reported using at EMA and/or EOD.

To gain a different perspective, three variable cross tabulations were conducted to determine the consistency in reported tobacco use at baseline, EMA and EOD. Similar results were found in the cross tabulations as the chi square discussed in the previous chapter. The cross tabulations were conducted to simultaneously show the relationship between baseline, EMA and EOD data regarding participants reported tobacco use. When examining participants who reported not using smoke tobacco at baseline, there were many individuals reporting smoking tobacco at EMA and/or EOD. This is also true for smokeless tobacco use with no smokeless tobacco use reported at baseline, but reported use at EMA and EOD. This shows that, during this

study, tobacco use was not captured at baseline, but was captured during the other survey points. EMA surveys occurred at five random times a day and prompted participants about their current use behavior. The EOD surveys were once day, at a predetermined time (e.g., 10PM Eastern Standard Time) and asked about behaviors and events throughout the past day. A possible explanation for the discrepancy between baseline and EMA and EOD along with the possibility that the baseline questions may not have captured all tobacco use behaviors is that there might have been recall bias inherent in the baseline survey because it relies on traditional recall methodology. While it is possible that there can be some recall bias that occurs with EOD, it is not as big of a threat as with the baseline survey.   This could be because during the baseline survey, participants are asked to recall behaviors for the past year while EOD asks them to recall events just over the past several hours. This is consistent with research regarding the bias and error often introduced into studies through traditional recall methods (Shiffman, 1997; Buckner, 2012). Behavioral scientists often rely on participants' retrospective reports for study data. However, accurate retrieval of personal memories requires participants to not only recall relevant data, but summarize it (Shiffman, 1997). This recall is highly prone to error and bias (Shiffman, 1997; Lavender, 2013).

Along with recall bias, there might be self-report bias by the participant at baseline because a researcher team member read each survey question aloud and recorded participant responses. It may not be socially desirable to use tobacco, which could have altered participant responses. Later, they may have felt more comfortable responding to EMA and EOD questions that were distributed electronically, which allowed participants to complete the surveys alone. Although it is very difficult to conclude which survey method—baseline or EMA and EOD—is more reliable to collect tobacco use behaviors, research has shown that traditional recall methods

have inherent biases that may not accurately reflect participant behavior (Shiffman 2009a, Shiffman 2009b, Minami, 2011)

A similar discrepancy of reported use among the different survey methods was found for smokeless tobacco users. There were several people who reported using tobacco at EOD, but did not report using it at baseline or EMA. While they may not have reported using tobacco at baseline due to the possible explanations included earlier in this section, EMA may not have captured this behavior since the EMAs prompts were randomly distributed five times throughout the day. There is a chance that they were prompted at times they were not using tobacco. This could be due to the fact that most participants reported using tobacco less than 6-10 times. This indicates that there was infrequently use among participants who reported using tobacco.

Another explanation is that they were not truthful in their EMA and EOD surveys due to social desirability bias. This could be due to participants being influenced by other people who were in their immediate environment while they were responding to the surveys (Rani, 2003). Although, the EMA and EOD questions were not sensitive in nature, they may have been concerned that others could read their responses.

In summary, the cross tabulations indicate that for this study, tobacco use is not captured well among those who report being tobacco users at baseline. For individuals who report not using tobacco at baseline, many report not using tobacco during EMA and EOD. While other research can help understand some of these discrepancies reported at different survey methods, no published research reviewed for this thesis compares similarities and differences between baseline, EMA and EOD.

This still leaves researchers to question whether baseline or EMA or EOD is better at capturing this tobacco behavior. It is clear that they should be used together in order to maintain

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consistency in participant responses (Shiffman, 2008, Shiffman 2009a, Shiffman 2009b). Perhaps a third type of survey should be added to future EMA studies in India to capture any missing data, however, the additional assessment would increase participant burden.

Group Differences in Completed Surveys

In addition to understanding tobacco use habits reported during different times of the day, different groups were examined to determine which participant characteristics were related to completing the most and least number of surveys. This analysis was helpful to better understand what groups of participants are more or less likely to complete EMA and EOD surveys. The characteristic variables examined for this thesis were: age, education level, work status, and gender. Age, education level, and work status were statistically significant regarding the average number of completed EMA surveys only. In the examination of EOD surveys, none of the aforementioned variables were statistically significant. These results can help develop procedures to increase EMA and EOD participation rates in future EMA studies in India. By showing who is less likely to complete EMA and EOD surveys, protocols can be created that target these groups in an attempt to increase the number of surveys they complete.

Among age group subcategories: 16-20; 21-25; 26-30; 31-35; and 36-40 year olds, the group that completed the most EMA and EOD surveys were 36-40 year olds. This is surprising given that some EMA studies have found that younger individuals are more attracted to studies that are reliant on technology (Shiffman, 2007; Kauer, 2009; Shiffman 2009a). A possible explanation for the difference in age groups is that more older Indians have jobs in information technology (IT) and are more comfortable using this medium to communicate (Ezer, 2006). However, 31-35 year olds report completing the least number of EMA and EOD surveys on average. If 36-40 years complete the most, then it would be reasonable to hypothesize that 31-35

year olds would also complete a similar number of surveys. More research is needed to explore age differences and EMA survey completion. Interestingly, other researchers have reported that people in the field of IT tend to be over 30 years old and should be comfortable with this medium (Ezer, 2006; Shiffman, 2008). Perhaps the individuals in the younger age groups were too busy at work or unavailable during the day when they were prompted to take EMAs, which resulted in less completed surveys.

Participants in each of the age groups, 16-20 years old, 21-25 years old, and 26-30 years old all had similar rates for completed EMA and EOD surveys, slightly below that of the oldest participants. This result coincides with previous EMA research showing that younger individuals are more likely to complete these surveys as they have more of a propensity for technology as they are more accustomed to using it in their everyday life (Shiffman, 2008).

As for education, most of the groups showed similar average completed EMA and EODs except for those only with a primary school education. Participants of this group completed less EMA and EOD surveys on average. Part of the significant difference between the primary school only group and the others could be due to low literacy rates. If these individuals did not complete all of their schooling, they may not be able to read as well as individuals who completed at least high school. While the baseline questions were read aloud to each study participant, they had to complete EMA and EOD on their own. Low literacy levels are a challenge for this methodological approach in a study (Shiffman, 2008).

Univariate Analyses

Lastly, univariate analyses were examined. Upon initial examination of the sample characteristics, the average age was 25.8 years. This finding is supported given nearly half of the sample report being students as their work status. Additionally, this is an important age for

assessing tobacco use since nearly 20% of adult tobacco users initiate by age 18 (Chadda, 2003; Reddy, 2010).

These results also highlight that this sample is wealthier than most people in India. Currently, over 400 million people in India do not have electricity (World Bank, 2013). That is nearly a quarter of the inhabitants of this country as the boost a population just over 1 billion. However, in this sample 97.5% had electricity and 92.2% had a television. 74.5% owned a refrigerator and 68.4% had a flush toilet. Recent news reveals that half of Indians have phones, but no flush toilets ("No toilet", 2012). Also, most of this sample completed higher levels of education. This too can indicate that the sample is perhaps wealthier than the general population of India. No other income include data was collected in this study.

There were few tobacco users in this study. Only 6.0% of the sample smoked tobacco daily and another 12.8% reported using smoke tobacco sometimes or non-daily. Moreover, 3.9% reported using smokeless tobacco in this sample. Research reports that approximately 20% of Indians use tobacco daily (Statistics, 2013). According to Sorensen (2005), the strongest predictor of tobacco use is education status (Sorensen, 2005). Most of the sample used manufactured cigarettes, which is most commonly used by wealthier individuals with more education (Sorensen, 2005). In this sample, 70.2% have more than a high school education, yet such a few number of participants use tobacco. It can be hypothesized that because the sample seems to be wealthier and most participants have a high level of education, there would be more manufactured cigarette smokers. However, this was not found in this study's data. There could have been issues with recruitment. Participants were recruited for this study in malls and shopping centers. There may be less tobacco users in this area, which resulted in less tobacco users recruited for this study. Also, interested participants were not asked if they were tobacco

users before the baseline survey. This resulted in the research team being unaware of the number of participants that identified as a tobacco user before the baseline survey. Further investigation needs to be conducted to determine why so few tobacco users participated in this study.

In the univariate results section there is a focus on describing the tobacco habits of smoke and smokeless tobacco users using baseline, EMA and EOD data. The response rates for this study were 23% for EMA and 35% for EOD which were consistent with recent studies regarding drug use and other types of EMA studies (Buckner, 2012; Lavender, 2013). The baseline survey was used to describe the tobacco characteristics of participants at outset of the study. Daily smokers reported starting to smoke on a regular basis around age 19-20 years old. For "sometimes" smokers, the average age they began smoking was 23.8 years. This is older than the average age as nearly 20% of Indians report starting to smoke before age 18 (Chadda, 2003). Many Indians begin to experiment with tobacco at a much earlier age such as in childhood and adolescents and research shows that it typically continues into adulthood (Chatterjee, 2011).

Tobacco Environments in India

Some of the central findings from the EMA data are regarding location and tobacco use behavior. At baseline, neither sometimes or daily smokers reported smoking cigar cheroots or cigarillos. Yet, for the completed EMA surveys and participants report smoking cigar cheroots or cigarillos most often. Since the product was reported most often at EMA, it would be expected that individuals reported it most often at baseline as well. However, at baseline participants reported exclusively smoking manufactured cigarettes and one person reported smoking hookah every day. For sometimes smokers, they reported only smoking manufactured cigarettes and rolled tobacco in paper.

EOD surveys indicate participant behavior reported over the course of the day. There were 987 EOD surveys completed by the 282 participants. However, at EOD, individuals only reported using smoke tobacco 12.4% of the time and smokeless tobacco 1.5% of the time. This is similar to rates to what was reported at baseline in terms of tobacco preferences of users; however, the diversity of products reported at EMA varied from what was reported at baseline. The most commonly reported smoke tobacco products used at EOD were manufactured cigarettes, rolled tobacco in paper or leaf and bidis. Interestingly, no one reported smoking bidis at baseline or at EMA. A small number of individuals also reported smoking rolled tobacco in paper or leaf at EMA, but not at baseline. It would also be expected that participants would report smoking bidis as that is the most commonly smoked tobacco product in India (Rani, 2003). More research is needed to understand why they do not consistently report smoking products at baseline, EMA and EOD, as it may have to do with question wording or social desirability.

According to EMA, few people reported being tobacco users or seeing evidence of tobacco use. Over half of the participants report being at home and alone when they responded to the EMA survey. However, they reported being in environments where smoke and smokeless tobacco use was allowed. Although there was a notable lack of visual evidence (tobacco butts, bidi butts, used ashtrays or spit from oral tobacco) of tobacco use, participants commonly reported smelling tobacco. With the new regulations in India that limit where people can smoke, the result could be that individuals are in environments near smoking, but not close enough to see the evidence. The smell of tobacco can migrate around a participants' environment in ways that tobacco butts, used ashtrays and oral tobacco spit cannot. While there are more smokers than smokeless tobacco users in this study, most users report never seeing any tobacco advertisements

whether they are pro- or anti-tobacco. Research shows that over 80% of Indians are in

environments were there is tobacco use (Patel, 2011). Because tobacco use seems to be

prevalent in India, you would expect them to notice others using tobacco and advertisements for

or against tobacco use more frequently. Perhaps, the times when they were asked to complete

EMA surveys they were at home or the workplace where these advertisements and evidence are

less ubiquitous.

For EOD surveys, while most participants still saw and heard no anti-or pro- messages

with either assessment, they did report seeing more anti-tobacco messages on television and on

tobacco packaging than at EMA. This suggests that EMA did not capture the times that people

were in environments where they would see or hear these messages.   As discussed earlier, EOD

may be a better way of capturing participant behavior and environments.

Limitations

There are some limitations to this EMA pilot study which include the issues of recall

bias, missing data, and generalizability to name a few. The limitations of this study are listed

below in subsections.

Generalizability

As mentioned in the discussion of central findings, there are some potential limitations

surrounding the sample. The point of this study was to better understand participants' tobacco

behaviors and their environment; it seems beneficial to have more smoke and smokeless tobacco

users in the study. Over 50% of India's population uses tobacco products; however in this

sample less than a quarter used tobacco products. With so few respondents, it weakens the

statistical analyses. However, it does allow the research team to understand ways to recruit in

the future and make improvements in their survey questions, which is an important contribution for this pilot study.

Other concerns with generalizability regard the number of men and women included in this pilot study. Nearly three quarters of the sample are men where a more even gender split may have been helpful. In India, the sex ratio is 1.06 favoring men, which means there are approximately 51.5% males to 48.5% females (Chakraborty, 2010). By recruiting more women in the study, the results could have been more generalizable to the Indian population as a whole. There may have been additional characteristics, behaviors or events that would have been reported, such as more oral tobacco users as we know that more India women are oral tobacco users (Rani, 2003).

The study did do a good job of recruiting nearly equal participants from the two cities, Kolkata and Hyderabad. Nevertheless, this pilot study should have asked questions regarding socioeconomic status, which would have given more insight into the type of tobacco users in India.

Recall Bias

The most common limitation of EMA studies is related to recall bias (Shiffman S, 2008). For the pilot study, the EMA surveys were distributed at random throughout the day. The EMA surveys also asked about current behaviors and environments, which were not asking participants to recall any events. These two characteristics of EMA limited recall bias. Baseline and EOD data was subject to recall bias. For many parts of the analysis, the baseline data is used. However, researchers like Shiffman and Stone (2008) have shown that recall bias is an issue in traditional research and there are benefits of having EMAs supplement the baseline and EOD data (Shiffman, 2008; Stone, 2008). More importantly, EMA data can corroborate or disprove

what participants report at baseline. Shiffman and Stone (2008) suggest that EMA data is more reliable than baseline because of the recall bias. EMA may reduce recall bias and give researchers a more true understanding of participant behavior and environment.

Missing Data

The response rates for EMA and EOD were low, but consistent with similar studies (Buckner, 2012; Lavender, 2013). The missing assessments have the potential to bias the sample (Shiffman S, 2008). Individuals may have been prompted to take an EMA survey while they were in situations where they were not able to complete the survey, but they would have provided valuable feedback regarding tobacco behavior and their environment. They could have been at work or at school and unable to take the survey and thus tobacco use was not captured at those times. Likewise, this missing data may make the data that is available more biased because there is more emphasis on the completed surveys, which may not represent all participants' behavior or environment (Grenard, 2013).   By considering this limitation, improvements can be made to increase response rates. Recommendations are listed in the next section of this chapter.

Data Collection Inconsistencies

Data entry inconsistencies made it difficult for statistical analyses. There were two instances at baseline when participants reported tobacco use, but the researcher did not collect any information about their tobacco behaviors—what types of products they use, how often, etc. This made it difficult when considering them in the analysis of baseline characteristics and comparing them to EMA and EOD.

Application Issues

This was the first EMA study to be conducted outside of a Western country. Developing an application that everyone had access to take was a large accomplishment. However, there were some developmental issues with the application that made data analysis quite difficult. First, the application did not capture if someone did not take a survey. There is no way of knowing for certain how many times a person was prompted to take a survey each day. Further, there were only seven individuals who took all or nearly all EMA and EOD surveys. Therefore, it was decided by the research team that full participation meant responding to five EMA prompts per day for 10 days and taking one EOD per day for 10 days.

The second issue with the EMA and EOD application is that it did not cut off participation after 10 days. There were five participants who took more than 20 days of surveys. It was decided to only count the first ten days of surveys. The first ten days might not have been the best ten days due to reactivity (Lavender, 2013).

Lastly, using this application, it is impossible to know some participant behaviors. The application only recorded surveys that were totally complete or if the expired (the person delayed the survey, but never completed the survey). Therefore, if a person started a survey, but did not finish it, the survey was never recorded. It could have been valuable for the analysis to examine these surveys and subsequently determine if this data was useful. It would have been helpful to know if a person delayed the survey and completed it at a later time. Knowing how many people delayed surveys might help researchers understand how often people are unable to take surveys and need additional time, which would allow researchers to adjust research protocol.

While the application seemed to communicate the data effectively with the server, there were some fundamental issues that need to be resolved for future EMA studies. There are also

additions that can be made to this application to improve these studies, which is discussed in the next section below.

Recommendations for Future EMA Studies

Multiple Sampling Methods

The most important recommendation this thesis can make for future EMA studies is to have multiple sampling methods. EMA is a not a single method, or even two methods, but a collection of methods that share a set of characteristics (Shiffman, 2008; Kauer, 2009). While this EMA study utilized random momentary assessments and scheduled end of day surveys, there are different methods that can be included that may better capture tobacco use of participants. There are a variety of time-based sampling methods used in EMA protocols. Nearly every study reviewed for this thesis uses more than two types of EMA protocols (Waters, 2008; Warthen, 2009; Minami, 2011, Lavender, 2013. This is especially true for drug-related EMA studies.

The most important addition that should be made to future EMA studies related to tobacco use is event-based sampling. Event-based sampling is that when a participant takes in a specific, predetermined survey (Shiffman S, 2008). These surveys are not random, but are based on engagement in a specific behavior. This would be helpful to better understand tobacco environments in India as tobacco use was not frequently captured by EMAs in this pilot study. Tobacco use is a relatively rare event, especially since most tobacco using participants report using tobacco less than ten times a day. Therefore, if they are randomly sampled five times throughout a 14-hour period, it is unlikely they will get an EMA while using a tobacco product. Studies regarding rare events that occur during tobacco use, illicit drug use, anxiety disorders, and eating disorders utilize event based sampling in their EMA studies (Buckner, 2012; Koblitz,

2009; Lavender, 2013; Shiffman, 2009). This would help gather more information about tobacco users' environment in real time.

Increase Compliance

EMA studies largely rely on participant compliance. Therefore, much consideration should be made to increase compliance throughout all phases of the research design. There are several additions that can be made to future studies to increase participation.   The first way to increase compliance, but reduce bias would be to reduce reactivity. Reactivity is one of the major concerns with EMA studies. It is the idea that participants notice things they normally would not have because they are apart of a study (Stone, 2002). By adding on a few practice days to the study, researchers argue that this reduces reactivity as participants become more accustom to the EMA measures (Lavender, 2013; Stone, 2002). Many EMA studies have these practice days that are not used for analysis. At a minimum, participants could also be given a practice EMA study during the first research meeting where they are instructed on how to download the software.

Another recommendation to increase compliance would be to add reminders. Some studies email participants daily reminders to complete their surveys (Buckner, 2012). Other studies give participants progress reminders to help motivate them to complete more studies to increase their desire to participate (Shiffman S, 2008). The progress reminders are text messages, built into the EMA application or email reminders. The worry is that it might unethically encourage participation (Courvoisier, 2012). Careful consideration needs to be made in regards to the population being sampled.

The addition of extra questions that are not related to the study might increase participation. In a study by Stone and Shiffman (2008), they found that if participants knew about the point of the study, they were less likely to answer questions when they were not engaging in the behavior or in environments being studied (Stone, 2008). Therefore, because the participants knew they were being asked about smoking status and environmental cues surrounding tobacco use, they may not have answered questions if they were not presently engaging in tobacco use. Stone and Shiffman (2008) recommend effective training in momentary protocol and adding in extra questions as a way of largely eliminating this type of response bias (Stone, 2008).

Improve Questions

Another recommendation is to develop of clear, appropriate questions. While there were no apparent issues with most of the questions in this pilot study, each question should be carefully evaluated for clarity using an Indian sample group.   Perhaps for Indians, some of the questions were not clear. Researchers have stressed the need to identify the most relevant cues, environments and/or contextual factors that influence drug use (Warthen, 2009). Also, even if the questions were clear, they may not capture all of the environments or behaviors related to tobacco use in India. It would have been helpful to distribute a questionnaire following the survey to assess the participants' reactions to the EMA and EOD.

Recruitment

Recruitment efforts have to be made to include more women and more smoke and smokeless tobacco users. This would include going to where these users most typically frequent

such as outside markets, bars, and out in the street. Snowball sampling may be another effective way to recruit tobacco users. The recruitment procedures included hanging posters and recruiting key community members to help encourage people to participate. More efforts must be made to have a more representative sample. This type of study requires quite a bit of time, over recruitment should occur as participants are bound to drop out. There were only10 people who did not complete any EMA or EOD surveys. It should be anticipated that people will drop out. Over-recruiting allows for more security in the analyses of future EMA studies.

Communication of Findings

The last recommendation would be to communicate major findings with community members and other stakeholders interested in EMA studies and research in India.

Conclusion

India suffers disproportionality from mortality related to tobacco use. The increased prevalence of smokers in India has resulted in a rise in chronic disease and premature death. More than one million people die every year in India due to tobacco related diseases (Tobacco Free Initiative, n.d.). More than 20% of the Indian population smokes daily, (Patel V, 2011). The most current data shows that there are a total of 275 million tobacco users in India (Sarkar, 2012). This total comprises of 164 million smokeless tobacco users, 69 million tobacco smokers and 42 million people using both forms (Sarkar, 2012). While tobacco use is very prevalent, there are gender inequalities that exist with use of any type of tobacco product. 65% of Indian men and 33% of Indian women consume some form of tobacco product either daily or sometimes (Rani, 2003; Sorensen, 2005). India also has a variety of tobacco products that offer individuals' an array of options, making tobacco consumption even more tempting.

While actions have been taken by the Indian government to reduce the amount of new and current tobacco users through detection and prevention, their efforts have not proven to significantly diminish the problem because of the lack of enforcement. The prevalence of tobacco use makes it seem like tobacco is ubiquitous in India.

More research is needed to determine Indian's perceptions of tobacco use and tobacco environments in India. This secondary data analysis has investigated the use of Ecologic Momentary Assessments to better understand individuals' tobacco behaviors, perceptions and environments. The results presented in this thesis allow for further studies to be developed in ways that best capture environmental and social cues around tobacco use in India. The findings from this study contribute to the literature on EMA studies, as there have been no EMA studies conducted in non-Western settings. These results help inform future research on the type of surveys that may work best in India, as well as the participant characteristics that may increase study participation. The strengths and limitations of this study are also important to inform future research on the best EMA protocol in non-Westerns settings. This EMA study is important as tobacco use in India is pervasive and more is needed to be done to understand tobacco behaviors and the environmental and social perceptions of tobacco use.

Appendix 1:

Diagram 1 of Behavioral Ecological Model
(Hovell, 2009)
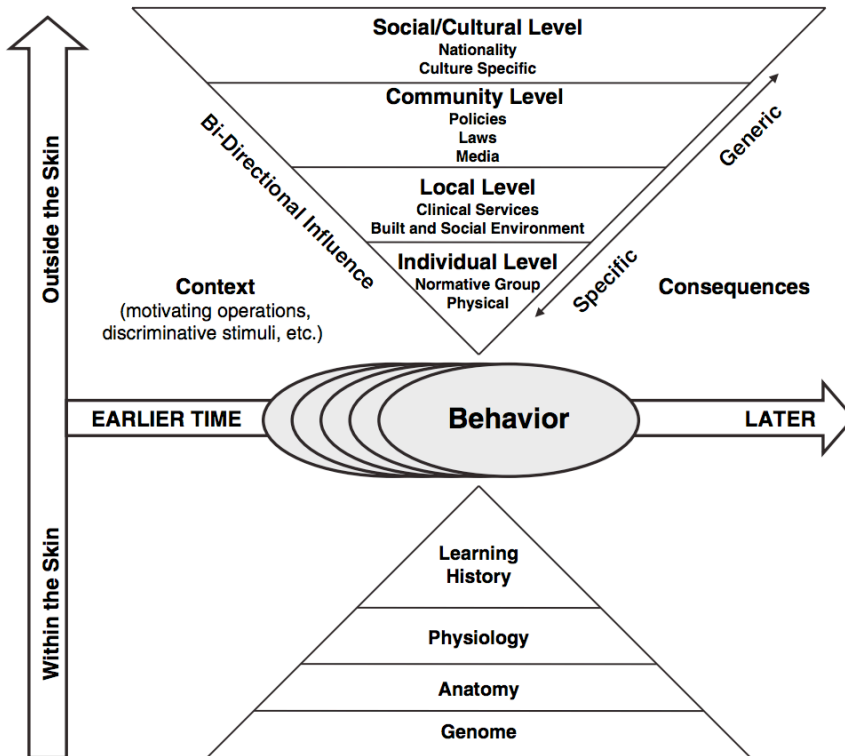
Appendix 2: Map of India

Hyderabad and Kolkata circled in yellow

(mapsofindia.com)

Appendix 3: Institutional Review Board Form: University of Maryland, College Park

UNIVERSITY OF MARYLAND COLLEGE PARK
Institutional Review Board
Human Subject Research Determination

Principal Investigator	Craig Fryer	Email Address	csfryer@umd.edu

Student/Co-Investigators	Amanda Strausser	Email Address(es)	Astraus3@umd.edu

Department	Behavioral and Community Health, School of Public Health
ORA Proposal #	

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1) **Project Information:**

A. **Provide a brief description of the project:** Describe the specific objectives, including background information and rationale for the proposed project. This summary should be written in a way that will be intelligible to non-specialists in your specific subject area.

> The aim of this proposed research is to do a secondary data analysis of deidentified baseline, ecological momentary assessments and end of day surveys to better understand the social and environmental cues that encourage and discourage tobacco use in India. This research will analyze data that determines gender differences among smokers and nonsmokers. In addition, I will look at the reporting of tobacco use at all three data points to see if there is reported consistency among tobacco users and nonusers to further investigate the validity of ecological momentary assessments.

B. **Describe the subject population/type of data/specimens to be studied:** Identify who your subjects will be and indicate the type of data or specimens you will collect. Describe the methods in which the data or specimens will be collected, stored, and how confidentiality will be maintained.

> The data is given to me through a secure, password protected online file. All of the data from the baseline surveys, ecological momentary assessments and end of day surveys are deidentified.

2. Determination of *Research* – 45 CFR 46.102 (d):
Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge (publication, presentation, etc.)

A. For existing specimens, was the data/specimen(s) obtained in a systematic manner?
No ☐ <mark>Yes</mark> ☐ Not Applicable – does not involve the collection of existing data

B. For future data collection, will the data/specimen(s) be obtained in a systematic manner?
No ☐ Yes ☐ <mark>Not Applicable</mark> – does not involve future data collection

C. Is the project designed to develop or contribute to generalizable knowledge (publication, presentation, etc.)?
No ☐ <mark>Yes</mark>

D. Is the intent of the project to create an archive for the purpose of providing a resource for others to do research?
No ☐ <mark>Yes</mark>

E. For research only involving coded private information or specimens, was the private information or specimens collected specifically for the currently proposed research project through an interaction or intervention with living individuals?
No ☐ <mark>Yes</mark> ☐ Not Applicable - does not involve coded private information/specimens

3. Determination of *Human Subject* – 45 CFR 46.102(f):
Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains **(1)** Data through intervention or interaction with the individual, or **(2)** Identifiable private information.

Intervention includes both physical procedures by which data are gathered and manipulations of the subject or the subject's environment that are performed for research purposes.

Interaction includes communication or interpersonal contact between investigator and subject.

Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the

information) in order for obtaining the information to constitute research involving human subjects.

A. Does the study involve intervention or interaction with a ***human subject?***
☐ No ☐ Yes

B. Does the study involve access to identifiable ***private information***?
☐ No ☐ Yes

C. Are data/specimens received by the investigator with identifiable ***private information?***
☐ No ☐ Yes

D. Are the data/specimens coded such that a link exists that could allow the data/specimen(s) to be re-identified?
☐ No ☐ Yes

- If *Yes*: Is there a written agreement that prohibits the Principal Investigator, Co-Investigator, student investigator(s), and any other members of the research team from access to the link?
☐   No ☐ Yes   (If Yes, please explain below.)

- Are there other legal requirements that prohibit the release of the key to the investigators, until the subjects are deceased?
☐   No ☐ Yes   (If Yes, please explain below.)

Appendix 4: Institutional Review Board: UMD Determination of Not Human Subjects

UNIVERSITY OF MARYLAND

INSTITUTIONAL REVIEW BOARD

DATE: March 10, 2014

TO: Craig Fryer, PhD
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [568546-1] Secondary Data Analysis Investigating the Utilities of Ecologic Momentary Assessments to Understand Smoking Environments in India

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF NOT HUMAN SUBJECT RESEARCH
DECISION DATE: March 10, 2014

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records

Appendix 5: Institutional Review Board: Johns Hopkins School of Public Health- Investigator/Study Staff Agreement

615 N. Wolfe St, Suite El 100
Baltimore, MD 21205
Phone: (410) 955-3193
fax: (410) 502-0584

Johns Hopkins School of Public Health
Institutional Review Board
Investigator/Study Staff Agreement

Complete this form, or *copy* and *paste language into* an *email* and send from *investigator /study staff 's email address.*

IRB Number:	4709
Study Title:	**EMA to examine cues to use tobacco in India**
Principal Investigator:	Dr. Dina Borzekowski

I agree to assume the responsibility as <u>student investigator</u>*(insert role: "Principal Investigator", "co- investigator"; "student investigator")whose work on the project is associated with an academic degree objective; or "study staff", meaning personnel who will interface with participants and/or their identifiable private information, such as research coordinator(s), interviewer (s), or data manager(s)* for the study listed above. I understand that this responsibility includes all of the following commitments:

1. I will protect the rights and welfare of all study participants.
2. I will follow the IRB approved research plan.
3. I will not institute any changes for which IRB review is required, to the research plan or any other study documentation without prior IRB approval.
4. I will comply with JHSPH IRB policies, and with the federal, state, international, or local laws applicable to the site of the research.

I (do) (do not)(check one) have a financial conflict of interest with this study. If you check "do", please disclose your conflict to the Principal Investigator on the project, who should report it and discuss further necessary actions with the IRB.

<u>Amanda Strausser</u>
  Print'Name

_____   11/21/2013
  Signature   Date

Appendix 6: Baseline Study Questions

A1. **What is your gender**:　　　1- Male　　　2 - Female

A1. gen

A2. **How old are you?**　　　Enter age in years

A2. age

A3. **What is the highest level of education you have completed?**

A3. educ

1. No formal schooling
2. Less than primary
3. Primary school completed
4. Less than high school complete
5. High school completed
6. Intermediate school completed
7. Diploma completed
8. UG degree Completed
9. Post Graduate Degree Completed
99. Don't Know

A4. **Which of the following best describes your main work status over the past 12 months?**

A4. work_stat

1. **Government employee**
2. **Non-government employee**
3. **Self-employed**
4. **Student**
5. **Homemaker**
6. **Retired**
7. **Unemployed, able to work**
8. **Unemployed, unable to work**

A5. **Please tell us whether your household has the following items:**

	Code (No – 0, Yes -1, DKCS -99)
1. **Electricity**	A.5.1　household1
2. **Flush toilet**	A.5.2　household2
3. **Car**	A.5.3　household3
4. **Moped/scooter/motorcycle**	A.5.4　household4
5. **Television**	A.5.5　household5
6. **Refrigerator**	A.5.6　household6
7. **Wash**	A.5.7　household7
8. **Fixed telephone/Landline**	A.5.8　household8
9. **Cell/mobile telephone**	A.5.9　household9
10. **Radio**	A.5.10　household10

Section B: Tobacco Smoking

Intro: **We would now like to ask you some questions about <u>smoking</u> tobacco, including bidis, cigarettes, cigars, *cheroots*, rolled cigarettes, tobacco rolled in maize leaf and newspaper, hookah, pipes, *chillum*, *chutta*. Please do NOT answer about smokeless tobacco at this time.**

B1. **Do you <u>currently</u> smoke tobacco on a daily basis, less than daily, or not at all?**

1.	Daily	[Proceed to B1a.]
2.	Less than daily/sometimes	[skip to B1b. on next page]
3.	Not at all	[skip to B2.]

B1. smkstat_current

B1a. *[FOR THOSE WHO SMOKE DAILY]*

   i.   **To your best estimate, how old were you when you first started smoking tobacco <u>daily</u>?**
(Enter age in years)

B1ai. dailysmk_start

   ii.   **To your best estimate, at what age did you first <u>try</u> smoking?**
(Enter age in years)

B1aii. dailysmk_first_try

   iii.   **Which of the following products do you <u>currently</u> smoke daily, and approximately how often do you smoke them in a typical day?** Record an answer for each of the products.

	Smoke? (No – 0, Yes – 1)	How many per DAY?	Do you smoke this product less than daily? (No – 0, Yes – 1)
1. **Manufactured cigarettes**	B1a1. dailysmk1	B1a2. dailysmk1_perday	B1a3. dailysmk1_less
2. **Rolled tobacco in paper**	B1a4. dailysmk2	B1a5. dailysmk2_perday	B1a6. dailysmk2_less
3. **Bidis**	B1a7. dailysmk3	B1a8. dailysmk3_perday	B1a9. dailysmk3_less
4. **Cigars, cheroots, or cigarillos**	B1a10. dailysmk4	B1a11. dailysmk4_perday	B1a12. dailysmk4_less
5. **Hukkah/hookah**	B1a13. dailysmk5	B1a14. dailysmk5_perday	B1a15. dailysmk5_less

iv. **How soon after you wake up do you usually have your first smoke**?

1.	Within 5 minutes	3.	31-60 minutes
2.	6 to 30 minutes	4.	More than 60 minutes

B1aiv. dailysmk_wakeup

PLEASE SKIP TO B3

B1b. *[FOR THOSE WHO SMOKE LESS THAN DAILY/SOMETIMES]*

    i.   **Which of the following products do you <u>currently </u>smoke, and how often do you smoke them in a typical week or month? Check all that apply.**

	Smoke? (No – 0, Yes – 1)	How many per Week?	How many per Month?
1. **Manufactured cigarettes**	B1b1. somesmk1	B1b2. somesmk1_perwk	B1b3. somesmk1_permo
2. **Rolled tobacco in paper**	B1b4. somesmk2	B1b5. somesmk2_perwk	B1b6. somesmk2_permo
3. **Bidis**	B1b7. somesmk3	B1b8. somesmk3_perwk	B1b9. somesmk3_permo
4. **Cigars, cheroots, or cigarillos**	B1b10. somesmk4	B1b11. somesmk4_perwk	B1b12. somesmk4_permo
5. **Hukkah/hookah**	B1b13. somesmk5	B1b14. somesmk5_perwk	B1b15. somesmk5_permo

----

B2. **In the <u>past,</u> have you smoked tobacco on a daily basis, less than daily, or not at all?**
    1. Daily
    2. Less than daily   [skip to section C.]
    3. Not at all   [skip to section C.]
    99. Don't know   [skip to section C.]

B2. smkstat_past

B2a. *[FOR FORMER DAILY SMOKERS]*
    i.   **To your best estimate, how old were you when first started smoking tobacco <u>regularly</u>?** (Enter age in years)

    ii.   **To your best estimate, at what age did you first <u>try</u> smoking?** (Enter age in years)

    iii. **How long has it been since you stopped smoking regularly?**

           1. Less than a month ago [Skip to Section C]
           2. 1 -3 Months   [Skip to Section C]
           3. 4 – 6 Months   [Skip to Section C]
           4. 7 -12 Months   [Skip to Section C]
           5. More than an year ago [Continue]

B2ai. smk_pastdaily_whenstart
B2aii. smk_pastdaily_firsttry
B2aiii. smk_pastdaily_howlong

B3. Have you visited a doctor or other health care provider in the past 12 months for any reason of personal health? – No – 0, Yes – 1

| B3. dailysmk_doc_visit |

B4. During any visit to a doctor or health care provider were you asked if you smoke tobacco? – No – 0, Yes - 1

| B4. dailysmk_doc_ask |

B5. During any visit to a doctor or health care provider, were you advised to quit smoking tobacco? – No – 0, Yes - 1

| B5. dailysmk_doc_quit |

B6. Have you ever tried to stop smoking tobacco?
No – 0, Yes – 1 [skip to B9 if response is NO]

| B6. dailysmk_tried_quit |

B7. Think about the last time you tried to quit. How long did you stop smoking?
1. Less than a week
2. 1-4 weeks
3. 1 -3 Months
4. 4 – 6 Months
5. 7 -12 Months
6. More than an year

| B7. dailysmk_last_quit |

B8. Do you know of any products or methods that help people to quit smoking? (No – 0, Yes -1)

Counseling, including at a smoking cessation clinic	B8a. S_quit_aware_m1
Nicotine replacement therapy, such as patch or gum	B8b. S_quit_aware_m2
Prescription medications, such as Bupropion	B8c. S_quit_aware_m3
Traditional medicines, such as Ayurvedic, Homeopathic, Unani	B8d. S_quit_aware_m4
Quit line or smoking telephone support line	B8e. S_quit_aware_m5
Switching to smokeless tobacco	B8f. S_quit_aware_m6
No method, just stopped	B8g. S_quit_aware_m7
Other (specify)	B8h. S_quit_aware_m8

B8a. I will now read some common ways to quit smoking. If you have tried to stop smoking tobacco, please indicate which you have tried. (No – 0, Yes -1)

Counseling, including at a smoking cessation clinic	B8ai. dailysmk_quit_meth1
Nicotine replacement therapy, such as patch or gum	B8aii. dailysmk_quit_meth2
Prescription medications, such as Bupropion	B8aiii. dailysmk_quit_meth3
Traditional medicines, such as Ayurvedic, Homeopathic, Unani	B8aiv. dailysmk_quit_meth4
Quit line or smoking telephone support line	B8av. dailysmk_quit_meth5
Switching to smokeless tobacco	B8avi. dailysmk_quit_meth6
No method, just stopped	B8avii. dailysmk_quit_meth7
Other (specify)	B8aviii. dailysmk_quit_meth8

B9. Which of the following best describes your thinking about quitting smoking?

| B9. dailysmk_quit_thoughts |

1. I am planning to quit within the next month
2. I am thinking about quitting within the next 12 months
3. I will quit someday but not within the next 12 months
4. I am not interested in quitting

Section C. Smokeless Tobacco

The next questions are about using smokeless tobacco, such as tobacco leaf, betel quid with tobacco, sada/surti, khaini or tobacco lime mixture, gutkha, or pan masala.

C1. **Do you currently use smokeless tobacco on a daily basis, less than daily, or not at all?**
  1. Daily   [Continue to C1a.]
  2. Less than daily   [Skip to C1b.]
  3. Not at all   [skip to C2.]
  99. Don't know   [skip to C2.]

> C1.
> smkless_stat_current

C1a. *[FOR THOSE WHO USE SMOKELESS DAILY]*

  i. **Which of the following smokeless tobacco products do you currently use daily, and approximately how often do you use them in a typical day or week?**

	Use? (No – 0, Yes – 1)	How many per DAY?	Do you use this product less than daily? (No – 0, Yes – 1)
1. **Betel quid with tobacco**	C1a1. daily_smkless1	C1a2. daily_smkless1_perday	C1a3. daily_smkless1_less
2. **Khaini or tobacco lime mixture**	C1a4. daily_smkless2	C1a5. daily_smkless2_perday	C1a6. daily_smkless2_less
3. **Ghutkha or tobacco lime, areca nut mixture**	C1a7. daily_smkless3	C1a8. daily_smkless3_perday	C1a9. daily_smkless2_less
4. **Oral tobacco use (snuff, mishri, qul, gudakhu)**	C1a10. daily_smkless4	C1a11. daily_smkless4_perday	C1a12. daily_smkless4_less
5. **Panmasala and betel quid *without* tobacco**	C1a13. daily_smkless5	C1a14. daily_smkless5_perday	C1a15. daily_smkless5_less
6. **Nasal snuff**	C1a16. daily_smkless6	C1a17. daily_smkless6_perday	C1a18. daily_smkless6_less

  ii. **How soon after you wake up do you usually use tobacco for the first time in the day?**
  1. Within 5 minutes
  2. 6 to 30 minutes
  3. 31-60 minutes
  4. More than 60 minutes

> C1aii.
> daily_smkless_wakeup

iii. **How old were you when first started using smokeless tobacco daily?** (Enter age in years)

C1aiii.
daily_smkless_start

iv. **What age did you first try smokeless tobacco? Please provide best estimate.** (Enter age in years)

C1aiv.
daily_smkless_first_try

[skip to C3]

C1b. *[FOR THOSE WHO USE SMOKELESS TOBACCO LESS THAN DAILY]*
Which of the following smokeless products do you currently use, and how often do you use them in a typical week or month? Check all that apply.

	Use? (No – 0, Yes – 1)	How many per Week?	How many per Month?
1. Betel quid with tobacco	C1b1. some_smkless1	C1b2. some_smkless1_perwk	C1b3. some_smkless1_permo
2. Khaini or tobacco lime mixture	C1b4. some_smkless2	C1b5. some_smkless2_perwk	C1b6. some_smkless2_permo
3. Ghutkha or tobacco lime, areca nut mixture	C1b7. some_smkless3	C1b8. some_smkless3_perwk	C1b9. some_smkless3_permo
4. Oral tobacco use (snuff, mishri, qul, gudakhu)	C1b10. some_smkless4	C1b11. some_smkless4_perwk	C1b12. some_smkless4_permo
5. Panmasala and betel quid *without* tobacco	C1b13. some_smkless5	C1b14. some_smkless5_perwk	C1b15. some_smkless5_permo
6. Nasal snuff	C1b16. some_smkless6	C1b17. some_smkless6_perwk	C1b18. some_smkless6_permo

C2.i **In the past, have you used smokeless tobacco on a daily basis, less than daily, or not at all?**

1. Daily   [Continue to C2a]
2. Less than daily   [skip to section D]
3. Not at all   [skip to section D]
99. Don't know   [skip to section D]

C2i. smkless_stat_past

C2a.*[FOR FORMER DAILY USERS OF SMOKELESS TOBACCO]*

i. **To your best estimate, at what age did you start using smokeless tobacco daily?** (Enter age in years)

C2ai.
smkles_pastdaily_whenstart

ii. **To your best estimate, at what age did you first try using smokeless tobacco?** (Enter age in years)

C2aii.
smkless_pastdaily_firsttry

iii. **How long has it been since you stopped using smokeless tobacco regularly?**

1. Less than a month ago [Skip to Section D]
2. 1 -3 Months   [Skip to Section D]
3. 4 – 6 Months   [Skip to Section D]

C2aiii.
smkless_pastdaily_howlong

4. 7 -12 Months   [Skip to Section D]
5. More than an year ago   [Continue]

[Skip to Section D if the response is LESS than 1 year or 12 months]

C3. **Have you visited a doctor or other health care provider in the past 12 months for any reason of personal health?**   – No – 0, Yes - 1

C3. daily_smkless_doc_visit

C4. **During any visit to a doctor or health care provider, were you asked if you use smokeless tobacco?**   – No – 0, Yes - 1

C4. daily_smkless_doc_ask

C5. **During any visit to a doctor or health care provider, were you advised to stop using smokeless tobacco?**   – No – 0, Yes - 1

C5. daily_smkless_doc_quit

C6. **Have you ever tried to stop using smokeless tobacco?**
– No – 0, Yes – 1 [skip to C9 if the response is No.]

C6. daily_smkless_tried_quit

C7. **Think about the last time you tried to quit. <u>How long did you stop</u> using smokeless tobacco?**
1. Less than a month
2. 1 -3 Months
3. 4 – 6 Months
4. 7 -12 Months
5. More than an year

C7. daily_smkless_last_quit

C8. **Do you know of any products or methods that help people to quit smoking?** Indicate the methods that the participant gives. (No response – 0, Yes -1)

Counseling, including at a tobacco cessation clinic	C8a. SL_quit_aware_m1
Nicotine replacement therapy, such as patch or gum	C8b. SL_quit_aware_m2
Prescription medications, such as Bupropion	C8c. SL_quit_aware_m3
Traditional medicines, such as Ayurvedic, Homeopathic, Unani	C8d. SL_quit_aware_m4
Quit line or tobacco telephone support line	C8e. SL_quit_aware_m5
Other (specify)	C8f. SL_quit_aware_m6

C9. **I will now read some common ways to quit using smokeless tobacco. If you have tried to stop using smokeless tobacco in the last 12 months, please indicate which you tried.** (No – 0, Yes -1)

Counseling, including at a tobacco cessation clinic	C9a. daily_smkless_quit_meth1
Nicotine replacement therapy, such as patch or gum	C9b. daily_smkless_quit_meth2

Prescription medications, such as Bupropion	C9c. daily_smkless_quit_meth3
Traditional medicines, such as Ayurvedic, Homeopathic, Unani	C9d. daily_smkless_quit_meth4
Quit line or tobacco telephone support line	C9e. daily_smkless_quit_meth5
Other (specify)	C9f. daily_smkless_quit_meth6

C9. **Which of the following best describes your thinking about quitting smokeless tobacco?**
1. **I am planning to quit within the next month**
2. **I am thinking about quitting within the next 12 months**
3. **I will quit someday but not withing the next 12 months**
4. **I am not interested in quitting**

C9. daily_smkless_quit_thoughts

Section D. Second-Hand Smoke

D1. **Which of the following best describes the practices about smoking inside (not including balcony, terrace etc) of your home?**
1. **Allowed**
2. **Not allowed, but exceptions**
3. **Never allowed**   [skip to D3]
4. **No rules**   [skip to D3]
99. **Don't know**

D1. inside_home_rules1

D2. **Inside your home, are there any rooms in which smoking does not occur?**
0. No
1. Yes   [skip to D2c]
99. Don't know

D2. inside_home_rules2

D2a. **In how many rooms is smoking allowed in your home?**

D2a. inside_home_rules3

D2b. **In how many rooms is smoking <u>NOT</u> allowed in your home?**

D2b. inside_home_rules4

D2c. **How often does <u>anyone</u> smoke in any room in your house? Provide best estimate.**

1. Daily	4. Less than monthly
2. Weekly	5. Never
3. Monthly	99. Don't know

D2c. inside_home_rules5

D3. **In which of the following <u>outdoor</u> areas of your home, is smoking allowed?**

	Code: (No- 0, Yes- 1, DKCS- 99)
Smoking is not allowed in the outdoor areas. [skip to D4]	D3i. outside_home_rules1
Balcony	D3ii. outside_home_rules2
Porch	D3iii. outside_home_rules3
Terrace	D3iv. outside_home_rules4
Roof	D3v. outside_home_rules5
Front/back entrance	D3vi. outside_home_rules6

D3a. **How often does <u>anyone</u> smoke in the outdoor areas of your home?**
1. Daily
2. Weekly
3. Monthly
4. Less than monthly
5. Never
99. Don't know

D3a. outside_home_rules7

D4**. Do you currently work or go to school/college outside of your home?**
1. Yes
2. No, I work at home   [skip to D10]
3. Don't work at all   [skip to D10]

D4. work_outside_home

D5. **Do you work in a government building?** (No – 0, Yes – 1)

D5. work_gov_bldg

D6. **Do you usually work or go to school/college indoors or outdoors?**
1. Indoors   [skip to D8]
2. Outdoors
3. Both   [skip to D8]

D6. work_indoors_outdorors

D7. **Are there any indoor areas at your work place or school/college?**
0. No   [skip to D10]
1. Yes
99. Don't know   [skip to D10]

D7. work_indoor_areas

D8. **Which of the following best describes the <u>indoor</u> smoking policy where you work or go to school/college?**
1. Smoking is allowed anywhere
2. Smoking is allowed only in some indoor areas
3. Smoking is not allowed in any indoor areas
4. There is no policy
99. Don't know

D8. work_indoor_policy

D9. **In the past week, did anyone smoke in <u>indoor</u> areas where you work or go to school/college?**
0. No
1. Yes
99. Don't remember

D9. work_indoor_anyone_smoke

D10. scale1_secondhand

D10. **Please indicate whether you agree or disagree with the following statement:**

"Breathing other people's smoke cause serious illness in non-smokers"

1. -3   -   Completely Disagree
2. -2
3. -1
4. 0   -   Neutral

5. +1
6. +2
7. +3   -   Completely Agree

D11. **We will now discuss some of the places you visited during the past 30 days. I will name some places you may have visited. Please tell me if you saw someone smoking there.** (Note to interviewer: if participants respond that people were smoking outside of buildings where smoking is still not permitted, e.g. outside the hospital, please indicate "Yes -1" under "Saw someone smoking there?")

Place (Read out to the participant)	Visited?	Saw Someone smoking there?	No smoking areas with signs?	Saw smoking in No smoking?
		(No -0, Yes -1, DKCS / Don't remember -99)		
1. **Government buildings / offices**	D11.1 visited_gov	D11.2 visited_gov_saw_smk	D11.3 visited_gov_saw_sign	D11.4 visited_gov_rules_broken
2. **Hospital**	D11.5 visited_hosp	D11.6 visited_hosp_saw_smk	D11.7 visited_hosp_saw_sign	D11.8 visited_hosp_rules_broken
3. **Restaurant**	D11.9 visited_rest	D11.10 visited_rest_saw_smk	D11.11 visited_rest_saw_sign	D11.12 visited_rest_rules_broken
4. **Bar**	D11.13 visited_bar	D11.14 visited_bar_saw_smk	D11.15 visited_bar_saw_sign	D11.16 visited_bar_rules_broken
5. **Coffeehouse**	D11.17 visited_coffee	D11.18 visited_coffee_saw_smk	D11.19 visited_coffee_saw_sign	D11.20 visited_coffee_rules_bro
6. **Public Transport**	D11.21 visited_transport	D11.22 visited_transport_saw_smk	D11.23 visited_saw_sign	D11.24 visited_transport_rules_
7. **Indoor Stores**	D11.25 visited_stores	D11.26 visited_stores_saw_smk	D11.27 visited_stores_saw_sign	D11.28 visited_stores_rules_bro

Section E. Economics – Tobacco Smoking

Sub-section E1. Manufactured Cigarettes

[FOR RESPONDENTS WHO CURRENTLY SMOKE DAILY OR LESS THAN DAILY **AND** SMOKE <u>MANUFACTURED</u> <u>CIGARETTES</u>]

E1a. **The last time you bought cigarettes for yourself, please tell us whether you bought them loose, in packs, or in cartons. Then estimate how many you bought during that time.**

1. Cigarettes	2. Pack	3. Cartons

E1a. cigs_purchase_form

i) How many? E1ai. cigs_purchase_qty

E1b. **In total, how much money did you pay for this purchase?** (in Rupees)

E1b. cigs_purchase_cost

E1c. **What brand did you buy the last time you purchased cigarettes for yourself?**

1. Wills Navy Cut	4. Classic	7. Triple Five
2. Panama	5. Gold flake	8. Camel
3. Four square	6. Marlboro	99. Don't remember

E1c. cigs_purchase_brand

10. Others (Please specify)   E1ci. cigs_purchase_brand_other

E1d. **The last time you purchased cigarettes for yourself, where did you buy them?**

1. Vending machine	5. Duty-free shop	9. From another person
2. Grocery store/Kirana	6. Outside the country	99. Don't remember
3. Chai or coffee stand	7. Pan shop	
4. Military store	8. Internet	

E1d. cigs_purchase_loc

11. Others (Please specify)   E1di. cigs_purchase_loc_other

Section E. Economics – Tobacco Smoking

Sub-section E2. Bidis

[FOR RESPONDENTS WHO CURRENTLY SMOKE DAILY OR LESS THAN DAILY **AND** <u>SMOKE BIDIS</u>]

E2a. **The last time you bought bidis for yourself, please tell us whether you bought them loose, in packs, or in cartons. Then estimate how many you bought during that time.**

1. Bidis	2. Packs	3. Cartons

E2a. bidis_purchase_form

i) How many?

E2b. **In total, how much money did you pay for this purchase**?

E2ai. bidis_purchase_qty
E2b. bidis_purchase_cost

E2c. **What brand did you buy the last time you purchased bidis for yourself?**

1. Ganesh	4. A-One	7. Chandan		E2c. bidis_purchase_brand
2. Pataka	5. Aleem	8. Kareem		
3. Mazdoor	6. Bharath	99. Don't remember		

10. Others (Please specify) | E2ci. bidis_purchase_brand_other |

E2d. **The last time you purchased bidis for yourself, where did you buy them?**

1. Vending machine
2. Grocery store/Karana
3. Chai or coffee stand
4. Military store
5. Duty-free shop
6. Outside the country
7. Paan shop
8. Internet
9. From another person
99. Don't remember

E2d. bidis_purchase_loc

11. Others (Please specify) | E2di. bidis_purchase_loc_other |

Section F. Economics – Smokeless Tobacco

[FOR RESPONDENTS WHO CURRENTLY USE <u>SMOKELESS TOBACCO</u> DAILY OR LESS THAN DAILY]

F1. **The last time you bought smokeless tobacco products for yourself, please tell us whether you bought them in pouches, cans, or another type of packaging. Then estimate how many of those you bought.**

1. Pouches
2. Cans
3. Other (specify)

F1. smkless_purchase_form
F1.3. (Others)- purch_SL_form

i) **How many?** | F1i. smkless_purchase_qty |

F2. **In total, how much money did you pay for this purchase? (in Rs.)** | F2. smkless_purchase_cost |

F3. **The last time you purchased smokeless tobacco products for yourself, where did you buy them?**

1. Vending machine
2. Grocery store/Karana
3. Chai or coffee stand
4. Military store
5. Duty-free shop
6. Outside the country
7. Paan shop
8. Internet
9. From another person
99. Don't remember

F3. smkless_purchase_loc

11. Others (Please specify) | F3i. smkless_purchase_loc_other |

Section G. Media
The next set of questions asks about your exposure to the media and advertisements in the last 30 days. We will ask about cigarettes, bidis, and smokeless tobacco.

SUB-SECTION: **ANTI-TOBACCO** MEDIA & ADVERTISING

These questions will ask about media and advertisements that warn <u>against</u> using tobacco products, warn about the dangers of using them, and/or encourage quitting.

G1. **In the last 30 days, have you noticed any information in the following about the dangers of using tobacco products or that encourage quitting use of tobacco products?**

Item (Please read)	**Cigarettes?**	**Bidis?**	**Smokeless Tobacco?**
	(No - 0, Yes – 1, DKCS / Don't remember -99)		
1. Newspaper / Magazine	G1.1 noticed_mags1	G1.2 noticed_mags2	G1.3 noticed_mags3
2. Television	G1.4 noticed_tv1	G1.5 noticed_tv2	G1.6 noticed_tv3
3. Radio	G1.7 noticed_radio1	G1.8 noticed_radio2	G1.9 noticed_radio3
4. Billboard/ Hoarding	G1.10 noticed_billboard1	G1.11 noticed_billboard2	G1.12 noticed_billboard3

G2. **Have you ever seen any health warnings on cigarette packages?**
   0. No   [Skip to G4]
   1. Yes
   99. DKCS/Don't remember   [Skip to G4]

> G2.
> seen_warnings_cigpacks

G3. **Please describe the health warnings on cigarette packages in detail.**
   1. Cannot describe pictures or words.
   2. Correctly describes the picture, but no words.   [Skip to G5]
   3. Correctly describes the picture and words.   [Skip to G5]

> G3.
> describe_warnings_cigpacks

 G4. **Have you seen labels like this on cigarette packages? (show the cigarette pack picture)**
   0. No
   1. Yes

> G4.
> show_warnings_cigpacks

G5. **If you currently smoke cigarettes daily or less than daily:**
Please indicate whether you agree/disagree with the following: (Show the preference scale)
   "Health warnings on cigarette packages have made me think about quitting smoking."

> G5.
> scale2_cigpack_warnings

   1. -3   Completely disagree
   2. -2
   3. -1
   4. 0   Neutral
   5. +1
   6. +2
   7. +3   Comple

G6. Have you ever seen any health warnings on smokeless tobacco products?
    0. No   [Skip to G8]
    1. Yes
    99. DKCS/Don't remember   [Skip to G8]

G6.
seen_warnings_smkless

G7. Please describe the health warnings on smokeless tobacco products in detail.
    1. Cannot describe pictures or words.
    2. Correctly describes the picture, but no words.   [Skip to G9]
    3. Correctly describes the picture and words.   [Skip to G9]

G7.
describe_warnings_sr

G8. Have you seen labels like this on smokeless tobacco products? (show the smokeless pack picture)
    1. No
    2. Yes
    3. Did not see any cigarette packages

G8.
show_warnings_smkless

G9. If you currently use smokeless tobacco daily or less than daily:
Please indicate whether you agree/disagree with the following: (Show the preference scale)

    "Health warnings on smokeless tobacco products have made me think about quitting smoking."

SUB-SECTION: **PRO-TOBACCO** MEDIA & ADVERTISING

G9. scale3_smkless_warnings

G10. **In the last 30 days, have you noticed any advertisements or signs promoting the following tobacco products in the following:**

Item (Please read)	Cigarettes?	Bidis?	Smokeless Tobacco?
	(No - 0, Yes – 1, DKCS / Don't remember -99)		
Stores where tobacco products are sold	1. pro_tob_stores1	2. pro_tob_stores2	3. pro_tob_stores3
Television	4. pro_tob_tv1	5. pro_tob_tv2	6. pro_tob_tv3
Radio	7. pro_tob_radio1	8. pro_tob_radio2	9. pro_tob_radio3
Billboard/ Hoarding	10. pro_tob_billboard1	11. pro_tob_billboard2	12. pro_tob_billboard3
Posters	13. pro_tob_posters1	14. pro_tob_posters2	15. pro_tob_posters3
Newspapers / Magazine	16. pro_tob_mags1	17. pro_tob_mags2	18. pro_tob_mags3
Cinema	19. pro_tob_cinema1	20. pro_tob_cinema2	21. pro_tob_cinema3
Internet	22. pro_tob_internet1	23. pro_tob_internet2	24. pro_tob_internet3
Public Transport (vehicle / station)	25. pro_tob_transport1	26. pro_tob_transport2	27. pro_tob_transport3
Public Walls	28. pro_tob_walls1	29. pro_tob_walls2	30. pro_tob_walls3

Anywhere Else	31. pro_tob_other1	32. pro_tob_other2	33. pro_tob_other3

G11. **In the last 30 days, have you noticed any of the following promotions of tobacco products?**

Item (Please read)	Cigarettes?	Bidis?	Smokeless Tobacco?
	(No - 0, Yes – 1, DKCS / Don't remember -99)		
Free Sample	1. promo_samples1	2. promo_samples2	3. promo_samples3
Sale at discounted price	4. promo_sale1	5. promo_sale2	6. promo_sale3
Coupons	7. promo_coupon1	8. promo_coupon2	9. promo_coupon3
Free gifts	10. promo_gift1	11. promo_gift2	12. promo_gift3
Brand Promotion (logo on Clothing etc)	13. promo_logos1	14. promo_logos2	15. promo_logos2
Promotional Email	16. promo_email1	17. promo_email2	18. promo_email3

Section H. Knowledge, Attitudes &Perceptions

H1. **Based on what you know or believe, does <u>smoking</u> tobacco cause serious illness**?
- 0. No
- 1. Yes
- 99. DKCS

H1. knowledge_smk_illness

H2. **Based on what you know or believe, does smoking tobacco cause the following:**

(No – 0, YES – 1, DKCS – 99)

i.	**Stroke (blood clots in the brain that may cause paralysis)**	H2i. knowledge_smk_stroke
ii.	**Heart attack**	H2ii. knowledge_smk_heart
iii.	**Lung cancer**	H2iii. knowledge_smk_lung

H3. **Based on what you know or believe, does using <u>smokeless tobacco</u> cause serious illness?**
- 0. No
- 1. Yes
- 99. DKCS

H3. knowledge_smkless_illness

H4. **In places where smoking is <u>NOT</u> allowed, how many people do you think follow the rules?** [Tell the options to the respondents]
1. **Almost Everyone**
2. **Some people follow, some don't**
3. **Very few people follow**
4. **No one follows**

H4. percep_follow_rules

H5. **How important do you think it is to have laws about tobacco use?** [Tell the options to the respondents]

1. **Very important**
2. **Moderately important**
3. **A little important**
4. **Not important**

H5. attitude_laws

H6. **Please tell me if you think that smoking is allowed in the following places.** (Note to interviewer: if the participant responds with "sometimes" or "it depends" mark as "Allowed-1".)

Not Allowed – 0, Allowed - 1

1. **Waiting at the doctor's office**	H6.1 percep_allowed1
2. **Waiting for public transportation**	H6.2 percep_allowed2
3. **Inside a school**	H6.3 percep_allowed3
4. **Inside an office**	H6.4 percep_allowed4
5. **Terrace of the office**	H6.5 percep_allowed5
6. **By the road / on the walkway**	H6.6 percep_allowed6
7. **Inside a hotel room**	H6.7 percep_allowed7
8. **Inside a bar / pub**	H6.8 percep_allowed8
9. **Inside a restaurant**	H6.9 percep_allowed9
10. **Inside an airport**	H6.10 percep_allowed10
11. **Inside a taxi**	H6.11 percep_allowed11
12. **In a public toilet**	H6.12 percep_allowed12
13. **At a public playground or park**	H6.13 percep_allowed13
14. **At a cinema**	H6.14 percep_allowed14
15. **At an indoor supermarket or shopping center**	H6.15 percep_allowed15
16. **On an escalator**	H6.16 percep_allowed16

H7. **Below are some celebrities and well-known people. Check the ones who are known to smoke tobacco.** (Don't Smoke -0, Smoke -1, DKCS – 99)

1. **ShahRukh Khan**	H7.1 percep_celeb1
2. **Ranbir Kapoor**	H7.2 percep_celeb2
3. **Arjun Rampal**	H7.3 percep_celeb3
4. **Hrithik Roshan**	H7.4 percep_celeb4
5. **Saif Ali Khan**	H7.5 percep_celeb5

6. Fardeen Khan	H7.6 percep_celeb6
7. Ajay Devgan	H7.7 percep_celeb7
8. Sanjay Dutt	H7.8 percep_celeb8

Appendix 7: EMA Study Questions

1. Where are you?
    1) Home   **[private]**
    2) Work-place   [**public**]
    3) Other's home   [**private**]
    4) Bar/restaurant   [**public**]
    5) Vehicle   [**private**]
    6) Outside   [**public**]
    7) Place of worship?   **[public]**
    8) Store/shopping place [**public**]
    9) Other   **[Move to 1.a.]**

    a. Please give a brief of where you are

2. Are you with someone?
    1) No, I am alone
    2) Yes, with my spouse
    3) Yes, with family members/ relatives
    4) Yes, with friends
    5) Yes, with a co-workers
    6) Yes, in public with people I don't know

3. Are you currently using a tobacco product?
    1) No
    2) Yes, Smoke tobacco –
        [drop down menu appears]
        i. Manufactured/branded cigarette
        ii. Rolled tobacco in paper or leaf
        iii. Bidi
        iv. Cigar, cheroots, or cigarillo
        v. Hookah or water pipe
    3) Yes, Smokeless tobacco –   **[drop down menu]**
        i. Betel quid with tobacco
        ii. Khaini or tobacco lime mixture
        iii. Gutkha or tobacco lime, areca nut mixture
        iv. Oral tobacco such as snuff, mishri, qul, gudaka

4. Are other people using tobacco products in your current location?

    i. No
    ii. Yes, in my group   **[drop down menu]**
        i. Using smoke tobacco
        ii. Using smokeless tobacco

   iii.   Yes, in view   **[drop down menu]**

5. Do you <u>see</u> evidence of tobacco use around your current location? If yes, check all that you see. **[Multiple selections possible]**

   i.   Cigarette butts
   ii.   Bidi butts
   iii.   Ashtrays (used only)
   iv.   Spit from oral tobacco (such as snuff, mishri, betel quid)

6. Can you **<u>smell</u>** tobacco smoke in your current location?
   i.   No
   ii.   Yes

7. Is smoking allowed in your current location?
   i.   Allowed
   ii.   Not allowed, but with exceptions
   iii.   Never allowed
   iv.   No Rules
   v.   Don't know

8. Is smokeless tobacco use allowed in your current location?
   i.   Allowed
   ii.   Not allowed, but with exceptions
   iii.   Never allowed
   iv.   No Rules
   v.   Don't know

[Section B: Anti- and Pro-smoking media]

1. In your current location, do you see any information in **<u>newspapers or magazines</u>** about the dangers of using tobacco products or that encourage quitting use of tobacco products?
   1)   No   **[Skip to Question 2]**
   2)   Yes
      1.a. : Check all that apply
        i.   Cigarettes
        ii.   Bidis
        iii.   Smokeless tobacco

2. In your current location, do you see any information on **<u>television</u>** about the dangers of using tobacco products or that encourage quitting use of tobacco products?
   1) No   **[Skip to Question 3]**
   2) Yes
      2.a. : Check all that apply

      i.   Cigarettes
      ii.   Bidis
      iii.   Smokeless tobacco

3. In your current location, do you hear any information on the **radio** about the dangers of using tobacco products or that encourage quitting use of tobacco products?
   1) No   **[Skip to Question 4]**
   2) Yes
        3.a. : Check all that apply
          i.   Cigarettes
          ii.   Bidis
          iii.   Smokeless tobacco

4. In your current location, do you see any information on **billboards or posters** about the dangers of using tobacco products or that encourage quitting use of tobacco products?
   1) No   **[Skip to Question 5]**
   2) Yes
        4.a. : Check all that apply
          i.   Cigarettes
          ii.   Bidis
          iii.   Smokeless tobacco

5. In your current location, do you see any health warning labels on **cigarette packages**?
   1) No
   2) Yes

6. In your current location, do you see any health warning labels on **smokeless tobacco packages**?
   1) No
   2) Yes

7. In your current location, do you see any advertisements or signs in **newspapers or magazines** promoting tobacco products?
   1) No   **[Skip to Question 8]**
   2) Yes
        7.a. : Check all that apply
          i.   Cigarettes
          ii.   Bidis
          iii.   Smokeless tobacco

8. In your current location, do you see any advertisements or signs on **television** promoting tobacco products?
   1) No   **[Skip to Question 9]**
   2) Yes
        8.a. : Check all products that apply
          i.   Cigarettes
          ii.   Bidis
          iii.   Smokeless tobacco

9. In your current location, do you hear any advertisements or signs on the **radio** promoting tobacco products?
    1) No   **[Skip to Question 10]**
    2) Yes
            9.a. : Check all that apply
                i.   Cigarettes
                ii.   Bidis
                iii.   Smokeless tobacco

10. In your current location, do you see any advertisements or signs on **billboards or posters** promoting tobacco products?
    1) No
    2) Yes
            10.a. : Check all that apply
                iv.   Cigarettes
                v.   Bidis
                vi.   Smokeless tobacco

Appendix 8: EOD Study Questions

2. Did you use any tobacco products **today**?
   1) No **[skip to question 2]**
   2) Yes, Smoke tobacco – **[drop down menu appears]**
      - vi. Manufactured/branded cigarette
      - vii. Rolled tobacco in paper or leaf
      - viii. Bidi
      - ix. Cigar, cheroots, or cigarillo
      - x. Hookah or water pipe
   3) Yes, Smokeless tobacco – **[drop down menu appears]**
      - v. Betel quid with tobacco
      - vi. Khaini or tobacco lime mixture
      - vii. Gutkha or tobacco lime, areca nut mixture
      - viii. Oral tobacco such as snuff, mishri, qul, gudakhu

[If answer is from the list 1.ii or 1.iii then move to 1.a]

   a. About how many times did you use tobacco today?
      1) Only 1 time
      2) 2 to 5 times
      3) 6 to 10 times
      4) 11 to 15 times
      5) 15 to 20 times
      6) More than 20 times

3. Did you **see** other people using tobacco today?
   1) No   **[skip to question 3]**
   2) Yes   **[proceed to 2a]**

   a. Who were the people whom you say smoking today, you can select more than one option? **[Multiple selections possible]**
      - i. Spouse
      - ii. Friends
      - iii. Family/relatives
      - iv. Co-workers
      - v. People nearby that I do not know

4. Did you **see** any evidence of tobacco use today?
   1) No   **[skip to question 4]**
   2) Yes   **[proceed to 3a]**

   a. Check all that you saw. **[Multiple selections possible]**
      - i. Cigarette butts
      - ii. Bidi butts
      - iii. Ashtrays (used only)
      - iv. Spit from oral tobacco (such as snuff, mishri, betel quid)

5. Did you **smell** tobacco smoke at any time today?
   1) No
   2) Yes

6. Did you **see** or **hear** any messages today that said it was good to use tobacco?
    1) No   **[skip to 6]**
    2) Yes   **[proceed to 5a]**

    a. Check all of the places you saw or heard messages that said it was good to use tobacco products.
      i.   Television show (including popular characters using tobacco)
      ii.   Print story or ad in a newspaper or magazine
      iii.   Radio story or advertisement
      iv.   Billboard poster (including advertisements) in the street
      v.   Billboard or poster (including advertisements) near or within a store
      vi.   Packaging of tobacco products
      vii.   Movie theater

7. Did you see or hear any messages today that said it was bad to use tobacco?
    1) No   [skip to 7]
    2) Yes   [proceed to 6a.]

    a. Check all of the places you saw or heard a message saying it was bad to use tobacco products.

      i.   Television show (including popular characters or news reports)
      ii.   Print story or ad in a newspaper or magazine
      iii.   Radio story or advertisement
      iv.   Billboard poster (including advertisements) in the street
      v.   Billboard or poster (including advertisements) near or within a store
      vi.   Packaging of tobacco products
      vii.   Movie theater

7. Overall, was the total number of tobacco messages you saw or heard today like other days?
    1) Number of tobacco messages was **higher** than a typical day
    2) Number of tobacco messages was **lower** than a typical day
    3) Number of tobacco messages was **as typical** as most days
    4) **Not sure**

8. Were there any special messages that you can recall seeing or hearing about tobacco today?

    a. What was the message? **[qualitative response]**

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    b. Where did you see/hear the message**? [qualitative response]**

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Appendix 9: Table 1: Sample Characteristics Based on Baseline Data

Table 1: Sample Characteristics Based On Baseline Data (N=282)	
Participant Characteristics	**N (%)**
Age (years) mean (SD)	25.8 (7.0)
Sex	
Male	200 (70.9)
Female	82 (29.1)
Location of Residence (state)	
Hyderabad	142 (50.4)
Kolkatta	140 (49.6)
Highest Level of Education	
No formal schooling or less than primary	0 (0)
Less than secondary	13 (4.6)
High School Completed	71 (25.2)
More than high school completed	198 (70.2)
Work Status	
Government Employee	5 (1.8)
Non-government employee	65 (23.0)
Self-employed	55 (19.5)
Student	139 (49.3)
Homemaker	3 (1.1)
Retired	1 (0.4)
Unemployed able to work	14 (5.0)
Unemployed unable to work	0 (0.0)
Household Items	
Electricity	275 (97.5)
Flush Toilet	193 (68.4)
Car	79 (28.0)
Moped/Scooter/motorcycle	163 (57.8)
Television	260 (92.2)
Refrigerator	210 (74.5)
Wash	141 (50.0)
Fixed telephone/landline	137 (48.6)
Cell/mobile telephone	264 (93.6)
Radio	149 (52.8)
Tobacco Use	
Smoke tobacco daily	17 (6.0)
Smoke tobacco sometimes (non-daily)	36 (12.8)
Do not smoke at all	229 (81.2)

Use Smokeless tobacco daily	11 (3.9)
Use smokeless tobacco sometimes (non-daily)	2 (0.7)
Do not use smokeless tobacco at all	262 (92.9)
Don't know if they use smokeless tobacco	6 (2.1)

Appendix 10: Table 2: Comparison of Tobacco Smoking Characteristics Between Daily and Sometimes (Non-Daily) Smokers at Baseline

Table 2: Comparison of Tobacco Smoking Characteristics Between Daily and Sometimes (Non-Daily) Smokers at Baseline (N=282)		
Participant Characteristics	**Daily Smokers** *17 (6.0)*	*Sometimes (Non-Daily) Smokers* *36 (12.8)*
Smoking Behavior	**Mean (SD)**	**Mean (SD)**
Age started smoking daily	21.2 (4.0)	23.8 (4.2)
Age first tried smoking	21.3 (4.0)	20.3 (5.7)
Number of manufactured cigarettes smoked daily	6 (4.1)	N/A
Products Currently Smoked	**N %**	**N %**
Manufactured Cigarettes	17 (6.0)	28 (9.9)
Rolled Tobacco in paper	0 (0.0)	11 (3.9)
Bidis	0 (0.0)	0 (0.0)
Cigars cheroots or cigarillos	0 (0.0)	0 (0.0)
Hukkah/hookah	1 (0.3)	0 (0.0)
Medical Care*	**N %**	**N %**
Have seen a doctor in the last 12 months	2 (0.7)	N/A
Asked by medical care provider if they smoke tobacco	4 (1.4)	N/A
Asked to quit by medical care provider	4 (1.4)	N/A
*Questions were asked to daily smokers only.		

Appendix 11: Table 3: Sample Smokeless Tobacco Characteristics at Baseline

Table 3: Sample Smokeless Tobacco Characteristics at Baseline (N=282)		
Participant Characteristics	**Daily Smokeless User** Mean (SD)	**Sometimes (Non-Daily) Smokeless User** Mean (SD)
Age started using smokeless tobacco daily	22.8 (4.9)	N/A*
Age first tried smokeless tobacco	22.8 (4.9)	N/A*
Smokeless Tobacco Products	**N %**	**N %**
Betel quid with tobacco	2 (0.7)	0 (0.0)
Khaini or tobacco lime mixture	3 (1.1)	2 (0.7)
Ghutkha or tobacco lime areca nut mixture	7 (2.5)	4 (1.4)
Oral tobacco use (snuff mishri qul gudakhu)	1 (0.4)	0 (0.0)
Oral tobacco use panmasala and betel quid without tobacco	2 (0.7)	0 (0.0)
Nasal snuff	0 (0.0)	0 (0.0)
Questions were asked to daily smokeless users only.		

Appendix 12: Table 4: Sample Characteristics of All Completed EMA

Table 4: Sample Characteristics of All Completed EMA Surveys (N=3277)	
Participant Characteristics	**N (%)**
Participant Location	
Home	2108 (64.3)
Work-place	571 (17.4)
Other's home	124 (3.8)
Bar/restaurant	25 (0.8)
Vehicle	100 (3.1)
Outside	301 (9.2)
Place of worship	11 (0.3)
Store/shopping place	18 (0.5)
Other	19 (0.6)
Participants' Social Setting	
Alone	1849 (56.4)
With spouse	103 (3.1)
With family members/relatives	562 (17.1)
With friends	340 (10.4)
with co-workers	295 (9.0)
In public with strangers	128 (4.0)
Personal Tobacco Use	
No tobacco use	3200 (97.7)
Reported using smoke tobacco	60 (1.8)
Reported using smokeless tobacco	17 (0.5)
Type of Tobacco Product	
Manufactured/branded cigarettes	16 (0.5)
Rolled tobacco in paper or leaf	17 (0.5)
Bidi	16 (0.5)
Cigar cheroots or cigarillo	24 (0.7)
Hookah or waterpipe	4 (0.1)

Appendix 13: Table 5: Individuals' Tobacco Environment Reported At All Completed EMA Surveys

Table 5: Individuals' Tobacco Environment Reported At All Completed EMA Surveys (N=3277)	
	N (%)
Observed Smoking	
Someone using tobacco in participants' social group	33 (1.0)
Someone using tobacco in participants' view	108 (3.3)
Evidence of Tobacco Use in Participants' Location	
Did Not See Evidence of Tobacco Use	3177 (96.8)
Saw Evidence of Tobacco Use	106 (3.2)
Specific Products Present	
Cigarette butts present	73 (2.2)
Bidi butts present	26 (0.8)
Used ashtray	13 (0.4)
Spit from oral tobacco present	19 (0.6)
Smell of Tobacco	
No smell of tobacco	2930 (89.4)
Tobacco smells present	347 (10.6)
Rules About Tobacco Use In Environment	
Smoke Tobacco Rules	
Smoking is allowed	1360 (41.5)
Smoking is not allowed but with exceptions	361 (11.0)
Smoking is never allowed	847 (25.8)
No rules	386 (11.8)
Don't know	323 (9.9)
Smokeless Tobacco Rules	
Smokeless tobacco use is allowed	1367 (41.7)
Smokeless tobacco use is not allowed but with exceptions	299 (9.1)
Smokeless tobacco use is never allowed	861 (26.3)
No rules	390 (11.9)
Don't know	360 (11.0)

Appendix 14: Table 6: Anti- and Pro-Smoking Media Reported at All Completed EMA Surveys and by Participant

Table 6: Anti- and Pro- Smoking Media Reported at All Completed EMA Surveys and by Participant		
	EMA Surveys (N=3277) N (%)	Participants (N=282) N (%)
Anti-Tobacco Advertisements		
Types of Advertisements		
No Advertisements	3066 (93.6)	167 (59.2)
Magazines/Newspapers	65 (2.0)	46 (16.3)
Television	77 (2.3)	50 (17.7)
Radio	34 (1.0)	23 (8.2)
Billboards or Posters	35 (1.1)	26 (9.2)
Health Warnings		
No Health Warnings	3091 (94.3)	180 (63.8)
Cigarette Packages	84 (2.6)	42 (14.9)
Smokeless Tobacco Packages	102 (3.1)	47 (16.7)
Pro-Tobacco Advertisements		
Types of Advertisements		
No Advertisements	3191 (97.4)	202 (71.6)
Magazines/Newspapers	45 (1.4)	27 (9.6)
Television	41 (1.3)	26 (9.2)
Radio	0 (0.0)	0 (0.0)
Billboards or Posters	0 (0.0)	0 (0.0)

Appendix 15: Table 7: Sample Characteristics Reported At All Completed EOD Surveys

Table 7: Sample Characteristics Reported At All Completed EOD Surveys (N=987)	
Participant Characteristics	**N (%)**
Reported Tobacco Use	
No tobacco use	850 (86.1)
Reported using smoke tobacco	122 (12.4)
Reported using smokeless tobacco	15 (1.5)
Type of Tobacco Product	
None	865 (87.6)
Manufactured/branded cigarettes	44 (4.5)
Rolled tobacco in paper or leaf	13 (1.3)
Bidi	14 (1.4)
Cigar cheroots or cigarillo	16 (1.6)
Hookah or waterpipe	16 (1.6)
N/A	19 (1.9)
Smokeless Tobacco Product Used	
None	972 (98.4)
Betel quid with tobacco	1 (0.1)
Khaini or tobacco lime mixture	2 (0.2)
Gutkha or tobacco lime areca nut mixture	4 (0.4)
Oral tobacco such as snuff mishri qul gudakhu	1 (0.1)
N/A	7 (0.7)
Number of Times Tobacco Used	
0 times	850 (86.1)
1 time	23 (2.3)
2-5 times	70 (7.1)
6-10 times	35 (3.5)
11-15 times	3 (0.3)
15-20 times	2 (0.2)
More than 20 times	4 (0.4)

Appendix 16: Table 8: Individuals' Tobacco Environment Reported at All Completed EOD Surveys

Table 8: Individuals' Tobacco Environment Reported At All Completed EOD Surveys (N=987)	
	N (%)
Observed Smoking	
No observed smoking	565 (57.2)
Spouse	11 (1.1)
Friends	134 (13.6)
Family/Relatives	52 (5.3)
Co-workers	39 (4.0)
People nearby	186 (18.8)
Evidence of Tobacco Use	
Saw Any Evidence of Tobacco Use	
No evidence of tobacco use	729 (73.9)
Saw evidence of tobacco use	258 (26.1)
Specific Products Present	
Cigarette butts	230 (23.3)
Bidi butts	102 (10.3)
Used ashtray	57 (5.8)
Spit from oral tobacco	119 (12.1)
Smell of Tobacco	
No tobacco smells present	720 (72.9)
Tobacco smells present	267 (27.1)

Appendix 17: Table 9: Anti- and Pro- Smoking Media Reported at All Completed EOD Surveys and by Participant
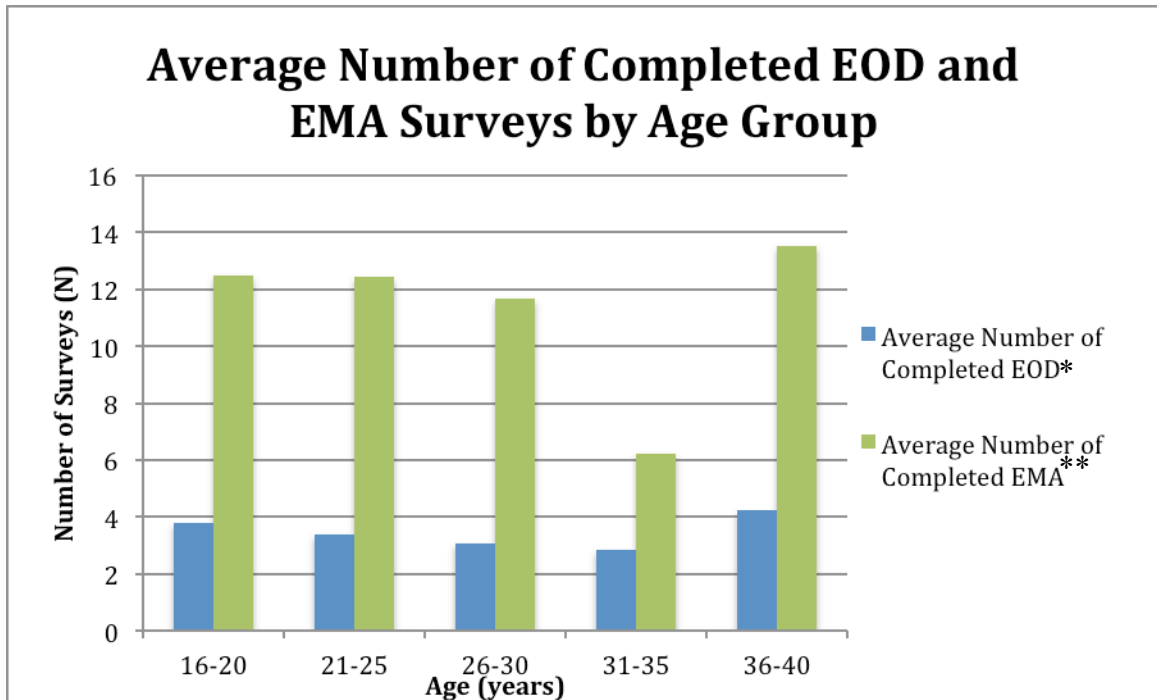
Table 9: Anti- and Pro- Smoking Media Reported At All Completed EOD Surveys and by Participant	EOD Surveys (N=987) N (%)	Participants (N=282) N (%)
Anti-Tobacco Advertisements		
Types of Advertisements		
No Advertisements	567 (57.4)	127 (45.0)
Television show	157 (15.9)	67 (23.8)
Print story or ad in newspaper or magazine	39 (4.0)	27 (9.6)
Radio story or advertisement	42 (4.3)	28 (9.9)
Billboards or poster in the street	58 (5.9)	32 (11.3)
Billboards or poster near or within a store	53 (5.4)	29 (10.3)
Packaging of tobacco products	142 (14.4)	57 (20.2)
Movie theater	76 (7.7)	44 (15.6)
Pro-Tobacco Advertisements		
Types of Advertisements		
No advertisements	900 (91.2)	193 (68.4)
Television show	25 (2.5)	16 (5.7)
Print story or ad in newspaper or magazine	11 (1.1)	9 (3.2)
Radio story or advertisement	7 (0.7)	6 (2.1)
Billboards or poster in the street	10 (1.0)	9 (3.2)
Billboards or poster near or within a store	8 (0.8)	7 (2.5)
Packaging of tobacco products	14 (1.4)	13 (4.6)
Movie theater	12 (1.2)	11 (3.9)

Appendix 18: Tables 10 and 11: Reported Tobacco Characteristics by EMA Survey and By Participant

Table 10: Reported Tobacco Characteristics Reported in All Completed EMA and EOD Surveys, %		
	EMA (N=3277)	EOD (N=987)
Saw a Tobacco User	5.4	31.8
Saw a Smoker	2.2	31.8
Exposed to Smoking Evidence	12.5	32.7
Saw a Pro-Tobacco Message	1.9	5.0
Saw an Anti-Tobacco Message	5.3	26.8

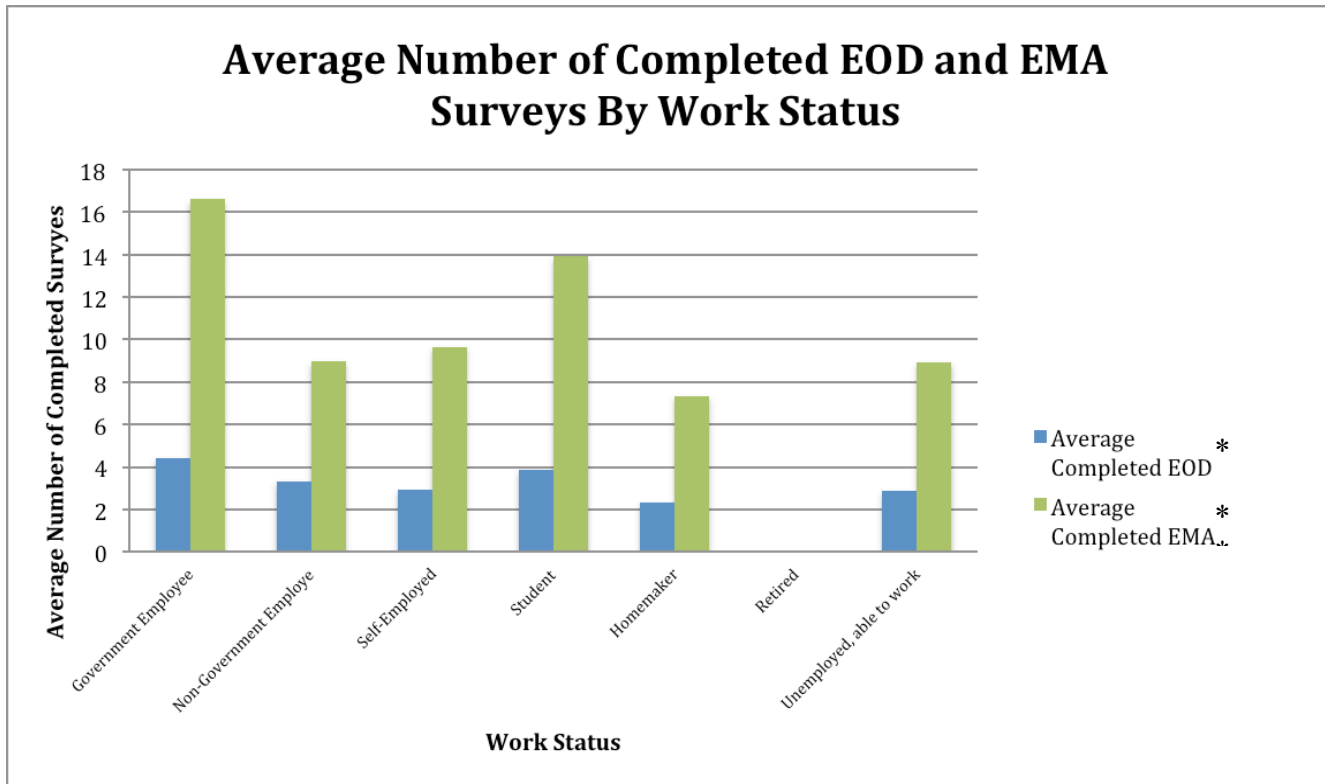| Table 11: Tobacco Characteristics Reported By All Participants (N= 282) at EMAs and EOD, N (%)		
	EMA	EOD
Saw a Tobacco User	60 (25.1)	115 (51.6)
Saw a Smoker	29 (12.1)	115 (51.6)
Exposed to Smoking Evidence	128 (53.6)	117 (52.5)
Saw a Pro-Tobacco Message	37 (15.5)	30 (13.5)
Saw an Anti-Tobacco Message	90 (31.9)	96 (43.0)

Appendix 19: Figure 4.1

Average Number of Completed EOD and EMA Surveys by Age Group

*p= NS (.207)
**p=.036

Appendix 20: Figure 4.2

Average Number of Completed EOD and EMA Survey By Education Level
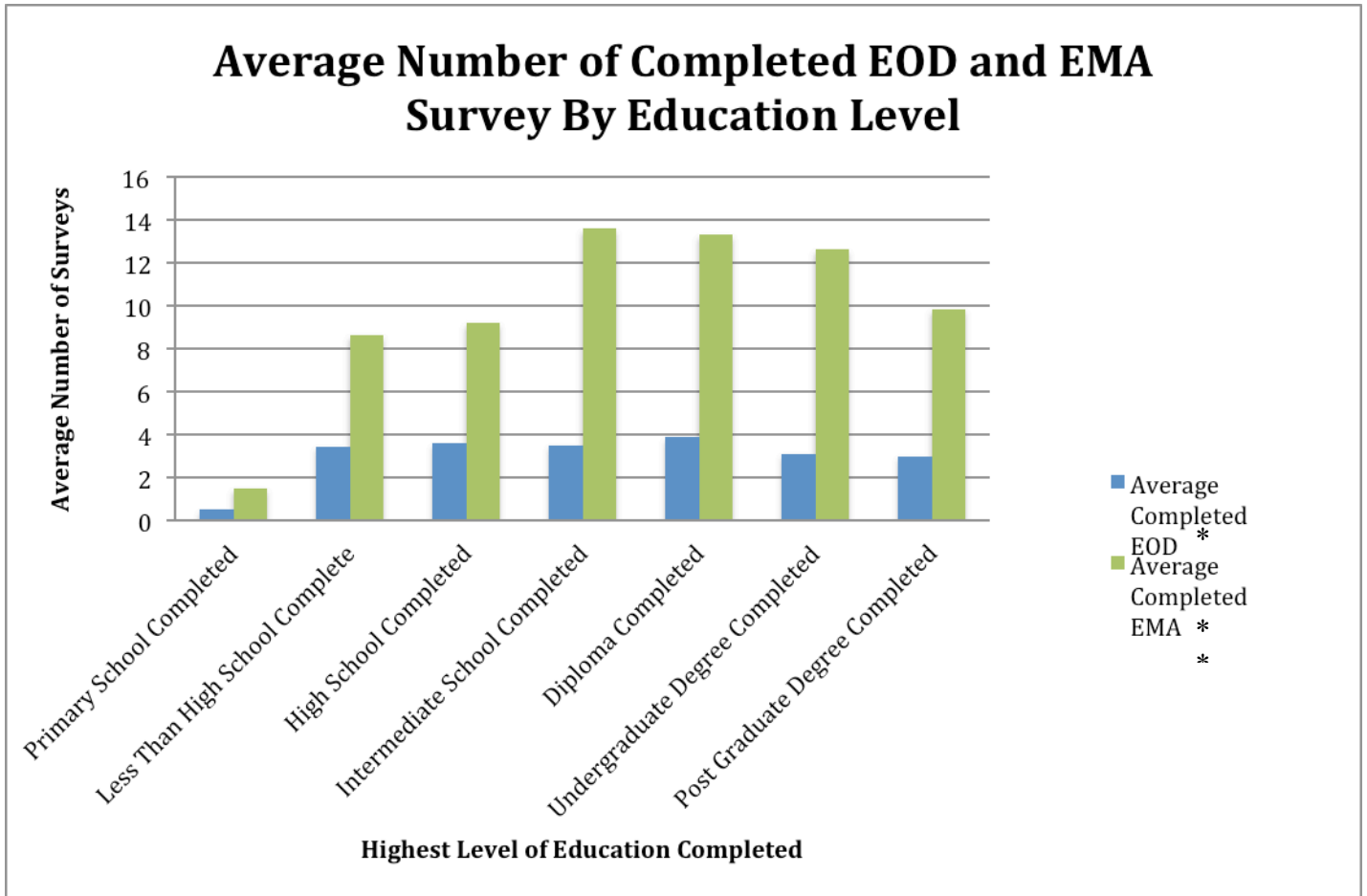
*p= NS (.572)
**p=.043

Appendix 21: Figure 4.3
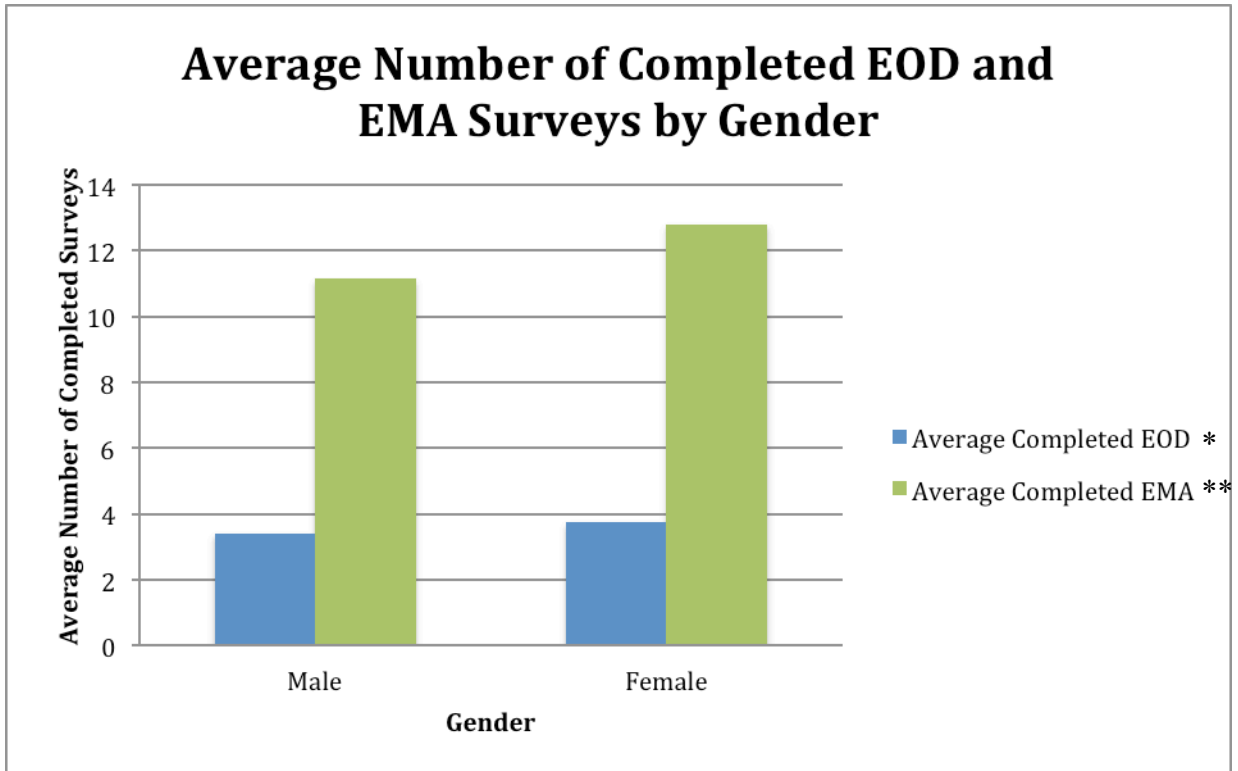

Average Number of Completed EOD and EMA Surveys By Work Status

*p= NS (.264)
**p=.043

Appendix 22: Figure 4.4

*p =NS (.381)
**p =NS (.283)

Appendix 23: Figure 4.5

Examination of Reported Smoke Tobacco Use at Baseline, EMA and

EOD (N=209)

Appendix 24: Figure 4.6

Examination of Reported Smokeless Tobacco Use at Baseline, EMA

and EOD (N=207)

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