Article

Prevalence of BIDI® Stick E-Cigarette Use among Youth and Young Adults in the United States

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Abstract

Background: In the 2022 National Youth Tobacco Survey disposable e-cigarette devices are shown to be the most widely used e-cigarette devices amongst U.S. youth. In this paper we report the results of research designed to estimate the prevalence of use of BIDI® Stick branded e-cigarettes amongst youth (aged 13 to 17), and under-age young adults (aged 18 to 20) in the U.S.

Methods: Cross-sectional online survey of a nationally representative sample of 1,215 youth (13-17 years) recruited via the IPSOS probability-based KnowledgePanel and 3,370 young adults aged 18 to 24 - amongst whom 1,125 were aged 18 to 20.

Results: Amongst youth aged 13 to 17, 0.91% [95% CI: 0.44-1.68] or 190,000 [95% CI: 90,000-350,000] youth reported having ever used a BIDI® Stick branded product and 0.04% [95% CI: 0.00-0.38] or less than 10,000 youth reported currently using a BIDI® Stick branded product. Amongst those young adults aged 18 to 20, 3.90% [95% CI: 2.49-5.81] or 470,000 [95%CI: 300,000-700,000] reported having ever used a BIDI® Stick product whilst 0.60% [95% CI: 0.17-1.55] or 70,000 [95% CI: 20,000-180,000] reported they now use a BIDI® Stick product "every day" or "some days".

Conclusions: The low prevalence of youth and underage adult current use of the BIDI® Stick e-cigarette suggests that this product is not responsible for the recent growth in the use of disposable e-cigarettes by youth within the U.S. as demonstrated by the 2022 National Youth Tobacco Survey.

Keywords: Disposable E-cigarettes Youth Young Adult Prevalence

Introduction

In 2022, the global market for e-cigarettes was estimated to be worth $22.8 billion, projected to rise at an annual rate of 4.3% from 2022 to 2027 [1]. Whilst there are no precise figures for the number of people using e-cigarettes, researchers have estimated that figure to be in the region of 58m in 2018, rising to 81m in 2022 [2]. As the number of people using e-cigarettes has increased, so too has the focus of national and international regulatory authorities in determining whether these devices are having a positive or negative impact on public health and how they should be appropriately regulated [3].

Whilst there remains some dispute as to how effective e-cigarettes are in enabling adult smokers to quit, it is widely accepted that these devices are significantly less harmful than combustible tobacco products

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[4] and that, for at least some groups of adult smokers, e-cigarettes may offer a route out of combustible tobacco product use. [5, 6]   Research has shown that where adult smokers have access to e-cigarettes, their use is associated with an increased number of quit attempts and an increased likelihood that those quit attempts will have been successful [7,8]. Further, other research has shown e-cigarettes to be at least as effective, and in some instances, more effective than other validated means of quitting smoking (9,10). Despite such positive findings, there has been mounting concern at the extent of youth use of e-cigarettes within the U.S. which, whilst now showing recent signs of reducing, has increased markedly over the last ten years   to the point that e-cigarettes have become the most widely used tobacco product by youth within the U.S. [11]. In the 2022 National Youth Tobacco Survey (NYTS), 14.1% of high school students, and 3.3% of middle school students, reported having used an e-cigarette within the last 30 days. Among those youth reporting current i.e. last 30 day use of an e-cigarette, 42.3% reported used an e-cigarettes on more than 20 days in the last 30 days, and 27.6% reported having used an e-cigarette on a daily basis [12] .

As well as documenting the overall extent of e-cigarette use amongst U.S. youth, the 2022 NYTS has also evidenced the increasing popularity of disposable devices with these products now being the most widely used type of e-cigarette among current e-cigarette using youth (12).   In this paper we report the results of research aiming to estimate the prevalence of use of one particular disposable e-cigarette currently on sale within the U.S.   The BIDI® Stick is a tamper resistant, disposable e-cigarette, available in a range of flavors: tobacco (Classic), menthol (Artic) and nine other flavor variants. It has been estimated that the BIDI® Stick product range now holds an estimated 24.2% share of the disposable e-cigarette market in the United States[13].

In an attempt to reduce the likelihood of youth use of BIDI® Stick devices the manufacturer has adopted a number of measures designed to reduce youth appeal and youth access to their products. Those measures include the use of non-characterizing flavor names that are intended to be non-youth appealing (Winter, Artic, Solar, Dawn, Marigold), and requiring retail outlets selling BIDI® products to

operate a rigorous, age verification system, at the point of purchase. Given the popularity of disposable e-cigarette amongst U.S. youth there is an important need to monitor the prevalence with which leading brand disposable e-cigarette devices are being used by youth, and those young adults below the legal age at which tobacco products can be purchased within the U.S. rather than to assume that such marketing measures are successfully addressing the issue of youth e-cigarette use within the U.S.

In this paper we report the results of research designed to estimate the prevalence with which youth in the U.S. (aged 13 to 17), and young adults (aged 18 to 20) are using a BIDI® branded e-cigarette device. Whilst it is important to present data on any past e-cigarette use on the part of youth and underage young adults, the most important measure in providing an assessment of the extent to which these products may pose a risk to public health is current use. It is this measure of use which presents the clearest picture of what is happening at the present time rather than what may have happened at some distant point in time.

Methods

Data were collected via an online cross-sectional survey in June 2022 of 1,215 U.S. youth (aged 13 to 17) and 3,370 young adults (aged 18 to 24).   Youth survey respondents aged 13 to 17 were all children of adult panel members of the IPSOS KnowledgePanel, which is the largest, probability-based, internet research panel in the U.S. designed to be representative of the non-institutionalized U.S. population aged 18 years and older. With regard to the young adult sample 25% of survey participants were recruited from the KnowledgePanel with the remainder being recruited from non-probability consumer research panels maintained by Ipsos and its sample partners- this arrangement was as a result of there being too few young adult members of the KnowledgePanel to meet the planned sample size for the current survey. To align their probability and non-probability panels, IPSOS utilise a calibration methodology based on a multidimensional set of measures that have been found to significantly differentiate between these two types of samples and enable correcting weights to be

applied to the final samples to ensure comparability between their probability and non-probability panels.

In the case of the youth sample, a total of 4,256 invitations were sent out and 1,825 were completed giving a completion rate of 42.9%. Of the surveys that were completed, 1,218 cases qualified giving a qualification rate of 66.7%. Of the 1,218 cases that completed the survey, 3 were removed (as a result of missing youth demographics), resulting in a final youth sample of 1,215 cases. In the case of the young adult sample, a total of 6,810 invitations were sent out with 4,147 being completed giving a completion rate of 60.9%. Of the surveys that were completed, 3,376 cases qualified giving a qualification rate of 81.4%; 5 participants were removed for age comparison and 1 for skipping, resulting in a final young adult sample of 3,370 cases. Amongst the 3,370 young adults participating in this survey were 1,125 aged 18-20 (i.e. below age 21 at which tobacco products can be legally purchased within the U.S.) it is this sub-sample of the young adults who, along with those youth aged 13 to 17 are the   focus of this paper.

In advance of contacting parent panel members of IPSOS KnowledgePanel who were parents members of the IPSOS panel were sent a screening questionnaire that verified that they were a parent of a child aged 13 to 17 years old, that the child was living in the parent's household, and that the parent's were willing for their child to be contacted in connection with their possible involvement in the present study. When a parent provided consent for their child to be contacted, the child was emailed a link to an information sheet and consent form. Consent forms for both youth and young adults outlined the nature of the research being undertaken, the reason why the research was being undertaken, the type of information that would be requested, and the fact that survey participants would be shown images of tobacco products. It was further underlined to both adult and youth participants that involvement within the research was entirely voluntary at the individual's decision and that they would be free to withdraw from the research at any point.

Participants self-completed a web-based survey instrument predominately composed of questions and response options that were extracted or adapted from two established national, annually administered surveys of tobacco use behaviors, perceptions, and intentions among middle and high school students in the United States: (i) the 2021 National Youth Tobacco Survey (NYTS); and (ii) the Youth Interview Form administered at Wave 5 of the FDA Population Assessment of Tobacco and Health (PATH) Study [14]. To assess participants' use and intentions to use cigarettes and e-cigarettes, the format and wording of questions, and response options, were extracted exactly or near-exactly as they appeared in these instruments with the only modification being that the questions related to specific brand of e-cigarettes and devices. In order to increase the accuracy of the reporting with regard to which e-cigarette brands and devices individuals reported having used, narrative questioning of respondents based upon the NYTS and PATH instruments was combined with the presentation of device and brand images. Respondents reporting that they had used a particular brand or device were shown images of the same in order to confirm that it was indeed this device that they had used.

Measures

Demographic Information

Demographic information recorded in this survey encompassed age, gender, ethnicity, race, school grade/education level, income, and residence state.

Awareness and Use of any type of e-cigarette

Awareness of e-cigarettes before the study was assessed by the question "Have you ever seen or heard of e-cigarettes before this study?". Participants who answered 'No' were routed to the end of the survey. Participants who answered "Yes" were asked the question, "Have you ever used an e-cigarette, even one or two times?". Participants who answered "Yes" to this question were routed via logic to questions about the age at which they first used an e-cigarette, the number of times they have used an e-cigarette in their lifetime, the number of days in the past 30 days that they used an e-cigarette and when they last used an e-cigarette. Adults were also asked whether they now use an e-cigarette ("Every day"; "Some days"; "Not at all").

Use of e-cigarette brands

Those who reported having ever used an e-cigarette were routed via logic to questions about brand specific devices used. Survey participants were provided with an image of 19 different e-cigarette brand logos and asked "Please look carefully at the brand logos below. Have you ever used any of these brands of e-cigarettes, even once or twice? (Select all that you have ever used)".   Participants who had never used any of these 19 e-cigarette brands were routed to the end of the survey. Participants who had used one or more of the 19 e-cigarette brands were asked which of the devices within each of the brands they had ever used.

Ever use of specific e-cigarette devices

Participants who reported having ever used an e-cigarette brand were asked the name of the device they had ever used using the question "You said that you have used an [INSERT BRAND NAME] e-cigarette. Below are the names of different e-cigarette ranges that are made by [INSERT BRAND NAME]. Which of these [INSERT BRAND NAME] e-cigarette ranges have you ever used, even once or twice (Check all that apply)". Participants who selected that they had ever used one of the listed name categories were then asked which of the specific e-cigarette devices, belonging to that name category, they had ever used with the question "You said that you have used the [INSERT BRAND AND CATEGORY NAME]. Below are pictures of different e-cigarettes in the [INSERT BRAND AND CATEGORY NAME] range. Which of these [INSERT BRAND AND CATEGORY NAME]s have you ever used?"

Participants who reported having ever used a specific device were asked the number of times they had used that specific device in their entire life using the question "How many times have you used the [INSERT BRAND AND DEVICE NAME] in your entire life?" Participants could select from a list of six response options ranging from "1 time, even just a few puffs" to "100 or more times".

Past 30-day use of e-cigarette brands

Participants who reported that they had used e-cigarettes in the past 30 days and reported having ever used one or more of the 19 brands were asked about their use of these e-cigarette brands during the past 30 days using the question, "Please look carefully at the brand logos below. In the past 30 days, have you used any of these brands of e-cigarettes, even once or twice? (Select all that you have ever used)". Response options were dependent upon the selection(s) made by the participant previously in the survey when asked to select the e-cigarette brand(s) they had ever used. Only the brand logo(s) selected as part of the ever use question were available for selection in this question. The list of response options was randomized, and participants were given the option to respond, "I have not used any of these brands of e-cigarettes in the past 30 days".

User Group Definitions

User group definitions for the BID® Stick brand and BID® Stick devices for youth and young adults are shown in Table 1 and Table 2 respectively

Table 1: Youth User Group Definitions

User Group	Definition
Never User	Participant had never tried using a BIDI® Stick device, not even once or twice
Ever User	Participant had used an e-cigarette / the BIDI® Stick brand / a BIDI® Stick device, even once or twice
Current User	Participant had used an e-cigarette / the BIDI® Stick brand / a BIDI® Stick device in the past 30 days

Table 2: Young Adult User Group Definitions

User Groups	Definition
Every Day or Some Days User[1] (Brand)	Participant now uses any of the 11 BIDI® Stick devices every day or some days
Every Day or Some Days User[1]	Participant now uses an e-cigarette / a BIDI® Stick device every day or some days
Current Established User	Participant now uses an e-cigarette / a BIDI® Stick device every day or some days and have used an e-cigarette / a BIDI® Stick device 100 or more times in their lifetime

Current Experimental User	Participant now uses an e-cigarette / a BIDI® Stick device every day or some days and have used an e-cigarette / a BIDI® Stick device less than 100 times in their lifetime

[1]An every day or some days user includes current established users and current experimental users

Statistical Analysis

Following data collection, design weights were adjusted to account for any differential non-response that may have occurred. Geodemographic distributions (age, gender, race, census region, household income) for the corresponding youth and young adult populations were obtained from the 2021 March Supplement of the U.S. Census Bureau's Current Population Survey (CPS), the U.S. Census Bureau's American Community Survey (ACS), or from the weighted KnowledgePanel profile data. An iterative proportional fitting (raking) procedure was used to produce the final weights. Weights were examined to identify and, if necessary, trim outliers at the extreme upper and lower tails of the weight distribution. The resulting weights were then scaled to aggregate to the total sample size of all eligible respondents.

Prevalence estimates including a weighted percentage and 95% confidence intervals (CI) were produced for each user group definition of youth and young adults. Data were weighted using the effective base weight function. CIs were calculated using the Jeffreys method. Weighted prevalence estimates were used to calculate the estimated weighted number of persons and the 95% confidence interval based on the March 2021 United States Census Bureau Current Population Survey. The estimated number of persons was calculated by dividing the population estimate by the weighed percentage then rounded down to the nearest 10,000 persons.   All analyses were conducted in SPSS v27.0.

Results

Use of the BIDI® Stick Brand

In Table 3 an estimated 0.91% [95%CI: 0.44-1.68] or 190,000 [95% CI: 90,000-350,000] of youth aged 13 to 17 years reported having ever used a BIDI® Stick branded product. Current i.e. past 30-day use of the BIDI® Stick brand was reported by 0.04% [95% CI: 0.00%-0.38%] or <10,000 youth aged 13 to 17 years

Table 3: Prevalence of ever[1] and current use[2] of the BIDI® Stick brand among a nationally representative sample of youth

	13 to 17 years		13 to 14 years		15 to 17 years	
	W% [95% CI]	EWNP [95% CI] ‡	W% [95% CI]	EWNP [95% CI] ‡	W% [95% CI]	EWNP [95% CI] ‡
Ever Users	0.91 [0.44-1.68]	190,000 [90,000-350,000]	0.32 [0.04-1.32]	20,000 [0,000-100,000]	1.29 [0.58-2.51]	160,000 [70,000-320,000]
Current Users	0.04 [0.00-0.38]	<10,000	0.00 [†]	<10,000	0.07 [0.00-0.63]	<10,000

Abbreviations: W% = weighted percentage; CI = confidence interval; EWNP = estimated weighted number of persons

‡ = rounded down to the nearest 10,000 persons

[†] = 95% CI not reported

[1] Ever use is defined as having ever used the BIDI® Stick brand even once or twice

[1] Current use is defined as use of the BIDI® Stick brand in the past 30 days

In table 4 an estimated 3.90% [95% CI: 2.49-5.81] or 470,000 [95% CI: 300,000-700,000] young adults aged

18 to 20 years reported ever use of the BIDI® Stick brand. An estimated 0.60% [95% CI: 0.17- 1.55] or

70,000 [95% CI: 20,000-180,000] reported now using a BIDI® Stick branded product "every day" or

"some days".

Table 4: Prevalence of ever[1] use and 'every day or some days'[2] use of the BIDI® Stick brand among a nationally representative sample of young adults

	18 to 20 years	
	W% [95% CI]	**EWNP [95% CI] ‡**
Ever Users	3.90 [2.49-5.81]	470,000 [300,000-700,000]
Every Day or Some Days Users	0.60 [0.17-1.55]	70,000 [20,000-180,000]

Abbreviations: W% = weighted percentage; CI = confidence interval; EWNP = estimated weighted number of persons

‡ = rounded down to the nearest 10,000 persons

[1] Ever use is defined as having ever used the BIDI® Stick brand even once or twice

[2] 'Every day or some days' use of the BIDI® Stick brand is defined as participants who reported now using any one of the 11 BIDI® Stick devices "every day" or "some days"

Use of BIDI® Stick Flavor Variants amongst those aged 13 to 17

In Table 5 ever use of the BIDI® Stick in Winter, Marigold and Dawn flavor variants was not reported by youth aged 13-17 (0.00%, <10,000). Youth aged 13-17 reported ever use of the BIDI® Stick Regal (0.02%, <10,000), Gold (0.06%, 10,000), Tropic (0.08%, 10,000), Arctic (0.08%, 10,000), Solar (0.09%, 10,000), Classic (0.10%, 20,000), Summer (0.13%, 20,000) and Zest (0.25%, 50,000) flavor variants. Current use of a BIDI® Stick by youth was reported for the BIDI® Stick Summer only (0.04%, <10,000).

Table 5: Prevalence of never[1], ever[2], and current use[3] of BIDI® Stick products among a nationally representative sample of youth

	13 to 17 years		13 to 14 years		15 to 17 years	
	W% [95% CI]	EWNP [95% CI] ‡	W% [95% CI]	EWNP [95% CI] ‡	W% [95% CI]	EWNP [95% CI] ‡
BIDI® Stick Artic						
Never Users	99.50 [98.88-99.82]	21,020,000 [20,890,000-21,090,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.31 [98.34-99.78]	12,740,000 [12,620,000-12,800,000]
Ever Users	0.08 [0.01-0.44]	10,000 [0,000-90,000]	0.00 [†]	<10,000	0.13 [0.01-0.74]	10,000 [0,000-90,000]
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Classic						
Never Users	99.48 [98.85-99.80]	21,020,000 [20,880,000-21,080,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.28 [98.28-99.76]	12,740,000 [12,610,000-12,800,000]
Ever Users	0.10 [0.01-0.49]	20,000 [0,000-100,000]	0.00 [†]	<10,000	0.16 [0.02-0.81]	20,000 [0,000-100,000]
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Zest						
Never Users	99.33 [98.64-99.71]	20,980,000 [20,840,000-21,070,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.03 [97.93-99.62]	12,710,000 [12,570,000-12,780,000]
Ever Users	0.25 [0.06-0.74]	50,000 [10,000-150,000]	0.00 [†]	<10,000	0.41 [0.09-1.24]	50,000 [10,000-150,000]
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Winter						
Never Users	99.58 [98.99-99.86]	21,040,000 [20,910,000-21,100,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.44 [98.53-99.84]	12,760,000 [12,640,000-12,810,000]
Ever Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Tropic						
Never Users	99.49 [98.87-99.81]	21,020,000 [20,890,000-21,090,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.30 [98.32-99.77]	12,740,000 [12,620,000-12,800,000]
Ever Users	0.08 [0.01-0.45]	10,000 [0,000-90,000]	0.00 [†]	<10,000	0.14 [0.01-0.76]	10,000 [0,000-90,000]
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Gold						
Never Users	99.52 [98.90-99.82]	21,020,000 [20,890,000-21,090,000]	99.68 [98.69-99.96]	8,260,000 [8,180,000-8,290,000]	99.41 [98.48-99.82]	12,760,000 [12,640,000-12,810,000]
Ever Users	0.06 [0.00-0.41]	10,000 [0,000-80,000]	0.10 [0.00-0.90]	<10,000	0.03 [0.00-0.54]	<10,000
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Marigold						
Never Users	99.58 [98.99-99.86]	21,040,000 [20,910,000-21,100,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.44 [98.53-99.84]	12,760,000 [12,640,000-12,810,000]
Ever Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Regal						
Never Users	99.56 [98.96-99.85]	21,030,000 [20,910,000-21,090,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.41 [98.48-99.82]	12,760,000 [12,640,000-12,810,000]
Ever Users	0.02 [0.00-0.32]	<10,000	0.00 [†]	<10,000	0.03 [0.00-0.54]	<10,000
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Summer						
Never Users	99.45 [98.81-99.79]	21,010,000 [20,870,000-21,080,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.23 [98.21-99.73]	12,730,000 [12,600,000-12,800,000]
Ever Users	0.13 [0.02-0.54]	20,000 [0,000-110,000]	0.00 [†]	<10,000	0.21 [0.03-0.90]	20,000 [0,000-110,000]
Current Users	0.04 [0.00-0.38]	<10,000	0.00 [†]	<10,000	0.07 [0.00-0.63]	<10,000
BIDI® Stick Solar						
Never Users	99.49 [98.86-99.81]	21,020,000 [20,890,000-21,090,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.29 [98.30-99.76]	12,740,000 [12,610,000-12,800,000]
Ever Users	0.09 [0.01-0.47]	10,000 [0,000-90,000]	0.00 [†]	<10,000	0.15 [0.01-0.79]	10,000 [0,000-100,000]
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
BIDI® Stick Dawn						
Never Users	99.58 [98.99-99.86]	21,040,000 [20,910,000-21,100,000]	99.79 [98.88-99.98]	8,270,000 [8,200,000-8,290,000]	99.44 [98.53-99.84]	12,760,000 [12,640,000-12,810,000]

Ever Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000
Current Users	0.00 [†]	<10,000	0.00 [†]	<10,000	0.00 [†]	<10,000

Abbreviations: W% = weighted percentage; CI = Confidence Interval; EWNP = Estimated Weighted Number of People

‡ = rounded down to the nearest 10,000 persons

[†] = 95% CI not reported

[1] Never use is defined as having never used the BIDI® Stick device not even once or twice

[2] Ever use is defined as having ever used the BIDI® Stick device even once or twice

[3] Current use is defined as use of the BIDI® Stick device in the past 30 days

In table 6 young adults reporting on whether they had used BIDI® Stick products every day or some days is summarized. In the case of the tobacco flavored BIDI® Stick Classic product (0.22%; 20,000 95% CI range 0,000-110,000) reported using the product every day or some days. There were no established current users of the BIDI® Stick tobacco flavored Classic product. In the case of the menthol flavored BIDI® Stick Artic (0.30% 30,000 95% CI   0.000-130,000) reported every day or some day use of the product. The estimate of current established use of the BIDI® Stick Artic product was 0.08% <10,000). In the case of the BIDI® Stick Dawn (0.04%; <10,000), Winter (0.04%; <10,000), Zest (0.05%; <10,000), Marigold (0.10%; <10,000), Solar (0.15%; 10,000 95% CI range 0,000-90,000), Gold (0.25%; 30,000 95% CI range 0,000-110,000) and Tropic (0.27%; 30,000 95% CI range 0,000-120,000) reported use on every day or some days.   Current established use of each of these products was estimated to be 0.00% suggesting a prevalence of use under 10,000 amongst young adults in the U.S.

Table 6: Prevalence of 'every day or some days'[1], current established[2] and current experimental[3] use of BIDI® Stick products among a nationally representative sample of young adults

	18 to 20 years	
	W% [95% CI]	EWNP [95% CI] ‡
BIDI® Stick Artic		
Every Day or Some Days Users	0.30 [0.05-1.08]	30,000 [0,000-130,000]
Current Established Users	0.08 [0.00-0.67]	<10,000
Current Experimental Users	0.22 [0.03-0.93]	20,000 [0,000-110,000]
BIDI® Stick Classic		
Every Day or Some Days Users	0.22 [0.03-0.95]	20,000 [0,000-110,000]
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.22 [0.03-0.95]	20,000 [0,000-110,000]
BIDI® Stick Zest		
Every Day or Some Days Users	0.05 [0.00-0.61]	<10,000
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.05 [0.00-0.61]	<10,000
BIDI® Stick Winter		
Every Day or Some Days Users	0.04 [0.00-0.57]	<10,000
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.04 [0.00-0.57]	<10,000
BIDI® Stick Tropic		
Every Day or Some Days Users	0.27 [0.04-1.02]	30,000 [0,000-120,000]
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.27 [0.04-1.02]	30,000 [0,000-120,000]
BIDI® Stick Gold		
Every Day or Some Days Users	0.25 [0.04-0.99]	30,000 [0,000-110,000]
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.25 [0.04-0.99]	30,000 [0,000-110,000]
BIDI® Stick Marigold		
Every Day or Some Days Users	0.10 [0.01-0.71]	10,000 [0,000-80,000]
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.10 [0.01-0.71]	10,000 [0,000-80,000]
BIDI® Stick Regal		
Every Day or Some Days Users	0.20 [0.02-0.91]	20,000 [0,000-100,000]
Current Established Users	0.08 [0.00-0.67]	<10,000
Current Experimental Users	0.12 [0.01-0.75]	10,000 [0,000-90,000]
BIDI® Stick Summer		
Every Day or Some Days Users	0.14 [0.01-0.80]	10,000 [0,000-90,000]
Current Established Users	0.08 [0.00-0.67]	<10,000
Current Experimental Users	0.06 [0.00-0.62]	<10,000
BIDI® Stick Solar		
Every Day or Some Days Users	0.15 [0.01-0.80]	10,000 [0,000-90,000]
Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.15 [0.01-0.80]	10,000 [0,000-90,000]
BIDI® Stick Dawn		
Every Day or Some Days Users	0.04 [0.00-0.58]	<10,000

Current Established Users	0.00 [†]	<10,000
Current Experimental Users	0.04 [0.00-0.58]	<10,000

Abbreviations: W% = weighted percentage; CI = Confidence Interval; EWNP = Estimated Weighted Number of People

‡ = rounded down to the nearest 10,000 persons

[†] = 95% CI not reported

[1] 'Every day or some days' use is defined as use of the BIDI® Stick device "every day" or "some days"

[2] Current Established use is defined as use of the BIDI® Stick device 100 or more times in lifetime and now uses the BIDI® Stick device "every day" or "some days"

[3] Current Experimental use is defined as use of the BIDI® Stick device less than 100 times in lifetime and now uses the BIDI® Stick device "every day" or "some days"

Discussion

The research reported in this paper is one of the first studies to provide an estimate of the prevalence with which youth and young adults below the minimum legal age of 21 years   (at which tobacco products can be legally purchased in the United States) were using the BIDI® Stick brand of disposable e-cigarette products. On the basis of the data presented here the BIDI® Stick range of disposable e-cigarette devices does not appear to be a major contributor to the evident growth in youth use of disposable e-cigarette devices as demonstrated by the 2022 National Youth Tobacco Survey.

Within the United States, the Food and Drug Administration is currently overseeing the Pre-Market Tobacco Product Application process through which e-cigarette manufacturers are required to provide a range of data to FDA to enable the regulatory body to determine whether the products in question can be judged to be "appropriate for the protection of the public health" [15]. Whilst the definition of what constitutes "appropriate for the protection of the public health" (APPH) has not been precisely set out by the FDA, it is highly unlikely that an electronic nicotine delivery product that was being widely used by young people would be judged to be appropriate in this way [15].

Whilst the finding of very low levels of youth use of BIDI® Stickis positive, that finding does not in and of itself mean that the BIDI® Stick range of products would indeed be judged as being "appropriate for the protection of the public health" (APPH). In making that determination FDA are seeking to balance the potential benefit of ENDS products in assisting adult smokers in quitting with the risk and harm associated with the use of these products by youth.   On the basis of the data presented here then evidence that can contribute to at least part of that equation has been presented. The further need now is to establish whether adult smokers using the BIDI® Stick range of products are being assisted to switch wholly away from using combustible tobacco products, or to significantly reduce the extent of their use of those products.

The findings of this study should be interpreted within the context of several limitations. There was no pre-testing of participants' comprehension of survey questions. However, such pre-testing was not deemed to be necessary as all questions and response options used in this study had been extracted or closely adapted from NYTS 2021 and the PATH Waves 4 and 5 Youth Interview Form, both of which were developed based on extensive cognitive testing and are well-established as comprehensible to an 8th grade reading level. The estimates reported here are limited by a reliance on accurate, honest, self-reporting of tobacco product use behaviours. Self-reported tobacco product use may be subject to response bias. For the youth population, although participants were asked to complete and submit the survey in private and were assured that their answers would not be disclosed to their parents, participants may have been reluctant to report underage use of tobacco products. The validity of self-reported tobacco product use has, overall, been shown to be high in population-based studies. [16] However to enhance the accuracy of self-reported brand and device usage data this study combined both narrative questioning and image presentation.   Showing an image of a tobacco product carries a risk of making a proportion of participants, especially youth, aware of e-cigarettes for the first time and increasing their curiosity to try using e-cigarettes. To mitigate this risk, participants were only shown a tobacco product image if they reported that they were aware of e-cigarettes before the study. Finally, the research undertaken provides an estimate of the prevalence of BIDI® Stick device usage among U.S. youth and young adults at a single point in time. Given the fluidity in youth e-cigarette using behavior [17] there is an important need to monitor changes in e-cigarette use over time and to identify whether the very low level of youth use of BIDI® Stick branded products demonstrated in this study persists.

Conclusions

This study provides estimates of the prevalence of youth and under-age adult use of the BIDI® Stick disposable e-cigarette range encompassing 11 devices: the BIDI® Stick Classic (a tobacco flavored device), the BIDI® Stick Artic (a menthol flavored device) and 9 other flavor variants. The data presented here, whilst by no means providing conclusive proof that the BIDI® Stick range of products

are "appropriate for the protection of the public health", illustrate a level of youth use which would be

congruent with a product that could be judged "appropriate for the protection of the public health".

Given the evident fluidity in youth e-cigarette use within the United States, and the capacity of e-

cigarette manufacturers to innovate new devices, there is a clear need to continually monitor the

prevalence with which e-cigarette devices are being used by youth and under-age young adults.

Institutional Board Approval

An application was submitted to Advarra Institutional Review Board (IRB) on April 14, 2022. The

application included the Study Protocol, Consent Forms and Product Images and Codes. Approval was

obtained on April 21, 2022 (Pro00062814). A Subject Facing Material Modification application was

submitted on May 4, 2022, for the Survey Instruments. Approval was obtained on May 9, 2022.

Ethical Conduct of the Study

This study was conducted in accordance with the principles of ethical research. The organization

contracted for data collection is a member of the Market Research Society and thus, operated in

accordance with the Market Research Society Code of Conduct encompassing all local rules and

regulations for data collection.

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