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Research Article

Continued Deficits of the Perceived Harms of Cigarette Smoking Among Young Adults: Insights from Participants on Amazon Mechanical Turk

Abstract

Young adults are an age group that has been the target of multiple education campaigns regarding the harms of cigarette smoke exposure. Although smoking rates of conventional cigarettes have declined in the US, continued usage is noted among a select subset of the population aged 18–30 years. This group either serves as current or soon-to-be future caretakers of young children who will likely spend a significant amount of time exposed to their cigarette byproducts. Understanding their current knowledge base of the dangers of secondhand smoke and the means to address these risks are of major importance for the welfare of young children. We had utilized a brief and limited sample size survey to explore the utility of using an online task marketplace on Amazon.com® to assess secondhand smoking beliefs and financial incentives among young adults. The pilot study had a particular focus on the perception and means to minimize smoke exposure among children residing with young adults serving as their primary caretaker or fellow home residents.

Introduction

A successful, multipronged public health marketing campaign may be attributed to the decline in the cigarette smoking in the US. Approximately 18% of adults had reported to be currently smoking cigarettes in 2013, as compared to 25% in the 1990 [1,2]. However, there remains a recalcitrant population of young adults who continue to smoke despite being raised in a society with media that had inundated them with messages regarding the harms of cigarette products. Approximately 19% young adults (between the ages of 18–24) reported to be current smokers in 2013, of which a 6–7% greater rate of smoking was noted among males [1]. When viewed in the context of potential secondhand smoke exposures (SHSe) to children, high rates of smoking among young adults are alarming. SHSe has been attributed to a myriad of clinical morbidities in children [3,4]. Preschool-aged children are in particular at a greater risk of the harms of SHSe secondary to the greater length of time they reside in indoor settings [5]. Since the mean age for first time mothers and fathers is approximately 26–27 years of age, it is of critical importance to better understand the effectiveness of educational messaging of the harms of SHSe to children that target young adults [6].

Beyond the importance of acquiring SHSe knowledge is also the practice of enforcing the reduction of smoke exposures in the home setting. Multiple strategies of varying complexities are available to reduce home smoke exposures among pre-school aged children, but one that is frequently studied and recommended by various public health organization is the use of a home smoking ban [7–9]. Though the number of smoke free home rules have increased over the past

decade from 9.6% to 46.1% with a household with one smoker, it is quite evident that the SHSe educational marketing efforts are still inadequate [10]. This is particularly impactful among families with a lower socioeconomic status with higher rates of smoking and subsequent respiratory morbidities [11,12].

We have utilized the online task marketplace of Amazon® Mechanical Turk (MTurk) to determine its potential utility in capturing knowledge of basic pediatric SHSe concepts among young adult smokers and the means by which home smoking exposures are reduced in those identifying themselves as active smokers. We will also briefly explore the use of incentives as a means to encourage a reduction in home smoke exposures as select studies have shown utility in this modality and current healthcare policy initiatives have been directed to this arena [13]. This low-cost, pilot study is using MTurk given previous investigations that have largely sampled young adults using this modality [14–16].

Methods

Participants were recruited by crowdsourcing via the MTurk website that allows the cost-effective, yet reliable commission of participants for payable tasks. MTurk allows anonymous participants or “workers” to complete short tasks (HITs). The authors of the study served as “requesters” who post the HITs, with details on the study, to an Amazon.com-based MTurk website. The participants are paid upon satisfactory completion of all contents of the study’s survey.

All recruited participants were between the ages of 18–30 and whose servers indicated residence within the US. They had successfully

completed over 95% of their previous assigned HITs. MTurk participants who agreed to the contents of the study description and instructions were directed to a 39-item online survey administered using Qualtrics online software (Qualtrics Labs Inc., Provo, UT). Each was paid \$0.30 upon confirmation of completion. Despite the low reimbursement, review of recent comparative studies have not shown a significant difference in reliable responses among MTurk participants and sampling via non-online based modalities [17]. Though participants are anonymized on the MTurk website, pertinent details regarding the subjects were captured in the Qualtrics-based survey. Pre-validated survey questions exploring demographics, baseline smoking activity and SHSe beliefs were derived from the American Academy of Pediatric's (AAP) Survey, Questionnaires and Assessment Tools [18]. Preschool-aged children were defined as being less than 5 years of age. Current smoking status was defined as the use of at least 1 cigarette in the past 30 days.

Financial incentive characteristics queries included the type and amount of incentives to achieve either a 6-month total abstinence from smoking or cessation within the home setting (e.g., home smoking ban). Incentive strategies were subdivided based on participant identification as caretakers of preschool-aged children. Given the small sample size of active smokers in our pilot study, we have used descriptive statistics to summarize our findings.

Results

The sampled population was overwhelmingly single white males with a college-level education

The sampled population (n = 210) consisted of predominantly male participants (n = 149) (Table 1). Slightly over 2/3rd of participants were White, but less than 10% identified themselves as being Black or Hispanic. Asians had the largest representation among all non-White ethnicities. 70% of participants were non-married and 27% had reported being in a domestic relationship – the latter characterized as being either married or living with a partner. Approximately ½ of all participants had a college degree, while 43% had a level of education training falling short of this status. The majority had an annual income less than \$70000. About 30% had an income less than \$30000, which may reflect their current student status or being under the continued dependency of their guardians.

Participants questioned the chronologic and minimal dose-response effects of SHSe

Among the recruited participants, 32% (n = 67) stated that they were current smokers. Within this subset, approximately 20% stated that they served as the primary caretakers of pre-school aged children. Queries of pediatric-specific SHSe beliefs among all participants noted that 37% were either unsure or did not believe that cigarette smoke exposure had lasting effects on a child's health. Approximately 1/3 of participants felt fully certain that smoking cigarettes in a room in which a child resides has a lingering impact over many days on pediatric wellbeing. Participants felt either unsure or fully confident of the existence of safe SHSe levels in 15% and 12% of responses, respectively. Despite the varied responses of the chronologic and dose exposure effects of secondhand smoke, over 95% believed that cigarette smoke exposure is linked with respiratory issues in children.

Smokers identifying themselves as the primary caretakers of preschool-aged children have a higher motivation and involvement in the implementation of a home smoking ban

Among the limited individuals who reported to be current smokers and serving as caretakers of pre-school aged children (n=12), greater than 80% reported either a partial or no limitations in smoking within the home (Table 2). This is similar to the 55 participants who identified themselves as being current smokers and not serving in a childcare role, in whom greater than 90% reported limited to no home smoking restrictions. Primary caretakers of children had a greater participatory role as decision maker – most often with a spouse or partner. Regardless of the type of reported home smoking ban, smoke exposures continued to be reported in the

Table 1: Demographic, smoking status and SHSe beliefs of all screened participants aged 18-30 years (n=210).

Demographic Characteristics	N (%)	SHSe Beliefs	N (%)
Gender		Breathing air in a room today where people smoked yesterday may harm children's health	
Male	149 (71%)	Strongly agree	44 (21%)
Female	61 (29%)	Agree	88 (42%)
Ethnicity		Don't know	34 (16%)
White/Caucasian	143 (68%)	Disagree	42 (20%)
Black/African American	19 (9%)	Strongly disagree	2 (1%)
Hispanic	15 (7%)	Children exposed to SHS are more likely to have breathing problems	
Asian	23 (11%)	Yes	204 (97%)
Other	10 (5%)	No	4 (2%)
Marital status		Don't know	2 (1%)
Single	147 (70%)	Safe levels of SHS exposure exist	
Married	30 (14%)	Yes	25 (12%)
Divorced	6 (3%)	No	153 (73%)
Living with partner	27 (13%)	Don't know	32 (15%)
Educational level		Smoking Status	
High school or less	23 (11%)	Current smoker	
Some college (no degree)	63 (30%)	Yes	67 (32%)
College (with degree)	103 (49%)	Pre-school-aged caretakers who are current smokers *	
Professional degree	21 (10%)	Yes	12 (18%)
Combined annual income (\$)		No	55 (82%)
Less than \$30,000	65 (31%)	No	143 (68%)
\$30,000 – 69,999	90 (43%)		
More than \$70,000	55 (26%)		

* The percentage of pre-school aged caretakers are based on the total number of current smokers (n=67). Otherwise, all remaining percentages are based on the total number of participants (n=210).

Table 2: Home smoking ban features characterized by caretaker status among participants reporting to be current smokers (n=67).

Characteristics	Caretakers of preschool-aged children (n=12) N (%)	Non-caretakers of preschool-aged children (n=55) N (%)
Method of home smoking ban		
No smoking within the home	2 (17%)	1 (2%)
Smoking is permitted within select locations	7 (58%)	43 (78%)
Smoking is permitted in all locations	3 (25%)	11 (20%)
Decision maker for method of home smoking ban		
Participant only	4 (33%)	11 (20%)
Participant with spouse/partner residing in the home	6 (50%)	13 (24%)
Participant with family members residing in the home (not including spouse/partner)	2 (17%)	9 (16%)
Participant with family members not residing in the home (not including spouse/partner)	0	2 (4%)
Participant is not involved in the decision making	0	20 (36%)
Frequency of smoking by the smoker or other visitors in the home		
None	3 (25%)	13 (24%)
1x per month	1 (8%)	3 (5%)
2-3x per month	0	10 (18%)
1x per week	3 (22%)	1 (2%)
2-3x per week	5 (45%)	7 (13%)
Daily	0	21 (38%)
Motivation to stop others from smoking in your home		
Don't care	2 (17%)	15 (27%)
A little motivated	3 (25%)	19 (35%)
Moderately motivated	1 (8%)	12 (22%)
Highly motivated	6 (50%)	9 (16%)

homes of all current smokers. Greater levels of exposure were noted in those who did not have a childcare role. The motivation to cease individuals from smoking within the home was most prominent in those serving as caretakers of children.

Current smokers not serving in a childcare role are less likely to enforce a home smoking ban despite motivation with monthly cash incentives

Among current smokers caring for preschool-aged children, approximately 40% would require as little as \$25/month to enforce a 6-month home smoking ban (Table 3). Incremental increases of monetary incentives yielded a less motivated population; yet when offered \$100/month, only two individuals were either unsure or unwilling to alter their practices. Those smokers not caring for preschool children required higher level of incentives to be motivated to enforce an equivalent home smoking ban. A larger percentage of individuals appeared to be recalcitrant to lower level of incentives. Increasing incentives resulted in approximately 40% unwilling to accept \$100/month; ultimately, 10% would not consider \$1000/month sufficient to prohibit smoking within the home for 6-months.

Discussion

The study reflects both the utility and limitations of using an online database of participants. The objective of this work was to

serve as a pilot study into the greater use of using MTurk, or related online crowdsourcing platforms, to capture young adult perceptions of the harms and techniques to remediate SHSe in the homes of young children. Young adulthood represents an important stage in life in which long-term cigarette smoking behaviors are often established [19]. The majority of our participants were white males with a college-level education. Though women serve largely in the role of primary caretakers of children in society, they only represented approximately 30% of our patient population. Black and Hispanic minorities were also underrepresented, when compared to 2013 US Census data [20]. Among the 32% of participants identifying themselves as current smokers, about 1/5th served in a childcare role. The number of young adult smokers captured in our study is consistent with previous US-based population studies [19]. Moreover, despite the extensive public health marketing campaigns educating the public of the harms of SHSe on children, a select segment of the young adult population continues to be unaware of key pediatric SHSe concepts. As to be expected, current smokers caring for children were more likely to describe involvement in developing the characteristics of a home smoking ban. Despite continued SHSe of varying levels in the home, caretakers currently smoking were far more likely to be motivated to enforce a home smoking ban. This was subsequently reflected in the low level of incentives that they reported was needed to enforce a complete home smoking ban. Without the motivation of caring for

Table 3: Characteristics of cash incentives by caretaker status among current smokers willing to enforce a 6-month home smoking ban. Individuals not willing to accept the delineated monetary amount were offered the next value incentive. All preschool-aged caregivers accepted the offered incentive amounts. Among non-caretakers of preschool-aged children, seven participants did not accept the maximum offered incentive of \$1000.

Characteristics	Caretakers of preschool-aged children (n=12) N (%)	Non-caretakers of preschool-aged children (n=55) N (%)
Willing to enforce a 6-month home smoking ban for monthly cash incentives		
25 dollars		
Yes	5	17
50 dollars		
Yes	1	4
75 dollars		
Yes	1	6
100 dollars		
Yes	3	7
250 dollars		
Yes	1	5
500 dollars		
Yes	1	6
750 dollars		
Yes	n/a	0
1000 dollars		
Yes	n/a	3

a child, young adult smokers were both less involved in the decision making and had diminished motivation to change their smoking behaviors.

MTurk has been utilized by various medical, marketing and political researchers [21-23]. To the best of the authors knowledge, our work is the first to utilize this online platform to explore concepts and strategies that relate to pediatric SHSe. We had specifically targeted young adults given their soon-to-be evolving role into parenthood. This study has the potential to be valuable for not only US-based research, but also for global tobacco investigators where cigarette usage is increasing among young adults [24,25]. Given this concerning trend, along with low quit rates in both genders appreciated in various global settings, our sampling strategy may be a cost-effective approach to understand and trial tobacco-related messaging among young adults [24]. MTurk usage for global researchers may be further supported with participants representing over 66 countries, with the majority of non-USA based users coming from India [14].

Beyond the basic SHSe conceptual issues we had explored, we had also attempted to use the online forum to understand the role of incentives to increase motivation for enforcing a home smoking ban. Those who did not serve in a childcare role were less motivated in general to enact a home smoking ban and required far larger amounts of financial incentives to consider instituting such a policy.

Given that young adults in the US are often burdened with education debt and/or not earn higher levels of annual income, financial incentives may be a reasonable strategy to alter behavior patterns in those resistant to change [26]. Moreover, the differences in earned annual incomes become even more prominent in Black and Hispanic populations, who net significantly less than their White counterparts [27]. Aggressive marketing campaigns by cigarette companies have specifically targeted these lower income groups (including at a global level); however, financial incentives may provide a channel to persuade individuals to consider discontinuing smoking and thus “buying time” for them to consider adopting smoking cessation practices [28-30]. Though no incentive program has been developed to alter adult smoking behaviors for pediatric endpoints, this work may be informative for future research that is looking to use financial incentives beyond the typical focus of yielding abstinence among primary smokers [13,31].

This study had several notable limitations which are noteworthy for not only this pilot study but also for expansion of its objectives using an online platform. Our study population was not reflective of the US general population, nor of expected US current smokers. There was an underrepresentation of non-White ethnic groups, with the exception of Asians. Less than 10% of participants identified themselves as Black and Hispanic, which is notable given that they represent 13.2% and 17.1% of the US population, respectively [20,21]. Moreover, young adult US-born Hispanics and Blacks have higher levels of social and/or occasional smoking as compared to Whites [21]. Both ethnic groups are also likely to have their first child earlier with the average age at first birth for Blacks and Hispanics being 22.7 years and 23.1 years, as compared to 26.0 years for Whites [32]. Therefore, our recruited participants may have under-represented at-risk children with SHSe. We also did not explore in-depth the indoor smoking behaviors of the primary caregivers in the home setting, independent of visitors in the home who may be smoking. This limitation may have underestimated the significance of the primary caregiver’s smoking behaviors that may be exposing the preschool-aged child to the highest SHSe burden. Future work may as well benefit from exploring the SHSe beliefs among the population of individuals who do not accept the linkage between SHSe levels and the severity of disease symptoms. These individuals may have historical or ongoing observations of smoke exposures that may have not readily resulted in clinical manifestations of symptoms, which thus may be enlightening for future educational efforts. Our population was further limited by the disproportionate number of male participants, despite women usually serving in the role as the primary caretaker of children [33]. Our sampling approach did not reflect demographics of select social media sites whose users are comprised of more women and non-White minorities than evident in our sampled population [34]. We also used a more liberal definition of current smoker, as defined by the use of any cigarettes within 30 days. Though different than select national sampling strategies defining current smoking as both ≥ 100 cigarettes during one’s lifetime and smoking “every day or some days”, we believe we had captured more occasional and social young adult smokers that may be contributing to SHSe. We were further limited by exploring the responses of conventional cigarette users only and future work will

incorporate the input of consumers of electronic cigarettes, given its increasing prevalence of usage and recognition of the harms of its gaseous byproducts [35–37]. Our comparisons for home smoking ban features could have been enhanced by capturing the characteristics of tobacco restrictions among non-smoking caregivers. We had chosen to not capture the home smoking restrictions of this particular group since caregivers are often the primary source for home SHSe or in the optimal position to minimize clinically-impactful smoke exposures on their children [38]. Lastly, our method of exploring the motivation to change behavior patterns using escalating incentives is limited by a survey-based methodology and may be enhanced using contingent valuation scenarios among caretakers whose children are clinically impacted by home exposures. The contingent valuation method may be able to better determine how much a caretaker would be willing to pay to reduce SHSe due to its associated morbidities.

Therefore, using an online platform like Mturk may serve beneficial to rapidly and cost-effectively recruit participants for pediatric-centric outcomes. We were able to capture a proportion of young adult smokers in whom select characteristics mirror national smoking rates. This is insightful given that young adulthood represents a time when long-term cigarette smoking behaviors, including perceptions of pediatric smoke exposures, becomes indoctrinated in this population of likely first-time parents [6,39]. Among those identifying themselves as current smokers, it appeared that our participants who served in a childcare role were motivated enough to immediately adopt or be receptive to incentives to yield a home smoking ban. The major limitation to our work appears to be the ability to recruit an adequate young adult population that accurately reflects all ethnic, gender, educational and socioeconomic differences seen among the heterogeneous smoking young adult population. Future studies will explore the role of other online platforms (e.g., social media) in targeting a more ethnically diverse, lower income population with higher levels of home SHSe. This demographic would be more relevant for researchers focused on addressing the growing global cigarette consumption among young adults. Furthermore, translating the incentive-compatible paradigm to real-world trials may involve the provision of monetary incentives and observation of participants' behavior changes. Ultimately, this work is pursuing a new avenue of exploring perceptions and motivations to alter SHSe among the youngest and most vulnerable of children.

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