Examining the Awareness and Use of Electronic Cigarettes among Young Adults in New York City

By

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Leuda Forrester, Ph.D., Chairperson of the Thesis Committee

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Jerry Kostroff, DPM, Dean, School of Allied Health Professions
Dedication

This Thesis is dedicated to my parents Diana Agyemang-Duah and Kingsley Nana Essel, and my supportive friends, for their endless support and encouragement throughout this journey. Diana, you are my biggest supporter. You have always stood by my side and encouraged me and literally spent many nights by my side to ensure that I completed a task whenever I was exhausted.
Acknowledgments

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Abstract

There is an increased awareness and subsequent use of electronic cigarettes among young adults in New York City. The purpose of this study is to examine the awareness, prevalence and use of electronic cigarettes among young adults between the ages of 18-37 years. This study used a quantitative research design involving 110 young adults who reside in the New York City area. Data were collected through the completion of a survey through Survey Monkey and also manually handed to participants. Results of the research indicated that most of the participants surveyed (81%) were aware of e-cigarettes. The most commonly reported sources of their information on e-cigarettes were through social media and the Internet (38%), television or radio (22%), and friends and family (22%). Thirty-five percent (35%) of the participants used e-cigarette as a means of quitting other means of smoking. Chi-square analysis indicates that there is an association between awareness and e-cigarette use (p = 0.049); and that participants were motivated by different external sources to use e-cigarette (p=0.0127). Public health campaigns, and government policies and regulations can restrict the distribution and usage of electronic cigarettes among young adults in NYC. Further research needs to be conducted to efficiently communicate information about e-cigarette’s health effects and consider necessary regulations for companies that may use these channels to market and advertise to young, non-tobacco users, and other at-risk groups.
Chapter 1: Introduction to the Study

Background

The Food and Drug Administration (FDA, 2014) described electronic cigarettes, also known as e-cigarettes, as a battery-operated products meant to deliver nicotine, flavor and other chemicals. The agency further characterizes e-cigarettes smoking device that turns chemicals, containing highly addictive nicotine, into an aerosol that is inhaled by the user (FDA, 2014). The popularity of electronic cigarettes has grown exponential worldwide, especially in United States. Current studies indicate that 11.4% of adults in the United States claim to have used electronic cigarettes, and 4.1% used it almost monthly (Benowitz & Gronkiewicz, 2013). The users of electronic cigarettes (e-cigarettes or electronic nicotine delivery systems) heat a nicotine solution to generate vapor that is inhaled, without the burning of tobacco and its toxic constituents (Benowitz & Goniewicz, 2013).

According to (Choi & Forster, 2013) health professionals are concerned that e-cigarettes may impede the reduction in the prevalence of smoking in the United States for three reasons. Leading among these reasons are that the product may limit the effect of clean indoor air quality because smokers can use e-cigarettes indoors. This act may lessen their interest to stop smoking. Also, smokers may use e-cigarettes instead of recognized-effective smoking cessation treatments in their attempt to quit, even though the e-cigarettes’ effectiveness as quit aids is still unknown. Third, e-cigarettes may serve as an entryway to cigarettes smoking. Individuals who never smoked may experiment with e-
cigarettes (mainly because of the variety of e-cigarettes flavors), develop nicotine addiction, and later switch to smoking cigarettes (Choi & Forster, 2013).

Sales for e-cigarettes have skyrocketed since 2004, and it is estimated to have reached $650 million in Europe and $1.7 billion in United States in 2013 (Fairchild et al., 2014). Also, e-cigarette sales are projected to topple traditional tobacco cigarette sales in a couple of years (Fairchild et al., 2014). The popularity of e-cigarettes has been a hotly contested national debate between supporters of e-cigarettes, who contend e-cigarettes can be useful as a harm reduction tool for tobacco addicts whereas opponents of such measure argue that is a subtle strategy been used by big traditional tobacco industry to boost profit (Fairchild et al., 2014).

As e-cigarettes' popularity rises, so do the uncertainties and controversies about its potential harmful effects on human health that have soared especially here in the United States. As scientific studies on e-cigarettes attempt to catch up with its popularity, it remains to be seen if e-cigarettes use will be beneficial to smoking cessation or a setback toward the goal of cutting out nicotine for good.

**Problem Statement**

The potential harm associated with smoking e-cigarettes includes promoting continued smoking of cigarettes and renormalizing cigarette smoking behaviors according to the Food and Drug Administration (FDA), which announced plans to regulate e-cigarettes as a tobacco product (FDA, 2014).
However, there is mounting evidence about the negative effects of nicotine use on an individual’s health (Lam et al., 2014). Advocates of e-cigarettes maintain they contain a smaller quantity (or even no nicotine, tar or carcinogens) than traditional cigarettes. Yet, in the current environment of insufficient or absent regulation about e-cigarettes, there is not adequate information to objectively assess these claims (Lam et al., 2014).

**Research Questions and Hypotheses**

1. Is there an association between electronic cigarettes usage and the age of young adults in New York City?

   $H_01$: There is no association between electronic cigarettes usage and the age of young adults in New York City.

   $H_{a1}$: There is an association between electronic cigarettes usage and the age of young adults in New York City.

2. Does the awareness of electronic cigarettes play a significant role in the usage of electronic cigarettes among young adults in New York City?

   $H_{02}$: There was no association between the awareness of electronic cigarettes and its usage among young adults in New York City.

   $H_{a2}$: There was an association between the awareness of electronic cigarettes and its usage among young adults in New York City.
3. Does the motive for the use of electronic cigarettes determine its usage?

$H_{03}$: The motive of young adults in New York City does not determine their use of electronic cigarettes.

$H_{a3}$: The motives of young adults in New York City determine their use of electronic cigarettes.

4. Can the source of information for electronic cigarette influence the awareness of electronic cigarettes among young adults in New York City?

$H_{04}$: The source of information for electronic cigarettes does not influence the awareness of electronic cigarettes among young adults in New York City.

$H_{a4}$: The source of information for electronic cigarettes influences the awareness of electronic cigarettes among young adults in New York City.

**Purpose of Study**

The purpose of this study is to examine the awareness, perceptions and use of non-combustible cigarettes also known as electronic cigarettes among young adults between ages 18-37 years in New York City (NYC). The study applied a quantitative research design to explore the reasons for the use of e-cigarettes among young adult residents of NYC.

The study is important because young NYC adults may still be in the stage of initiating nicotine use. Besides, young adults are usually more likely to try new things
(Regan et al., 2013). They may pay more attention to new products such as e-cigarettes and be more inclined to use them.

**Definition of Terms**

**Vaporization** - the phase transition of a substance from liquid state to a gas state (Goniewicz et al, 2012).

**Electronic Nicotine Device** - Electronic nicotine delivery systems (ENDS) are devices that do not combust or use tobacco leaves but rather vaporizes a solution the user then inhales. The principal constituents of the solution, also to nicotine when nicotine is present, are propylene glycol, with or without glycerol and flavoring agents. ENDS solutions and emissions carry other chemicals, some of them considered to be toxicants (WHO, 2014).

**Harm-reduction** - is a public health perspective and intervention that seeks to reduce the adverse effects associated with drug use (Cahn & Siegel, 2011).

**Carcinogen** - any substance or agent with the ability to cause cancer in a living tissue (Farsalinos et al., 2013).

**Vaping** - the ‘street term’ used to describe the process of inhaling vapor from e-cigarettes (Goniewicz et al, 2012).

**Traditional Cigarette** - a term used in this research to differentiate conventional cigarettes from electronic cigarettes (Trehy et al., 2011).
Assumptions, Limitations, and Delimitations

Assumptions

It is assumed that participants surveyed were literate and were able to read and understand the survey questions and responded appropriately. I considered the response on electronic cigarettes usage, awareness and history of cigarette usage questions were answered by participants were answered to the best their knowledge.

Limitations

The first limitation for this study is the variation in the specificity of the nicotine concentration. The nicotine concentrations specified on refill electronic cigarettes’ liquids also known as “e-juice” vary across different brands, which make it difficult to compare electronic cigarettes brands to conventional cigarettes and assess the quantity of nicotine delivered to the user (Farsalinos et al., 2013). Since the e-cigarettes industry is growing at an exponential rate (estimated to be about $3 billion worldwide) and government regulations are slowly trying to catch up, there are no standard requirements to determine if the nicotine content specified on the labels of e-cigarettes products is accurate (Etter, 2013). Also considering the sensitivity of the subject of smoking, I anticipate difficulties of having participants being sincere and open with their answers.

Delimitations

Eligible participants were between 18 and 37 years, should have had a past encounter with smoking and must live in New York City. After eligible participants were
provided with informed consent, they were given a short survey comprised of 22 questions. Eligible participants completed the survey. No incentives or cash rewards were given to participants before or after their participation.

**Significance of the Study**

Regan et al., (2013) asserts that young adults have a higher prevalence of tobacco use than any other age group, with 1 in 3 young adults smoking. He believes electronic cigarettes may delay young adults from quitting smoking, thereby making it even harder to reduce a nearly static trend in young adult tobacco use. However, very little is known about characteristics of electronic tobacco associated with awareness and use of e-cigarettes among young adults in NYC and that is one primary focus of this study (Regan et al., 2013).

There has been a growing national debate on the effects and safety of electronic cigarettes due to its growing popularity among children and young adults (Fairchild et al., 2014). The speedy market invasion of e-cigarettes despite many unsettled issues about their safety, efficacy for harm reduction and cessation, and entire influence on public health is disturbing especially to local health officials (Fairchild et al., 2014).

E-cigarettes products are continually changing and many of the findings from studies of older products may not be applicable to the assessment of newer products that could be safer and more useful as nicotine delivery devices (Grana et al., 2014). They come in varying electronic-liquid cartridges that are flavored with tobacco, menthol, coffee, fruit,
candy, and alcohol flavors, as well as unique flavors such as cola and Belgian waffle (Grana et al., 2014).

According to the World Health Organization, electronic cigarettes are categorized as electronic nicotine delivery systems (ENDS), electronic devices designed for the purpose of nicotine delivery to the respiratory system where tobacco is not necessary for their operation World Health Organization (WHO, 2014). Awareness and use of e-cigarettes have increased exponentially in the past four years due to the consumer perceptions of the risks as well as the benefits. Grana et al., (2014) further emphasized that the decision to use e-cigarettes are heavily influenced by how they are marketed.

Despite the growing concerns by the public about surging dangers with the use of electronic cigarettes, there have been knowledge gaps related to the use of electronic cigarettes and other tobacco electronic devices. The immediate goal of the research used was to study the effects of the non-combustible tobacco products with the emphasis on electronic cigarettes among New York City residents. Electronic cigarettes have been promoted as a harmless alternative to cigarettes because it contains only nicotine and not the other harmful ingredients found in cigarettes (Henningfield, 2014).

The FDA indicated that some tested samples of e-cigarettes also carried toxic substances such as tobacco-specific nitrosamines, and one contained diethylene glycol (FDA, 2009). There have been claims that the heated vapor, when inhaled, mimics the practice of smoking, without all the carcinogens found in tobacco smoke. E-cigarettes mimic many of the habitual actions, social experiences and the nicotine delivery of tobacco.
Also, they have helped some former smokers give up tobacco products entirely according to some manufacturers of this product (Dawkins et al., 2013).

**Conclusion**

The decades-long campaign achievements by our nation’s public health agencies against the tobacco industry is being threatened and likely to be wiped away by the electronic cigarette movement (Fairchild et al., 2014), as advocates for e-cigarettes are applying pressure to make nicotine addiction common again. The literature review in the next chapter will further discuss the ongoing debate about electronic cigarettes.
Chapter 2: Literature Review

Introduction

Since its introduction in 2004, electronic cigarettes (e-cigarettes) have been marketed as an alternative to nicotine delivery as well as been advertised as a suitable means for smoking cessation worldwide (Bertholon et al., 2013). These claims made by e-cigarettes advertisers, have sparked a national debate due to the insufficient and inconclusive clinical and laboratory studies to determine the long and short-term potential harmful health effects on e-cigarettes users (Farsalinos, 2013).

Findings from the current research indicate an enormous interest in e-cigarettes nationwide (Ayers et al., 2011). For the past couple of years, public health officials attribute such increase in awareness to the subtle extensive advertising campaign (mostly feature celebrities) in the media by the leading e-cigarette brands which are owned and managed by traditional tobacco companies (Felberbaum, 2013).

However, as a result of the ongoing national controversy about e-cigarettes stated above, the use of e-cigarettes among youths at the local level, thus in New York City (NYC) has been of immense interest to me. The goal of this research is to determine how information about electronic cigarettes affects its usage among young adults in NYC. The literature that was of relevance to my study on e-cigarettes will be summarized. They comprise topics about: what constitutes e-cigarettes, the short and long-term health implications of e-cigarettes, comparing traditional cigarettes to e-cigarettes, the demographical features of e-cigarette in terms of awareness, perception and usage.
Trehy et al. (2011), described e-cigarettes as a metal or plastic electronic nicotine delivery device (END) that contain liquid-filled nicotine cartridges (Figure 1) powered by a battery that vaporizes the nicotine liquids in the cartridges. In order to understand how electronic cigarettes operate, researchers further compared the use of e-cigarette to traditional nicotine cigarettes where the vapor from e-cigarette is inhaled by the user when drawn and the nicotine vapor is exhaled into their surroundings as an aerosol.

Figure 1. This diagram shows the design of an e-cigarette. From http://cigarsmokersland.com/electronic-cigarettes, 2014

Health Implications of Electronic Cigarettes among Young Adults

The discussion about the adverse health effects of e-cigarettes is still ongoing and Drummond & Upson (2014), stressed on the fact that numerous studies have revealed that the vapor generated from electronic cigarettes has varying amounts of nicotine and
potential harmful toxins, although these vapors are at lower levels compared to traditional tobacco cigarettes. They further reiterated that the long-term carcinogenic and lung function effects of electronic cigarettes are not known. Drummond & Upson (2014) also emphasized the growing concerns regarding the potential negative effects of nicotine on adolescent brain development as well as the hazard for nicotine addiction and introduction of the use of traditional cigarettes or other tobacco products.

**Electronic Cigarettes Awareness and Demographics**

Studies suggest an increase in the popularity of electronic cigarettes across four countries. A real-time surveillance method based on internet search query data from Google showed that searches for e-cigarettes increased in all nations from July 2008 to February 2010; more specifically, searches for electronic cigarettes were several hundred times greater than the search for smoking alternatives in the United Kingdom (Ayers et al., 2011). According to data published in April, 2015 by the Centers for Disease Control and Prevention (CDC) and the U.S Food and Drug Administration’s Center for Tobacco Products (CTP), e-cigarette usage increased threefold among U.S. middle and high school students from 2013 to 2014. The study showed that current e-cigarette use increased from 4.5 percent in 2013 to 14.5 % in 2014. Thus usage increased approximately from 660,000 in 2013 to 2 million in 2014. This is a serious concern because the overall impact of e-cigarette uses in the public is still being researched.
Race, Education, and Income Level

Race, education, and income level have been shown to have varying associations with the awareness of electronic cigarettes (King et al., 2013). Some studies suggest that awareness of electronic cigarettes is considerably lower in non-Hispanic blacks compared to non-Hispanic Whites (Pearson et al., 2012). Furthermore, the awareness of electronic cigarettes was found to be lower in those with less than a high-school education (Pearson et al., 2012). However, there were no consistent differences in awareness observed by income level (King et al., 2013).

Winkleby et al. (1992) measured certain socioeconomic status (SES) factors such as education, income, occupation, or a combination of these and their correlation with the use of tobacco among adults. The authors’ research, further stressed the fact that education is the most commonly used measure of SES in epidemiological and public health studies and as a result most previous researchers have conducted fewer studies on the practical analysis measuring the relative impact of each separate dimension of SES on risk factors for cigarette usage (Winkleby et al., 1992).

Use of Electronic Cigarettes

Another intriguing factor that came up while reviewing the literature on the subject of e-cigarette use among young adults in New York City (NYC), was the view that e-cigarettes served as a smoking cessation tool or as an option to conventional cigarettes for current smokers. Pokhrel et al. (2014), asserts that one of the reasons young adults indulge in the use of e-cigarettes is to serve as a smoking cessation tool. Despite the lack of clarity
about their safety and usefulness as smoking cessation aids, e-cigarettes are commonly used to quit smoking as supported by Odum et al., (2012).

In the Legacy Longitudinal Smoker Cohort survey assessed by Pearson et al., (2013), current smokers were more likely to have tried electronic cigarettes compared to former smokers (6% vs. 3%, respectively). Furthermore, very little is understood about why young adult smokers may resort to e-cigarettes as an alternative to smoking cessation compared with other proven cessation aids. In fact, no other single public health effort is likely to achieve a benefit comparable to large-scale smoking cessation (Odum et al., 2012).

Sutfin et al., (2013) illustrated how most young adult smokers have made repeated efforts to quit and yet to no avail despite their use of other cessation tools like e-cigarettes. However, traditional smoking cessation approaches require nicotine-addicted smokers to abstain from tobacco and nicotine entirely the Centers for Disease Control and Prevention (CDC, 2013). Many smokers are unable to achieve this goal, according to that same report by the CDC. The fact that e-cigarettes are widely used in the face of impending adverse health consequences is very disturbing.

Tobacco harm reduction according to Polosa et al., (2011) is another alternative for current smokers who want to quit. Tobacco harm reduction suggests the use of alternative sources of nicotine, including modern smokeless tobacco products like the electronic cigarette, or even pharmaceutical nicotine products, as a replacement for smoking. Polosa et al. (2011), further described the role e-cigarettes play by implying it effectiveness as the
most encouraging product for tobacco harm reduction to date, besides delivering nicotine vapor without the combustion substances that are responsible for almost all of smoking’s damaging effects.

Polosa et al., (2011) also believed e-cigarettes replaced some of the rituals associated with smoking behavior. Thus, it is likely that young adult smokers who switch to e-cigarettes achieved large health gains compared to a traditional cigarette. The status quo of smoking cessation offers smokers with just two unpleasant alternatives: quit or suffer the harmful effects of continuing smoking.

**Similarity of Electronic Cigarettes to Traditional Cigarettes**

The close similarities of e-cigarettes’ physical appearance (Figure 2) and benefits compared to traditional cigarettes can’t be ignored. Some studies suggest users of e-cigarettes tend to get the kind of nicotine sensation similar to smoking traditional cigarettes; on the other hand, other studies have reported the detrimental effects of e-cigarettes as a tobacco cessation or reducing nicotine tool (Barbeau et al., 2013; Dawkins et al., 2013). Others e-cigarette users claim otherwise; the kind of experience generated from smoking traditional cigarettes seems better than smoking e-cigarettes (Choi et al., 2012).

Once you get rid of the smoke, e-cigarettes and traditional cigarettes still share at least one poison in common: nicotine. Users of e-cigarettes have the option of choosing the quantity (usually in percentages) of nicotine that their e-cigarette contains. In most cases, it is estimated that the majority of e-cigarettes contain at least 1.2%, usually more, and sometimes more than 4% nicotine (Grana et al., 2013).
This chapter described the current literature on electronic cigarettes with more emphasis on the ‘science’ of electronic cigarettes, the most user demographics and the controversial therapeutic benefits that electronic cigarette manufacturers claim it brings to smokers. Despite these claims, the FDA has limited regulations regarding the sale, use and distribution of electronic cigarettes across the country. The next chapter will outline how the data gathering process was undertaken for this research.
Chapter 3: Methodology

Research Design

A quantitative research approach was applied to examine the awareness, perceptions and use of non-combustible tobacco products like electronic cigarettes among young adults’ residing in NYC, who are the primary focus of this study.

Selection of Study Subjects and Data Collection

During data gathering, survey questions were handed out to participants in front of two “vaping” locations in the Bronx and Manhattan, at Monroe College (Bronx Campus, Ustin Hall), to employees of Affinity Health Plan, and by use of an electronic survey from Survey Monkey that met the criteria of the study. A survey involving 110 young adults (18-37 years old) on electronic cigarette products in the New York City area was based on self-reported electronic cigarette use. Participants provided feedback on their knowledge about the risks, perceptions, and use of tobacco products and marketing.

Instrumentation

The survey used was a 22-item based questionnaire (Appendix A) covering e-cigarette user demographics, electronic cigarette use history, conventional tobacco use history and respondents’ ideas about electronic cigarettes. The survey relied on self-reports on electronic cigarettes and tobacco use from former and current smokers.

Socio-demographic variables assessed included participants’ age, income, gender, education and ethnicity. To determine the annual household income, participants were
asked “What is your approximate household income?” Four response options were provided ranging from $24,000 or less to $74,999 and over. Education levels of participants were determined in terms of the highest level of schooling completed. Participants chose from a range of options from less than high school degree to graduate degree.

**Ethnicity**

Ethnicity was assessed on the basis of response to the survey question “What is your ethnicity?” The list ranged from African American/Black to Caucasian/White to other ethnic groups.

**Use of Cigarettes**

Cigarette smoking behavior was assessed in several questions. Participants characterized as current smokers were those who had smoked a minimum of 100 cigarettes in their lifetime and who responded to the question, “Do you currently smoke cigarettes daily, occasionally, or not at all?” Respondents who had smoked at least 100 cigarettes in their lifetime and answered “No I am an ex-smoker” were classified as former smokers. Survey questions used were designed to categorize participants’ rate of smoking cigarettes. Current smokers were defined as those who self-described that they smoked cigarettes at least for one day during the past 30 days (Guo, et al., 2010). Ex- smokers were defined as those who claimed to have smoked at least once in the past month while non-smokers were defined as participants who reported never to have smoked in their lifetime (Guo et al., 2010). Nonsmokers were also defined as those who had not smoked at least 100 cigarettes in their lifetime.
Use of Electronic Cigarettes and Other Cessation Aids

Use of cessation aids was assessed by the question, “Did you use any smoking cessation product or medication?” for which “Nicotine chewing gum or nicotine patch, electronic cigarettes and other available options were provided. Those who selected any of the three were defined as users and the follow up question “Are you currently using electronic cigarettes daily, some days, or not at all?” Those who selected “daily” or “occasionally” were defined as current users (Zhu et al., 2013).

Use of electronic cigarettes was also assessed in multiple questions. First, respondents were asked if they ever heard of electronic cigarettes prior to this study: E-cigarettes (electronic cigarettes) are electronic devices shaped like cigarettes that deliver nicotine in a vapor and look like cigarettes, but contain no tobacco. To measure participants’ awareness of e-cigarettes, they were asked: “Have you ever heard of e-cigarettes?” Participants were asked about their awareness or source of information about e-cigarettes including where they had had first heard about e-cigarettes. Participants were provided with a list of options: “Radio or TV”, “Internet”, “In-person conversation”, “Other sources such as billboards, etc.”

Additionally, questions were asked about who had heard of e-cigarettes: “How long did you use an electronic cigarette in place of one of the other smoking cessation medications or products listed above?” and those who answered “yes for 30 days” were considered current users. When the question of their motive or reason for using e-cigarettes was asked, the available options included: “Safer than cigarettes”, “Cheaper than
cigarettes,” “Easy to use when I can’t smoke,” or “To try to quit smoking cigarettes” (Zhu et al., 2013). Since participants could have multiple reasons for using any product, the order of these options was randomized by individual respondents to minimize the order effect in response (e.g., respondent may be more prone to choose the first option on the list).

Finally, participants who had never used e-cigarettes were questioned: “How likely are you to use e-cigarettes in the future?” This was designed to assess their susceptibility to e-cigarettes, much like the exposure measure on uptake of regular cigarettes (Zhu et al., 2013). Those who answered that they were “Very likely” or “Somewhat likely” were considered to be susceptible. This is a slightly stricter definition of e-cigarettes susceptibility than the exposure measure used in the literature review for this study, in that the present definition does not include those who responded “somewhat unlikely”. The susceptibility definition here includes those who have tried e-cigarettes but are not currently using them.

**Ethical Considerations**

A careful review of Institutional Review Board (IRB) rules both in advance and during the research process ensured that the appropriate steps were taken to protect the fundamental rights and welfare of respondents participating as subjects in this study. To accomplish participants’ confidentiality, protocols and related materials that were IRB-compliant such as informed consent documents were read and a copy handed out to participants to ensure the protection of their rights.
The data gathered from the 110 respondents was analyzed. The analysis process in the next chapter involved the testing of four hypotheses for statistical significance as well the systematic presentation of results.
Chapter 4: Results

Chapter 4 represents the results of the research. The demographic variables: gender, age, and race/ethnicity were included in the analyses (Table 1).

Table 1.
Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristics of Participants</th>
<th>Frequency (N)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>62</td>
<td>56.4</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>43.6</td>
</tr>
<tr>
<td>Total</td>
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<td>100</td>
</tr>
<tr>
<td><strong>Age</strong></td>
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<td>18-22</td>
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<tr>
<td>33-37</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Hispanics/Latino</td>
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<td>30</td>
</tr>
<tr>
<td>Asian</td>
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<td>18</td>
</tr>
<tr>
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<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>110</td>
<td>100</td>
</tr>
</tbody>
</table>
The data obtained in the previous chapter was analyzed using the Statistical Package for the Social Sciences (SPSS).

The participants surveyed were young adults who lived in New York City. All 110 participants completed the survey. The study was comprised of 62 (54%) males and 48 (44%) females. The largest number of participants were between ages of 23 to 27 (n = 34; 31%), followed by participants between ages 28 to 32 (n = 28; 25%), ages 33 to 37 (n = 24; 22 %) and participants between the ages of 18 to 22 (n = 24; 22 %). The ethnic composition of the study population was reasonably mixed. Participants were asked to choose all ethnicities that were applicable to them. The responses were 30% Hispanic/Latino; followed by; 24 % African American/ Black; 23 % White/ Caucasian and 18 % Asian while 6% who considered themselves as part of "Other ethnicity."

**Descriptive Statistics of Dependent Variables**

**Usage of Electronic Cigarettes**

Participants’ use of electronic cigarettes were also assessed in multiple questions. Figure 3 illustrates the usage of electronic cigarettes. Seventeen percent (17%) of participants never used them while 32% of participants claimed to have used them in the past. A total of 24% of respondents used electronic cigarettes occasionally, which was slightly lesser than the 27% daily users.
Figure 3. Usage of electronic cigarettes among participants

**Awareness of Electronic Cigarettes**

Another dependant variable assessed was participants' awareness of electronic cigarettes. As illustrated in Figure 4, there were four options for participants to choose from when asked about the duration since they first heard about electronic cigarettes. Of the 110 participants surveyed, 32% (35) had heard of electronic cigarettes over a year ago, 29% (32) claimed to have heard of electronic cigarettes less than a year ago while 22% (24) had been aware of electronic cigarettes less than six months ago. However, 17% (19) of the young adults surveyed claimed either not to know or just heard of electronic cigarettes.
Sources of Electronic Cigarette Awareness

The primary sources of communication responsible for the spreading of electronic cigarette information were assessed during the study. About a third of the participants 42 (38%) had heard about electronic cigarettes from the internet or social media, while 25 (22%) got their information from either radio or television. Also, 17% (19) had first heard of an electronic cigarette through other sources such as billboards, newspapers and magazines. Lastly, 22% (24) had their first electronic cigarette information from friends, family and other in-person conversations. Figure 5 below illustrates the sources of electronic cigarette awareness.
Figure 5. The Sources of Electronic Cigarettes awareness.

**Motive for the Use of Electronic Cigarettes**

Five possible options were available for participants to choose from when they were asked about their motive for the use of electronic cigarettes. As illustrated below on Figure 6, about 11% (12) believed electronic cigarettes were safer than regular tobacco cigarettes while 13% (14) of the participants were of the mindset that electronic cigarettes were cheaper than cigarettes. Of the participants, 35% (39) used electronic cigarettes because they wanted to quit smoking while 20% (22) believed electronic cigarettes were easy to use compared to cigarettes. The remaining 21% (23) used electronic cigarettes for other reasons such as recreational and out of curiosity.
Bivariate Analysis

Chi-square analysis was used separately to analyze the dependent variables and the demographic variables for a more meaningful comparison of the data.

Research Question 1 and Hypotheses

1. Was there an association between electronic cigarette usage and the age of young adults in New York City?

H_{01}: There was no association between electronic cigarette usage and the age of young adults in New York City.
$H_a$: There was an association between electronic cigarette usage and the age of young adults in New York City.

**Research Question 2 and Hypotheses**

2. Does the awareness of electronic cigarettes play a significant role in the usage of electronic cigarettes among young adults in New York City?

$H_0^2$: There was no association between the awareness of electronic cigarettes and its usage among young adults in New York City.

$H_a^2$: There was an association between the awareness of electronic cigarettes and its usage among young adults in New York City.

**Results of Questions 1 and 2**

The results in Table 2 indicate no association between electronic cigarettes usage and the age of young adults in New York ($p = 0.655$). Since the $p$-value is greater than 0.05, the researcher fails to reject the null hypothesis.

Table 2 also shows the results of the Chi-square analysis between cigarette usage and awareness. The results indicate that there is a statistical significant difference between awareness and cigarette usage ($p = 0.049$). As a result of this, the null hypothesis was rejected.
Table 2

Association between Electronic Cigarette Usage vs. Age and Awareness

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>$\chi^2$</th>
<th>$\rho$</th>
<th>df</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>6.831</td>
<td>0.655</td>
<td>9</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>Awareness</td>
<td>17.001</td>
<td>0.049</td>
<td>9</td>
<td>110</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: $\chi^2$ = the Pearson Chi-Square; $\rho$ = represents the level of significance; N = the number of participants; df = represents the degree of freedom

Research Question 3 and Hypotheses

3. Does the motive for the use of electronic cigarettes by a young adult in New York City determine usage of electronic cigarettes?

$H_03$: The motive of young adults in New York City does not determine their use of electronic cigarettes.

$H_{a3}$: The motives of young adults in New York City determine their use of electronic cigarettes.

Table 3 illustrates the motivation for the use of electronic cigarettes. Participants were asked to choose from a list of options when they were asked what their motivation for using electronic cigarettes was. Participants were highly motivated ($\rho = 0.0127$) to use e-cigarette (either that they wanted to quit, it was safer to use, it was cheaper, and easier to use than regular cigarettes). Therefore, the null hypothesis was rejected.
Table 3
Participants Motivation and E-Cigarette Usage

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
<th>$\rho$</th>
<th>df</th>
<th>%</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>25.295</td>
<td>0.0127</td>
<td>12</td>
<td>100</td>
<td>110</td>
</tr>
</tbody>
</table>

Note: $\chi^2$ = the Pearson Chi-Square; $\rho$ = represents the level of significance; N = the number of participants; df = represents the degree of freedom.

Research Question 4 and Hypotheses

4. Can the source of information for electronic cigarettes influence the awareness of electronic cigarettes among young adults in New York City?

$H_{04}$: The source of information for electronic cigarettes does not influence the awareness of electronic cigarettes among young adults in New York City.

$H_{a4}$: The source of information for electronic cigarette influences the awareness of electronic cigarettes among young adults in New York City.
Table 4
Awareness of E-Cigarettes and Source of Awareness

<table>
<thead>
<tr>
<th>Source of Awareness</th>
<th>$\chi^2$</th>
<th>$\rho$</th>
<th>df</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58.024</td>
<td>0.000</td>
<td>9</td>
<td>110</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: $\chi^2$ = the Pearson Chi-Square; $\rho$ = represents the level of significance; N = the number of participants; df = represents the degree of freedom.

Table 4 illustrates the Chi-square analysis between the awareness of electronic cigarettes, age and the source of awareness. There is a statistical significance. The source of information for electronic cigarette influences the awareness of electronic cigarettes among young adults in New York City since a p-value of 0.000 indicated the need to reject the null hypothesis (Ho4).

Summary of Findings

This chapter presented the findings from the data collected on the awareness and use of electronic cigarettes among young adults in New York City. The findings analyzed, among other variables, how the media and our social environment influenced the awareness and marketing of electronic cigarettes. The study also indicated how socio-demographic characteristics influenced electronic cigarette usage among young adults in New York City.
Chapter 5: Discussion, Conclusions and Recommendations

This chapter discusses the findings and observations of the awareness and usage of electronic cigarettes among young adults in New York City. Most respondents (83%) were knowledgeable of e-cigarettes. Current and former smokers were more likely to be aware of e-cigarettes than non-smokers. Younger male adults, Hispanics, Caucasians and participants with higher education were more predisposed to have heard of electronic cigarettes than females, older adults, other races or ethnicities, or those with lower education. The most usually reported sources of information were from internet sources (38%). Among the surveyed, participants between the ages 18-32 years were more likely to have heard about e-cigarettes from the internet than the older participants (33-37 years) surveyed. The findings from this research tends to fall in line with a recent CDC report (Centers for Disease Control and Prevention, 2015) which indicated the number of U.S. youths who used electronic cigarettes, but had never smoked a regular cigarette, has more than tripled in the past three years, from 79,000 in 2011 to over 263,000 in 2013.

When investigating e-cigarettes awareness, perceptions, and usage, the literature continually indicates that current and former smokers, young adults and males were more likely to be aware of and use electronic cigarettes than individuals who never smoked, which was reiterated by the findings of Pepper et al., (2013). In general, the research surveys on awareness indicated that most young adult users are under the impression that electronic cigarettes were less harmful or healthier than conventional cigarettes as indicated in Figure 6 (motives for the use of electronic cigarettes). In terms of socio-demographics, findings on awareness levels between males and females either showed no difference or
higher awareness in males as shown in Table 1. Concerning age, younger adults (between 23-27 years old) were more likely to be aware of electronic cigarettes than adults greater than 27 years of age. In general, income, education, and race were not shown to be significant predictors of awareness of electronic cigarettes.

Also, the findings indicated a strong correlation between electronic cigarettes usage and awareness among the young adults studied. The source of awareness or information on electronic cigarettes such as the Internet, radio and television strongly influenced the level of awareness of electronic cigarette users. That finding is consistent with previous research on the growing popularity of electronic cigarettes due to strong advertising and promotion through the media. The way electronic cigarettes are marketed and sold without any state or federal regulation or oversight is a huge concern to public health professionals nationwide. The tactics employed for advertising by electronic cigarette manufacturers is similar likened to what tobacco companies used at the peak of the cigarettes smoking pandemic sixty years ago (West & Brown, 2014). This has led to concerns about the safety of these products.

As seen in previous research and this study, electronic cigarettes are disruptive, innovative nicotine products that have raised crucial regulatory concerns. The impact of electronic cigarettes seems to have caught federal and state regulators by surprise since there are not yet enough epidemiological tests to either refute or accept the claims made by manufacturers on the health benefits of electronic cigarettes (West & Brown, 2014). Public health professionals will have to rely on toxicological tests to draw estimates on the harmful effects of this product on the users that are predominantly young adults.
As indicated by the results of this study in Table 3, the primary motive for the use of electronic cigarettes by young adults is the perceived advantage of its safety over regular tobacco cigarettes. This is of great concern to public health professionals especially considering the fact that the FDA has not come out with any report to refute those safety claims or harm reduction benefits of electronic cigarettes as of yet. Currently, electronic cigarettes are banned from being sold to minors in 40 states while indoor use is banned in over 100 cities nationwide including New York City (Regan et al., 2013). There is the need for federal and state regulators to have full oversight on how this product is marketed and sold since it has evolved so fast that federal and state regulators seemed to have been forced into a reactionary role rather than a controlling role.

**Strength and Weakness**

To the best of my knowledge, this is the first electronic cigarette study that solely focused on young adults in New York City aged 18 to 37 years. The study had some limitations that should be noted when considering the results. All estimates in the study were based on self-reported use of e-cigarettes and that could have resulted in reporting bias. Second, I did not examine whether the participants were currently using e-cigarettes on an intermittent basis but rather asked if they had ever used them. Participants did not report the number of times they used e-cigarettes, and the researcher was not able to assess how many used them regularly or intermittently. Also, the majority of the survey questions were geared towards smokers. Finally, the survey used was limited to only respondents in Bronx, Manhattan, Brooklyn and Queens. Therefore, generalizations to young adults in Staten Island cannot be made. Besides, the low survey sample of 110 could have biased
our results. In spite of these limitations, calculations obtained in this survey on electronic cigarette prevalence among young adults were similar to those of a nationwide survey conducted in 2010 suggesting reliability of the current results (Ramo et al., 2014). Another weakness of this study was the fact that the majority of the survey questions were geared toward current smokers and former smokers with relatively less emphasis on non-smokers.

**Recommendations**

Regarding regulations, e-cigarettes should be integrated into already existing clean air laws at both federal and local levels in the state of New York. Several smoke-free laws characterize the act of “smoking” as inhaling or carrying a lighted tobacco product planned for inhalation. E-cigarettes, which are not burned like conventional cigarettes but are usually “vaped”, are not covered under these laws. Local New York City and state government officials should include e-cigarettes in their smoke-and-tobacco-free restrictions by reviewing the definitions of the terms “smoking” or “tobacco products” to expressly cover e-cigarettes and other electronic nicotine delivery systems.

Secondly, E-cigarettes should be taxed as tobacco products regardless of what the big tobacco companies claim. The big tobacco companies assert that an e-cigarette tax will discourage current smokers who use e-cigarettes as a smoke cessation product from quitting. The Tobacco Control Act specifically defends the power of the state and local governments to impose taxes on tobacco products. A number of states have addressed this subject by clarifying the meaning of “tobacco products” in their tax codes so that e-cigarettes are regarded tobacco products for taxation purposes.
**Conclusion**

This study adds important findings to electronic cigarette research. The quantitative data collected and the analysis of the survey revealed that there were three repetitive themes associated with electronic cigarettes. First, participants provided important information on how popular electronic cigarettes are among NYC youths between the ages of 18 to 37 years. Second, participants in the study showed how the media played a vital role in the awareness and usage of electronic cigarettes. Thirdly, there is the need to regulate the production and distribution of electronic cigarettes on both the local and federal level as it seems the electronic cigarette companies are ahead of federal regulators who currently do not have conclusive reports on either the benefits or dangers of this product. Overall, the study participants confirmed much of what was already known in the research literature. However, the study also added important knowledge to potential future studies by considering electronic cigarettes as a key smoking cessation aid for the youths of New York City. It seems the awareness of e-cigarettes as less harmful than conventional cigarettes may be associated with the increased e-cigarette use among young adults.
References


Appendix A

This is a questionnaire designed to examine your awareness and behavior towards electronic cigarettes. There is, of course, no right answer for any statement. The best answer is what you feel is true of yourself at this moment.

1. What is your age?
   - □ 18-22
   - □ 23-27
   - □ 28-32
   - □ 33-37

2. What is your gender?
   - □ Female
   - □ Male

3. What is your ethnicity?
   - □ White
   - □ Black or African American
   - □ Hispanic
   - □ Asian
   - □ Other
4. What is your approximate average household income?

☐ $0-$24,999

☐ $25,000-$49,999

☐ $50,000-$74,999

☐ More than $74,999

5. What is the highest level of school you have completed or the highest degree you have received?

☐ Less than high school degree

☐ Associate degree

☐ Bachelor degree

☐ Graduate degree

6. Do you currently smoke cigarettes, or not?

☐ Yes I smoke daily

☐ Yes I smoke occasionally (not daily)

☐ No I am an ex-smoker

☐ No I never smoked
7. When did you quit smoking or stop using smokeless tobacco?

☐ A day ago

☐ A week ago

☐ Less than a year ago

☐ Over a year ago

8. If you are a current smoker, how many cigarettes (tobacco) do you smoke per day, on average?

☐ Less than 3 per day

☐ Less than 4 per day

☐ More than 4 per day

☐ Non-smoker

9. Are you currently using the electronic cigarette?

☐ No I never used it

☐ No but I used it in the past

☐ Yes occasionally (not daily)

☐ Yes I use it everyday
10. The first time you used a nicotine product, in which product was the nicotine administered?

- ☐ nicotine medication such as the patch, gum, tablet or inhaler
- ☐ cigarette, pipe or cigar
- ☐ smokeless tobacco
- ☐ electronic cigarette

11. How long did you use an electronic cigarette in place of one of the other smoking cessation medications or products listed above?

- ☐ Never
- ☐ Yes, for 3 days
- ☐ Yes, for 7 days
- ☐ Yes, for 30 days
- ☐ Yes, more than a month

12. Did you ever use any other smoking cessation medication or product?

- ☐ I never used smoking cessation medication
- ☐ Electronic Cigarettes
- ☐ Nicotine Patch
- ☐ Nicotine Chewing-Gum
13. Before you first used an electronic cigarette, were you a smoker or a user of smokeless tobacco?

☐ I never smoked or used smokeless tobacco

☐ I am a former smoker or ex-user of smokeless tobacco

☐ I was a daily smoker or user of smokeless tobacco

☐ I was an occasional smoker or user of smokeless tobacco

14. What smoking cessation aid did you use most?

☐ Nicotine Chewing Gum

☐ Nicotine Patch

☐ Electronic Cigarettes

☐ Other cessation aids

15. How long did your current episode or your most recent episode of use of the Medication or products that you just mentioned above last?

☐ Less than a week

☐ Less than a month

☐ Less than a year

☐ More than a year
16. Did you spend more on electronic cigarettes compared to cigarettes in a typical month?

☐ No they both cost the same
☐ No electronic cigarettes cost less
☐ Yes electronic cigarettes cost more
☐ I never checked

17. When did you first hear about electronic cigarettes?

☐ Never heard of it
☐ less than 6 months ago
☐ less than a year ago
☐ more than a year ago

18. In what medium did you hear about electronic cigarettes?

☐ Radio or TV
☐ Internet or Social Media
☐ In-person conversation
☐ Other
19. Do you intend to use or try electronic cigarettes in the future?

☐ I don’t know

☐ I have no intention of using it

☐ I am considering using it

☐ I really want to use it

20. Do you currently use any smokeless tobacco products (nicotine patch, snuff, puff or chewing tobacco)?

☐ Yes I use smokeless tobacco products daily

☐ Yes I use smokeless tobacco products occasionally (not daily)

☐ No I am a former user of smokeless tobacco products

☐ No I never used smokeless tobacco product

21. Have you smoked any tobacco (even one puff of cigarette, cigar, pipe, etc.), or used smokeless tobacco in the past 7 days?

☐ No

☐ Yes within the last 2 days

☐ Yes within the last 3 days

☐ Yes within the last 7 days
22. What will motivate you to use electronic cigarettes?

☐ Safer than electronic cigarettes

☐ Cheaper than cigarettes

☐ Easier to use than cigarettes

☐ Quit smoking

☐ Other (pleasure, curious, etc.)