

**Supplemental Table 1.** Characteristics of studies included in review.

<b>1<sup>st</sup> Author (year)</b>	<b><i>n</i></b>	<b>Country (State)</b>	<b>Population</b>	<b>Probability Sampling of Cases</b>	<b>Data collection date</b>	<b>Study Design</b>	<b>Financial Relationship</b>	<b>Key Limitations</b>
Adkison (2013) <sup>61</sup>	5,939	US, UK, Canada, Australia	≥18 years, T	Yes	Jul 2010-Jun 2011	Survey	No	Survey wave response rate not reported.
Barbeau (2103) <sup>49</sup>	11	US (MA)	18-64 years, M, ENDS users	No	Feb 2010	Focus groups	NR	Recruited from ENDS user forums and advocacy groups.
Bullen (2010) <sup>53</sup>	40	New Zealand	18-70 years, T, ENDS naïve	No	Jan-Feb 2008	Exper	Yes	<1 day of exposure. Did not provide time for participants to become familiar with using ENDS. Did not achieve desired (power) sample size. Some participants still smoked on days assigned to ENDS. Only tested 1 model of ENDS.
Caponnetto (2011a) <sup>86</sup>	2	Italy	50-51 years, T, ENDS users	No	Jan 2010	Case report	No	Only 2 participants.
Caponnetto (2011b) <sup>80</sup>	3	Italy	38-65 years, T, ENDS users	No	NR	Case report	No	Only 3 participants.
Caponnetto (2013a) <sup>76</sup>	14	Italy	Mean 45 years (SD 13), T	No	NR	Prosp trial	Yes	Uncontrolled trial of people with schizophrenia.
Caponnetto (2013b) <sup>77</sup>	300	Italy	Mean 44 years (SD 13), T	No	2010-2011	Prosp trial	Yes	Control group tested non-nicotine ENDS, not alternative cessation products. Recruitment ads described ENDS as healthier than cigarettes. 39% lost to follow up.
Chen (2013) <sup>82</sup>	47 adverse event reports	US	N/A	No	2008 – 2012	Observ	No	Adverse events may not be caused by ENDS.
Cho (2011) <sup>63</sup>	4,341	Korea	Mean 14 years (SD 1) in middle schools, mean 17 years (SD 1) in high schools, M	Yes <sup>a</sup>	2008	Survey	No	Regional sample. Did not ask about current use of ENDS so could not assess dual use.
Choi (2012) <sup>89</sup>	66	US (MN)	18-26 years, M	No	Jul-Dec 2010	Focus groups	No	Small group size in some focus groups. Did not differentiate comments from smokers vs. non-smokers or whether certain comments were relevant to ENDS versus other tobacco products.

Choi (2013) <sup>65</sup>	2,624	US (MN, SD, ND, MI, KS)	20-28 years, M	Mixed <sup>b</sup>	Oct 2010-Mar 2011	Survey	No	Regional sample. Mix of probability and non-probability sampling.
Dawkins (2012) <sup>88</sup>	86	United Kingdom	18-52 years, T, ENDS naïve	No	NR	Exper	Yes	Did not include a comparison condition in which participants smoked cigarettes. Participants were only 1-2 hours abstinent from smoking. Brief exposure (experimental session <1 hour). Only tested 1 model of ENDS.
Dawkins (2013a) <sup>87</sup>	20	United Kingdom	Mean 32 years (SD 9), T	No	NR	Exper	Yes	Did not include a comparison condition in which participants smoked cigarettes. Brief exposure (experimental session <1 hour). Only tested 1 model of ENDS.
Dawkins (2013b) <sup>42</sup>	1,347	33 countries (72% in Europe)	Mean 43 years (SD 12), M, ENDS users	No	Sep 2011-May 2012	Survey	No	Recruited through ENDS company websites.
Dockrell (2013) <sup>62</sup>	12,597 in 2010; 12,432 in 2012	United Kingdom	Adults ≥18 years, M	No	Feb 2010 & Feb 2012	Survey	No	In 2010 survey, only current smokers were asked about ENDS use. Response rate not reported.
Dockrell (2013) <sup>62</sup>	1,380	United Kingdom	Adults ≥18 years, T	No	Apr 2010	Survey	No	Did not differentiate users' and non-users' attitudes about ENDS. Response rate not reported.
Eissenberg (2010) <sup>54</sup>	16	US (VA)	Mean 30 years (SD 11), T, ENDS naïve	No	NR	Exper	NR	Did not provide time for participants to become familiar with using ENDS. Brief exposure (experimental session <2 hours).
Etter (2010) <sup>43</sup>	81	Belgium, Canada, France, Switzerland	Mean 37 years (range 19-65), M, current or former ENDS users	No	Sep-Oct 2009	Survey	No	Recruited from smoking cessation websites, ENDS discussion forums, and websites that sell ENDS.
Etter (2011a) <sup>44</sup>	3,587	US, France, United Kingdom, Switzerland, Canada, & others NR	Median 41 years, M	No	Mar-Oct 2010	Survey	No	Most recruitment from smoking cessation websites, ENDS discussion forums, and websites that sell ENDS.

Etter (2011b) <sup>45</sup>	31	US, France, United Kingdom, Switzerland, Canada, Italy	Median 41 years, M, ENDS users	No	Sep 2010- Jan 2011	Survey	No	Very low response rate (16%). Most recruitment from smoking cessation websites, ENDS discussion forums, and websites that sell ENDS.
Farsalinos (2013a) <sup>81</sup>	1	NR	35 years, ENDS user, T	No	Aug-Nov 2012	Case report	No	Only 1 participant. Improvements in health may not be due to ENDS use.
Farsalinos (2013b) <sup>55</sup>	80	Greece	Mean 37-38 years (range 20-45), M, ENDS users and ENDS naïve	No	NR	Exper	NR	Brief exposure (experimental session <1 hour). Only tested 1 mode of ENDS.
Foulds (2011) <sup>46</sup>	104	US (PA)	Mean 34 years (SD 9), ENDS users, T	No	2011	Survey	No	Recruited from meeting of ENDS enthusiasts.
Goniewicz (2012) <sup>64</sup>	13,787	Poland	Mean 18 years (range 15-24), M	Yes <sup>a</sup>	Sep 2010- Jun 2011	Survey	No	Did not survey students living in rural areas with populations of <20,000 or attending private schools.
Goniewicz (2013) <sup>47</sup>	179	Poland	3% were 16-18 years, 18% 19-24 years, 79% ≥25 years, M, ENDS users	No	Fall 2009 (approx.)	Survey	No	Recruited from ENDS discussion forums and websites that sell ENDS.
Hua (2013a) <sup>22</sup>	73	NR	83% 19-45 years, 17% age NR, separate groups of T & ENDS users	No	NR	Observ	No	Use ENDS in YouTube videos may differ from use of ENDS in the general population. Not known whether participants were dual users.
Hua (2013b) <sup>83</sup> <sup>8</sup>	543 posts	US, Canada, United Kingdom, Ireland, Australia, New Zealand, & others NR	18-71 years (age NR for some users), ENDS users, M	No	Up through Jul 2011	Observ	No	Could not validate accuracy of user reports. Reported effects may not be due to ENDS use.
King (2013) <sup>60</sup>	6,689 in 2010; 4,050 in 2011	US	≥18 years, M	Yes	Jul-Sep 2010 Jul-Aug 2011	Survey	No	Did not ask about current use of ENDS so could not assess dual use. Data collection methods varied.

Kralikova (2012) <sup>51</sup>	973	Czech Republic	Mean 32 years, T	No	Oct 2011	Structured interviews	NR	Did not collect data on smoking history or amount of ENDS use.
Li (2013) <sup>70</sup>	480 in 2011; 360 in 2012	New Zealand	≥18 years, T	Yes	Jul-Sep 2011 Mar-May 2012	Survey	No	Treated purchase behavior as a proxy for use. High proportion of “don’t know” responses suggests lack of familiarity with ENDS. Response rate not reported.
McCauley (2012) <sup>84</sup>	1	US (OR)	42 years, ENDS user, tobacco use NR	No	NR	Case report	No	Only 1 case. Health problems may not be due to ENDS use.
McMillen (2012) <sup>67</sup>	3,240	US	14% 18-24 years, 86% ≥25 years, M	Yes	Sep-Nov 2010	Survey	No	Did not distinguish between ENDS and other emerging tobacco products when reporting on smoking cessation.
McQueen (2011) <sup>50</sup>	15	US (MO)	Range 20-70 years (approx.), ENDS users, T	No	Aug 2010	Qual interv	No	Recruited from meeting of ENDS enthusiasts. Varied and unsystematic interview methodology.
Monroy (2012) <sup>85</sup>	1	US (TX)	70 years, ENDS user, T	No	NR	Case report	No	Only 1 case. Health problems may not be due to ENDS use.
Pearson (2012) <sup>59</sup>	2,649	US	≥18 years, M	Yes	Jun 2010	Survey	No	None.
Pearson (2012) <sup>59</sup>	3,658	US	18-49 years, T	Yes <sup>a</sup>	Jan-Apr 2010	Survey	No	Did not ask about current use so could not estimate dual use.
Pepper (2013) <sup>66</sup>	228	US	11-19 years, M	Yes	Nov 2011	Survey	No	Males only. Very few smokers.
Polosa (2011) <sup>75</sup>	40	Italy	Mean 43 years (SD 9), T	No	Winter-summer 2010 (approx.)	Prosp trial	Yes	Uncontrolled trial. 33% lost to follow-up.
Popova (2013) <sup>68</sup>	1,836	US	Mean 42 years, T	Yes	Nov 2011	Survey	No	Potentially moderate response rate (58% completed screening; 41% of those qualified and completed the survey). Did not differentiate ENDS from other smokeless tobacco products when asking about reasons for using.
Prochaska (2012) <sup>90</sup>	153 Twitter accounts	Multiple countries (not listed)	N/A	No	Jul 2007-Aug 2010	Observ	No	Only captured Tweets from accounts with user names that referenced smoking cessation.
Regan (2013) <sup>58</sup>	10,587 in 2009; 10,328 in 2010	US	Adults ≥18 years, M	Yes <sup>a</sup>	Apr-May 2009 & Apr-May 2010	Survey	NR	Moderate response rates (50-52%). May underrepresent people without mailing addresses. Did not ask about current use of ENDS in 2009.

Richardson (2012) <sup>69</sup>	1,310	US	Adults ≥18 years, T	Yes	June 2010	Survey	No	Potentially moderate response rate (65% completed screening; 39% of those qualified and completed the survey). Did not assess current use of ENDS so could not determine dual use of ENDS.
Siegel (2011) <sup>48</sup>	216	NR	Adults ≥18 years, T, ENDS purchasers	No	Mar 2010	Survey	NR	Very low response rate (5%). Sampled from 1 ENDS brand during the company's first weeks of operation.
Sutfin (2013) <sup>71</sup>	4,444	US (NC)	Mean 21 years (SD 3), M	Yes <sup>a</sup>	Fall 2009	Survey	No	Moderate response rate (41%). Did not distinguish former versus experimental smokers.
Trumbo (2013) <sup>52</sup>	244	US (CO)	19-22 years, M	No	Apr 2011	Survey	No	Participants were students in one lecture class at a university.
Vansickel (2010) <sup>56</sup>	32	US (VA)	18-55 years, T, ENDS naïve	No	NR	Exper	No	Brief exposure (experimental session <2 hours). Did not provide time for participants to become familiar with using ENDS.
Vansickel (2012a) <sup>57</sup>	20	US (VA)	18-55 years, T, not current ENDS users	No	NR	Exper	NR	Brief exposure (experimental session <3 hours). Only tested 1 model of ENDS. Does not describe how participants were recruited.
Vansickel (2012b) <sup>79</sup>	8	US (VA)	18-55 years, ENDS users, T	No	NR	Exper	No	Brief exposure (experimental session 5 hours). Does not describe how ENDS users were recruited.
Vickerman (2013) <sup>74</sup>	2,476	US (CT, LA, NE, NC, SC, TX)	Mean 49 years (SD 13), T	No	Jan 2012-Oct2012	Survey	No	Low response rate (35%). Not known whether participants tried ENDS before calling quitline or whether participants used ENDS as part of their quit attempts.

*Note:* ENDS = electronic nicotine delivery system. US = United States. N/A = not applicable. NR = not reported. SD = standard deviation. T = limited to current and former tobacco users. M = mix of tobacco users and non-users. Exper = experimental study design. Observ = observational study design. Prosp trial = prospective trial. Financial relationship = funded by or received free products from ENDS industry.

<sup>a</sup>Participants were randomly selected from clusters chosen purposively. <sup>b</sup>Combination of probability and quota sampling methods.

**Appendix 1.** Main findings of included studies.

1 <sup>st</sup> Author (year)	Brief Study Description	Rates of Awareness	Rates and Amount of Use	Reactions to Own Use (Users Only)	Beliefs about and Reasons for Use (Users and Non-Users)
Adkison (2013) <sup>61</sup>	Survey of current and former smokers ( <i>n</i> =5,939).	47% had heard of ENDS. Higher among: US and UK (vs. Canada or Australia), young, higher educ, higher income, male, white. Heavy smokers had greatest awareness. Long term quitters had lowest.	<u>Ever use</u> : 8% had ever tried ENDS. Higher among: US and UK, females, younger, higher income, perceived ENDS less harmful than cigs. Highest use among non-daily smokers and lowest among long-term quitters. Use not associated with quit intentions. <u>Current use</u> : 3% were current users. Highest use among daily heavy smokers and non-daily smokers.		<u>Health</u> : 70% of respondents aware of ENDS believed they were less harmful than cigs. Varied by country. Of users, 80% used ENDS in order to reduce harm. <u>Quit</u> : 85% used ENDS to help them quit smoking and 75% to help them reduce smoking. <u>Restrict</u> : 70% used ENDS to get nicotine in smoke-free places.
Barbeau (2013) <sup>49</sup>	Focus groups with ENDS users ( <i>n</i> =11).	-	<u>Dual use</u> : 1 of 11 (9%) was a current smoker.	<u>Quit</u> : ENDS helped users quit smoking, but not necessarily quit using nicotine. Had more success quitting with ENDS than other NRTs. <u>Satisf</u> : Enjoyed the flavors and variety of devices. <u>Similar</u> : ENDS use mimicked the feel of smoking cigs. Had same daily routine with ENDS as with cigs. Similarity of ENDS to cigs made it easier to switch from cigs to ENDS. <u>Withdraw</u> : ENDS alleviated withdrawal symptoms.	<u>Health</u> : Believed ENDS were a safer form of nicotine delivery. <u>Quit</u> : Believed ENDS were better quit aids than other NRTs.

Bullen (2010) <sup>53</sup>	Randomized, repeated measures trial of 0 mg nicotine ENDS, 16 mg nicotine ENDS, cigs, and Nicorette inhalators (n=40).	-	-	<p><u>Health</u>: Experienced few adverse events with ENDS use. Most common were mouth/throat irritation (38%), nausea (29%), vertigo (21%), headache (18%).</p> <p><u>Satisf</u>: 16 mg nicotine ENDS was moderately satisfying and more pleasant than inhalator.</p> <p><u>Similar</u>: Nicotine ENDS considered best alternative to cigs.</p> <p><u>Withdraw</u>: ENDS with nicotine were better at reducing desire to smoke than ENDS without nicotine.</p>	<p><u>Quit</u>: Believed that 16 mg nicotine ENDS would be better than for own or friends' quit attempts than 0 mg nicotine ENDS or inhalator.</p>
Caponnetto (2011a) <sup>86</sup>	Case reports of smokers (n=2).	-	Participant 1 no longer used ENDS after quitting cigs. Participant 2 continued using ENDS after quitting.	<p><u>Health</u>: Dry cough for Participant 2.</p> <p><u>Quit</u>: Both participants quit smoking after a few weeks or months of ENDS use. Both had previously failed to quit using other NRTs.</p>	-
Caponnetto (2011b) <sup>80</sup>	Case reports of smokers (n=3).	-	2 of 3 participants continued using ENDS after quitting smoking.	<p><u>Health</u>: Dry cough for Participant 2. Participant 3 reported improved energy and no exacerbations of chronic lung disease.</p> <p><u>Quit</u>: All 3 quit smoking after previously failing to quit using other NRTs.</p>	<p><u>Quit</u>: All 3 began using ENDS to help quit smoking and believed they would not have been able to quit without ENDS.</p>
Caponnetto (2013a) <sup>76</sup>	12-month prospective trial of ENDS use among smokers (n=14).	-	<p><u>Dual use</u>: At week 52, some participants who reduced smoking were still using ENDS (% not reported).</p> <p><u>Amount</u>: Mean of 1 ENDS cartridge (SD 1) used per day over the course of the study.</p>	<p><u>Health</u>: No serious adverse events. Infrequent reports of dry cough, headache, nausea at early study visits. No change in symptoms of schizophrenia.</p> <p><u>Quit</u>: At week 52, 14% quit smoking and another 50% reduced number of daily cigs by at least half.</p> <p><u>Withdraw</u>: Participants did not experience withdrawal symptoms.</p>	-

Caponnetto (2013b) <sup>77</sup>	12-month randomized trial comparing use of nicotine ENDS to non-nicotine ENDS (n=300).	-	<p><u>Dual use</u>: At week 52, some participants who reduced smoking were still using ENDS (% not reported).</p> <p><u>Amount</u>: Median of 2 cartridges per day at early visits (weeks 2-10), and 0 per day at week 24 and week 52 visits.</p>	<p><u>Health</u>: No serious adverse events. 20% reported shortness of breath at baseline, but dropped to 4% by week 2. Similar patterns for cough, dry mouth, throat irritation and headache.</p> <p><u>Quit</u>: At week 52, in the nicotine ENDS group, 13% quit and another 10% reduced cigs by at least half. 4% of the non-nicotine ENDS group quit and 12% reduced cigs by at least half. No statistical difference between groups.</p> <p><u>Satisf</u>: Low satisfaction, but higher ratings of “would recommend to friend.”</p> <p><u>Withdraw</u>: Few withdrawal symptoms reported. At week 2, 7% reported hunger, 4% insomnia, 4% irritability, 3% anxiety, and 2% depression.</p>	-
Chen (2013) <sup>82</sup>	Description of 47 ENDS adverse event reports.	-	-	<p><u>Health</u>: 17% of reports were serious adverse events (e.g., pneumonia, burns, seizure). Other health effects were minor (e.g., headache, cough, nausea).</p>	-
Cho (2011) <sup>63</sup>	Survey (n=4,341).	10% had heard of ENDS. Most common sources were the Internet (46%) and friends (28%).	<p><u>Ever use</u>: &lt;1% overall had tried ENDS. Higher among males, ever smoked cigs.</p>	-	-



Choi (2012) <sup>89</sup>	Focus group of tobacco-users and non-users (n=66).	-	-	-	<p><u>Gateway</u>: Believed that ENDS could bring people closer to smoking cigs.</p> <p><u>Health</u>: Disagreement and uncertainty about health effects of ENDS.</p> <p><u>Quit</u>: Disagreement about whether ENDS help smokers quit. Anecdotes about others' successfully quitting.</p> <p><u>Restrict</u>: Believed that ENDS could be used anywhere and helped tobacco companies bypass smoking bans.</p> <p><u>Similar</u>: Believed smokers will only use ENDS if mimic feel of cigs. Different social experience with using ENDS than with smoking cigs.</p> <p><u>Withdraw</u>: Believed that people might become addicted to ENDS.</p>
Choi (2013) <sup>65</sup>	Survey (n=2,624).	70% had heard of ENDS. Higher among: males, higher educ, current and former smokers, at least 1 close friend who smokes.	<p><u>Ever use</u>: 7% had ever used ENDS. Of those aware of ENDS, higher use among: younger, male, current or former smoker, at least 1 close friend who smokes, believe ENDS less harmful, believe ENDS can help people quit smoking.</p> <p><u>Current use</u>: 1% had used in past 30 days.</p>	-	<p><u>Health</u>: 53% believed ENDS less harmful than cigs.</p> <p><u>Quit</u>: 45% believed ENDS can help smokers quit.</p> <p><u>Withdraw</u>: 26% believed ENDS less addictive than cigs.</p>
Dawkins (2012) <sup>88</sup>	Randomized trial of 18 mg nicotine ENDS, 0 mg nicotine ENDS, or just holding ENDS (n=86).	-	-	<p><u>Withdraw</u>: Desire to smoke declined for both 18 mg and 0 mg ENDS versus just holding an ENDS. Some reductions in withdrawal symptoms (e.g., anxiety, poor concentration). Experiences varied by gender.</p>	-

Dawkins (2013a) <sup>87</sup>	Randomized trial of 0 mg nicotine ENDS and 18 mg nicotine ENDS (n=20).	-	-	<u>Withdraw</u> : Desire to smoke and withdrawal symptoms were lower with 18 mg nicotine ENDS than 0 mg nicotine ENDS.	-
Dawkins (2013b) <sup>42</sup>	Survey of ENDS users (n=1,347).	First heard about ENDS through the Internet (41%), personal contacts (35%), other media (10%), or saw them being used (8%).	<u>Dual use</u> : 16% were current smokers. <u>Amount</u> : Mean 316 days of use and maximum of 236 puffs per day and 3 mL of e-liquid	<u>Health</u> : 72% reported better breathing. 70% said improved cough. Most common side effects were throat (37%) and mouth (23%) irritation. <u>Quit</u> : 74% had not smoked for at least several weeks since began using ENDS. 89% said ENDS helped them quit smoking and 94% said ENDS helped them cut down on smoking. <u>Restrict</u> : 36% said they frequently used ENDS in places where smoking was banned. <u>Satisf</u> : High overall satisfaction levels. 3% did not like taste. <u>Similar</u> : 56% said used ENDS “in similar manner” to cigs. 68% said ENDS as satisfying as cigs. <u>Withdraw</u> : 91% said using ENDS substantially decreased craving for cigs, and 70% said they do not have the urge to smoke cigs as much. 56% get “definite nicotine hit” from ENDS.	<u>Cost</u> : 3% said that they started using ENDS because they were cheaper than smoking. <u>Health</u> : 6% said they started using ENDS for health reasons. <u>Quit</u> : 76% said they started using as an alternative to smoking. <u>Restrict</u> : 3% said they started using ENDS to avoid smoking restrictions. <u>Similar</u> : 17% liked that ENDS look and feel like cigs.

Dockrell (2013) <sup>62</sup>	Survey (n=12,597 in 2010; n=12,432 in 2012).	Awareness among smokers increased from 62% in 2010 to 79% in 2012. 38% of never-smokers and 47% of former smokers had heard of ENDS in 2012.	<p><u>Ever use:</u> In 2010, 8% of smokers had ever used ENDS (reported for smokers only). In 2012, 22% of current smokers, 4% of former smokers, and &lt;1% of never smokers (overall % not reported). Higher use among younger respondents.</p> <p><u>Current use in 2012:</u> 3% of daily smokers, 1% of former smokers &lt;1% of never smokers (overall % not reported).</p> <p><u>Dual use:</u> 3% of daily smokers in 2010 and 7% in 2012 were current ENDS users.</p>	-	-
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Dockrell (2013) <sup>62</sup>	Survey of smokers (n=1,380).	-	<u>Ever use</u> : 35% had ever used ENDS.	-	<p><u>Cost</u>: 53% believed might be too expensive.</p> <p><u>Health</u>: 39% believed might good for own health and 40% for health of others. 21% believed might not be safe enough. 71% believed ENDS safer than cigs.</p> <p><u>Quit</u>: 55% believed ENDS might help to cut back on and 51% to help quit smoking. 35% of users first tried them to help quit smoking and 31% to cut down on smoking without quitting.</p> <p><u>Restrict</u>: 43% of users first tried ENDS so they could use them where smoking not allowed. 50% believed ENDS might help with cravings where smoking is banned.</p> <p><u>Satisf</u>: 17% believed that they might taste pleasant and 33% believed might taste unpleasant.</p> <p><u>Similar</u>: 35% did not like that ENDS might be mistaken for cigs. 17% liked that ENDS might not resemble a cigarette.</p> <p><u>Withdraw</u>: 60% believed ENDS might satisfy desire to smoke, and 39% believed they might not.</p>
Eissenberg (2010) <sup>54</sup>	Trial of 2 brands of 16 mg nicotine ENDS, cigs, just holding cigs (n=16).	-	-	<u>Withdraw</u> : One ENDS brand decreased craving at 1 time point. No other effects of either ENDS brand at any other time point.	-

<p>Etter (2010)<sup>43</sup></p>	<p>Survey of current and former ENDS users (<i>n</i>=81).</p>	<p>-</p>	<p><u>Amount</u>: 89% were daily users. Median 100 days of use and 175 puffs per day.</p>	<p><u>Cost</u>: Mixed experiences of ENDS cost relative to cigs.  <u>Health</u>: Most frequently listed positive effects: better breathing, less cough, and overall health improvement. Most frequently listed negative effects: dry mouth or throat, vertigo, headache, and nausea.  <u>Quit</u>: Frequently listed that ENDS helped to quit smoking (79% said helped “a lot”). Some previously failed to quit using other NRTs.  <u>Satisf</u>: Multiple comments that liked taste and smell and found pleasurable to use. Some disliked taste or had technical or quality problems.  <u>Similar</u>: Some stopped using ENDS because did not taste like cigs.  <u>Withdraw</u>: Multiple comments that using ENDS reduced cravings.</p>	<p><u>Cost</u>: Reasons for use included lower cost of ENDS relative to cigs.  <u>Health</u>: Reasons for use included that ENDS are healthier than cigs. Some users concerned about potential toxicity.  <u>Quit</u>: Many said they used ENDS in order to quit smoking.  <u>Restrict</u>: Reasons for use included that they can use ENDS in smoke-free places.  <u>Satisf</u>: Reasons for use included the pleasure of the experience.  <u>Similar</u>: Similarity of ENDS to cigs (inhalation, gestures/actions) perceived as a benefit.  <u>Withdraw</u>: Reasons for use included to get nicotine and to relieve cravings.</p>
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Etter (2011a) <sup>44</sup>	Survey (n=3587).	-	<p><u>Ever use:</u> 85% had ever used ENDS. Daily users (vs. never users) more likely to be men, former smokers, and have past use of some NRTs.</p> <p><u>Dual use:</u> 22% of daily ENDS users were current smokers. 65% said they had ever used ENDS and tobacco on the same day.</p> <p><u>Amount:</u> 84% were current ENDS users (81% daily and 3% occasional). Among daily ENDS users, median 91 days of use and 120 puffs per day.</p>	<p><u>Health:</u> 22% said burned throat; 26% said caused dry mouth or throat.</p> <p><u>Quit:</u> 92% of current smokers said ENDS helped reduce smoking. 96% of former smokers said ENDS helped them quit. Of those who stopped using ENDS, 25% said they relapsed to smoking.</p> <p><u>Restrict:</u> 71% used at work and 43% in restaurants/bars.</p> <p><u>Satisf:</u> High satisfaction overall. 91% liked taste, feel of inhalation. 94% would recommend to a friend. Multiple concerns about product quality (e.g., 37% said batteries run out too quickly and 18% said e-liquid leaked). 35% of those who had stopped using ENDS did so because of poor quality.</p> <p><u>Withdraw:</u> Of those who used ENDS during quit attempt, 90% said reduced cravings, 83% reduced irritability, 81% reduced anxiety, and 78% reduced restlessness. 10% still feel urge to smoke when using ENDS. 89% found it easy to abstain from smoking when using ENDS. 33% of those who had stopped using ENDS did so because ENDS did not reduce cravings.</p>	<p><u>Cost:</u> 57% used because they believed ENDS were cheaper than cigs.</p> <p><u>Health:</u> 84% used because they believed ENDS were less toxic than cigs. 6% feared ENDS might be toxic.</p> <p><u>Quit:</u> 77% used to help quit smoking or avoid relapse.</p> <p><u>Restrict:</u> 39% used to handle smoke-free situations.</p> <p><u>Withdraw:</u> 8% were afraid of becoming addicted to ENDS. 79% of former smokers feared they would relapse if do not use ENDS. 79% use ENDS to deal with cravings and 67% to deal with nicotine withdrawal. 4% believed they were addicted to ENDS.</p>
Etter (2011b) <sup>45</sup>	Survey with saliva collection from ENDS users (n=31).	-	<p><u>Dual use:</u> 1 participant (3%) described as occasional smoker.</p> <p><u>Amount:</u> 97% were daily users. Median 94 days of use and 200 puffs per day.</p>	-	-
Farsalinos (2013a) <sup>81</sup>	Case study of 1 former smoker.	-	<p><u>Amount:</u> Used ENDS daily.</p>	<p><u>Health:</u> Alleviated previously elevated white blood cell count (neutrophilia).</p> <p><u>Quit:</u> Quit smoking cigs within 10 days. 2 previous failed attempts.</p>	

Farsalinos (2013b) <sup>55</sup>	Comparison of smoking topography between experienced ENDS users using ENDS ( <i>n</i> =45) and ENDS naïve smokers ( <i>n</i> =35) using both ENDS and cigs.	-	<u>Amount</u> : ENDS users were all daily users and former smokers. Had used ENDS mean of 7 months and vaped 5 mL per day. Observed puff duration longer for ENDS users than other conditions (smokers using cigs or smokers using ENDS).	-	-
Foulds (2011) <sup>46</sup>	Survey of experienced ENDS users ( <i>n</i> =104).	-	<u>Dual use</u> : 12% currently smoked cigs or other tobacco. <u>Amount</u> : 89% used ENDS $\geq$ 20 of past 28 days. Mean 13 months of use (SD 9) and median 20 instances of use of ENDS per day.	<u>Quit</u> : 99% said ENDS helped them successfully quit smoking. 65% previously tried to quit using NRTs. <u>Restrict</u> : 90% were able to use where smoking was banned. <u>Similar</u> : 35% said they use ENDS the same amount or more frequently than cigs. 80% preferred taste of ENDS to cigs. <u>Withdraw</u> : 93% were extremely confident they could abstain from tobacco while using ENDS.	<u>Health</u> : 98% believed ENDS less harmful to their own health than cigs. 80% believed ENDS less harmful to others than cigs. <u>Quit</u> : 73% started using ENDS to help quit tobacco. <u>Restrict</u> : 64% used because they could do so where smoking is banned. <u>Withdraw</u> : 58% believed they get the same or more nicotine with ENDS.
Goniewicz (2012) <sup>64</sup>	Survey ( <i>n</i> =13,787).	86% had heard of ENDS.	<u>Ever use</u> : 21%. Higher among ever smokers, current smokers, males, urban areas, and those who had a smoking parent or partner. <u>Current use</u> : 7% used in the past 30 days. Higher among younger, male, urban, current smokers, and those who had a smoking parent or partner. <u>Dual use</u> : 15% of current smokers had used ENDS in past 30 days.	-	<u>Health</u> : 55% believed that ENDS were safer than cigs.

Goniewicz (2013) <sup>47</sup>	Survey of ENDS users (n=179).	-	<p><u>Dual use</u>: 34% of ENDS users were current smokers.</p> <p><u>Amount</u>: 98% were daily users. 54% had used <math>\geq 1</math> month. 33% used <math>\leq 15</math> times, 27% 16-25 times, and 40% used <math>&gt; 25</math> times per day.</p>	<p><u>Gateway</u>: 20% of those who said they were non-smokers when began using ENDS became smokers.</p> <p><u>Health</u>: Most frequent side effects of ENDS use were cough (27%), phlegm production (25%), and headaches (21%).</p> <p><u>Quit</u>: 64% who smoked when they began using ENDS had quit smoking.</p> <p><u>Similar</u>: 32% found the experience of using ENDS less satisfying, 32% equally satisfying, and 36% more satisfying than smoking.</p>	<p><u>Cost</u>: 14% tried ENDS for “other” reasons, which included cost.</p> <p><u>Health</u>: 41% first tried ENDS as a safer alternative to cigs. 15% believed ENDS were absolutely safe, and 82% believed that ENDS were not absolutely safe but safer than cigs.</p> <p><u>Quit</u>: 41% first tried ENDS to quit smoking.</p> <p><u>Restrict</u>: 14% tried ENDS for “other” reasons, which included being able to use in smoke-free places.</p> <p><u>Withdraw</u>: 33% believed ENDS were as addictive as cigs; 60% believed less addictive, 7% not addictive at all. 54% believed they were addicted to ENDS.</p>
Hua (2013a) <sup>22</sup>	Visual analysis of YouTube videos of individuals using ENDS and smoking cigarettes (n=73).	-	<p><u>Amount</u>: Puff duration for ENDS use was longer than puff duration for cigarette smoking.</p>	-	-
Hua (2013b) <sup>83</sup>	Analysis of reports of health effects from ENDS use (n=543 posts)	-	-	<p><u>Health</u>: 405 symptoms (78 positive, 326 negative, 1 neutral) reported. Most common negative symptoms were in the mouth and throat and in the respiratory, neurological, sensory, and digestive systems.</p>	-
King (2013) <sup>60</sup>	Surveys in 2010 (n=6,689) and 2011 (n=4,050).	39-41% had heard of ENDS in 2010. 58% had heard of ENDS in 2011. Higher among current smokers. Lower among $\geq 65$ years, African Americans, low educ.	<p><u>Ever use</u>: In 2010, 2-3% had ever tried ENDS. Higher among current smokers. In 2011, 6% had ever tried ENDS. Higher among current smokers.</p>	-	-



Kralikova (2012) <sup>51</sup>	Brief structured interviews of smokers (n=973).	86% had heard of ENDS.	<u>Ever use</u> : 26% had ever tried ENDS. <u>Dual use</u> : 7% used ENDS regularly.	<u>Cost</u> : 13% of those who stopped using ENDS found them too expensive. <u>Satisf</u> : 43% disappointed with ENDS use experience, 33% found as expected, and 24% better than expected. Of those who stopped using ENDS, 33% reported lack of satisfaction and 32% did not like taste. <u>Similar</u> : “Other” reasons (4%) for stopping using ENDS included that ENDS did not have the same “natural timing” of cigs.	
Li (2013) <sup>70</sup>	Surveys of smokers and recent quitters in 2011 (n=480) and 2012 (n=360).	-	<u>Ever use</u> : 7% of respondents in 2011 survey had ever purchased an ENDS (proxy for use). Higher among younger adults, higher income. Not associated with quit attempts.	-	<u>Cost</u> : 41% would switch to ENDS if cheaper than cigs. <u>Health</u> : 33% believed ENDS were safer than cigs. <u>Quit</u> : 34% believed ENDS could help people quit. 58% said they would try ENDS to help them quit smoking.
McCauley (2012) <sup>84</sup>	Case study of patient with lipid pneumonia (n=1).	-	<u>Amount</u> : Used ENDS for 7 months before diagnosis.	<u>Health</u> : Developed lipid pneumonia from glycerin-based oils in ENDS vapor. Improved after stopping use of ENDS.	-
McMillen (2012) <sup>67</sup>	Surveys (n=3,240).	-	<u>Ever use</u> : 2% had ever tried ENDS. Higher among current smokers. <u>Current use</u> : <1% of total sample (20% of those who had ever tried ENDS) had used ENDS in past 30 days.	-	-

McQueen (2011) <sup>50</sup>	Interviews with dedicated ENDS users (n=15).	Most common sources of initial awareness: friends, ads, Internet.	<u>Amount</u> : Most used ENDS ≤ 1 year.	<u>Cost</u> : Most found ENDS less expensive than cigs. <u>Health</u> : Less coughing and breathlessness and greater ability to be physically active when using ENDS. <u>Quit</u> : Had success quitting with ENDS even after failed with other quit aids. <u>Satisf</u> : Overall very satisfied. ENDS sometimes required troubleshooting or did not work as expected. <u>Similar</u> : Many switched from ENDS that look like cigs to modified ENDS. <u>Withdraw</u> : Some ENDS users experienced fewer withdrawal symptoms between bouts of use than they did with cigs, and they experienced relief of cravings within 5 minutes after use of ENDS.	<u>Health</u> : Users hoped that ENDS reduce health risks. <u>Similar</u> : Because ENDS are more complex than cigs, they believed there was a learning curve to ENDS use. Some believed ENDS could substitute for cigs because same physical actions of using. <u>Withdraw</u> : Believed ENDS could help get a “nicotine fix.” Believed that novice ENDS users could experience relapse temptation when cannot get ENDS to function properly.
Monroy (2012) <sup>85</sup>	Case study of 1 ENDS user.	-	<u>Amount</u> : Reported using ENDS for past 5-6 months.	<u>Health</u> : ENDS use associated with heart arrhythmia. Resolved after stopped using ENDS.	-
Pearson (2012) <sup>59</sup>	Survey (n=2,649).	40% had heard of ENDS. Higher awareness among: current and former smokers, men, younger respondents. Lower among African-Americans.	<u>Ever use</u> : 3% had ever used ENDS. Higher among smokers and younger age. For smokers, higher use if plan to quit in next 6 months (vs. no plans to quit). Not associated with quit attempts. <u>Current use</u> : 1% of sample (36% of ever users) had used in past 30 days. Higher among smokers and younger age. <u>Dual use</u> : 4% of current smokers had used ENDS in past 30 days.	-	<u>Health</u> : 71% of smokers aware of ENDS believed they were less harmful than cigs.

Pearson (2012) <sup>59</sup>	Survey of smokers (n=3,658).	58% had heard of ENDS. Higher among men. Lower among African-Americans.	<u>Ever use</u> : 6% of current smokers and 3% of former smokers had ever used ENDS. Higher use among White, higher educ, younger age. Not associated with quit intentions or attempts.	-	<u>Health</u> : 85% of smokers who were aware of ENDS believed they were less harmful than cigs.
Pepper (2013) <sup>66</sup>	Survey (n=228).	67% had heard of ENDS. Higher among older adolescents, non-Hispanic.	<u>Ever use</u> : <1% (n=2) had ever tried ENDS. Both were smokers.	-	-
Polosa (2011) <sup>75</sup>	6-month prospective trial of smokers (n=40) using ENDS.	-	<u>Dual use</u> : At week 24, some participants who reduced smoking were still using ENDS (% not reported). <u>Amount</u> : Mean 2 ENDS cartridges used per day (SD 1, range 0-4).	<u>Health</u> : No serious adverse events. Reports of dry cough (32%), mouth (21%) or throat (32%) irritation at early study visits. Most side effects resolved by week 24. <u>Quit</u> : 23% quit smoking and another 33% reduced number of daily cigs ≥50%. Rated ENDS highly as helpful to enable them to refrain from smoking. <u>Satisf</u> : Moderately high ratings of satisfaction. Enjoyed feeling of inhalation and exhalation. Multiple participants experienced problems with malfunctioning ENDS. <u>Withdraw</u> : Participants reported not experiencing withdrawal symptoms.	<u>Quit</u> : Rated ENDS highly for recommending to friends or relatives who want to quit smoking.
Popova (2013) <sup>68</sup>	Survey of current or recently quit smokers (n=1,836).	-	<u>Ever use</u> : 20% had ever used ENDS. Higher among women, younger age, Asians, and unsuccessful quitters (vs. never tried to quit). Not associated with quit intentions. <u>Current use</u> : 8% used ENDS in past month. Higher among those with moderate education, lower income.	-	<u>Quit</u> : Greater interest in ENDS among smokers who plan to quit at any point vs. those who do not plan to quit.

Prochaska (2012) <sup>90</sup>	Descriptive analysis of Twitter accounts (n=153).	-	-	-	<u>Health</u> : Tweets about ENDS included both health warnings and claims of health benefits over cigs. <u>Quit</u> : Some tweets described ENDS as a way to quit smoking.
Regan (2013) <sup>58</sup>	Surveys (n=10,587 in 2009; n=10,328 in 2010)	16% in 2009 and 32% in 2010 had heard of ENDS. Higher awareness in 2010 among: males, younger, non-Hispanic White, current smokers, current tobacco users. Respondents with low educ (less than high school) less likely to be aware and those with some college more likely to be aware compared to college graduates.	<u>Ever use</u> : 1% in 2009. 3% in 2010 had tried ENDS. In 2010, higher among: women, very low and moderate incomes, low educ, former smokers, current smokers. Not associated with quit attempts or intentions. <u>Current use</u> : In 2010, 1% of sample (43% of ever users) had used in past month. Higher among: low educ, current smokers, current tobacco users. <u>Dual use</u> : In 2010, 6% of current smokers and 7% of current tobacco users had used ENDS in past month.	-	<u>Quit</u> : Among smokers, ENDS users and non-users did not differ in quit intentions.
Richardson (2012) <sup>69</sup>	Survey of cig and cigar smokers (n=1,310)	-	<u>Ever use</u> : 10% of cig-only smokers and 24% of dual cig and cigar smokers had ever tried ENDS.	-	<u>Health</u> : 83% of cigar only smokers, 63% of dual cig and cigar smokers, and 35% of cig-only smokers believed that ENDS were less harmful than cigs.

Siegel (2011) <sup>48</sup>	Survey of ENDS ever users 7 months after initial purchase (n=216).	-	<p><u>Current use:</u> At 6 months after purchase, 45% were not using ENDS, 33% non-daily user, and 22% daily users.</p> <p><u>Dual use:</u> among current ENDS users at 6-month follow-up, 65% smoked cigs.</p> <p><u>Amount:</u> Among users, 40% were daily users. 68% used ENDS ≤10 times per day.</p>	<p><u>Quit:</u> 67% had reduced number of cigs per day. 49% quit smoking for some period of time, and 31% were smoking abstinent at 6-month follow-up.</p>	-
Sutfin (2013) <sup>71</sup>	Survey (n=4,444).	-	<p><u>Ever use:</u> 5% had ever used ENDS. Higher use among: males, Hispanic and other race students, members of fraternities/sororities, and current and former smokers (vs. never smokers). Less likely among those who “don’t know” about harms of ENDS vs. believed equally harmful. Not associated with quit intentions among smokers. Of ENDS ever users, 12% were never, 30% were former, 42% were current smokers.</p> <p><u>Current use:</u> 2% had used in past month.</p>	-	<p><u>Health:</u> 23% believed ENDS were less harmful, 17% as harmful, and 2% more harmful than cigs. 50% said they did not know.</p> <p><u>Quit:</u> Among smokers, ENDS users and non-users did not differ in quit intentions.</p>
Trumbo (2013) <sup>52</sup>	Survey (n=244).	71% had heard of ENDS. Higher among current or former smokers than never smokers.	<p><u>Ever use:</u> 13% had ever tried ENDS.</p>	-	<p><u>Restrict:</u> Believed that using ENDS in public places (e.g., restaurants) was more acceptable than smoking cigs in those places.</p>

Vansickel (2010) <sup>56</sup>	Trial of 16 mg nicotine ENDS, 18 mg nicotine ENDS, cigs, and “sham” (unlit cigs) ( <i>n</i> =32).	-	-	<p><u>Satisf</u>: Ratings of satisfying and pleasant increased at all time points for both ENDS. Ratings of “taste good” increased for some time points for both ENDS.</p> <p><u>Similar</u>: Ratings of “mild as own brand [of cigs]” increased at most time points for 1 brand of ENDS.</p> <p><u>Withdraw</u>: Both ENDS significantly reduced intention to smoke, anticipation of withdrawal, craving, and urge to smoke relative to baseline or sham at some time points during observation.</p>	
Vansickel (2012a) <sup>57</sup>	Within-subject “choice sessions” of money versus puffs of ENDS or cigs ( <i>n</i> =20).	-	-	<p><u>Satisf</u>: Increases in “pleasant,” “satisfying,” and “taste good” after use of ENDS.</p> <p><u>Similar</u>: Increases in “harsh as own brand [of cigs],” “mild as own brand,” and “taste like own brand” after use of ENDS.</p> <p><u>Withdraw</u>: Decreases in intention to smoke, anticipation of relief from withdrawal, and urge to smoke after use of ENDS.</p>	
Vansickel (2012b) <sup>79</sup>	Observation of 5-hour “puff sessions” of ENDS users ( <i>n</i> =8).	-	<u>Amount</u> : Mean 12 months of use.	<p><u>Satisf</u>: ENDS use increased ratings of pleasantness, satisfaction, and “taste good.”</p> <p><u>Withdraw</u>: ENDS use decreased anxiety, restlessness, and intention to smoke.</p>	-

Vickerman (2013) <sup>74</sup>	Survey with tobacco users who previously called state quitlines (n=2,476).	-	<p><u>Ever use</u>: 31% had ever tried ENDS. Higher among White, higher educ, live/work with other tobacco users. ENDS users less likely to have quit than never users.</p> <p><u>Current use</u>: 9% used ENDS at time of survey.</p> <p><u>Amount</u>: Of users, 27% used every day and 73% used some days. 62% had used for &lt;1 month.</p>	<p><u>Cost</u>: 2% of ever users tried ENDS because cheaper than cigs.</p> <p><u>Health</u>: 5% tried ENDS because they believed that they were less harmful than cigs.</p> <p><u>Quit</u>: 51% tried ENDS to quit other tobacco, 15% to replace other tobacco, and 7% to reduce other tobacco.</p> <p><u>Restrict</u>: 5% tried ENDS to use in places where other tobacco was not allowed.</p> <p><u>Similar</u>: 6% used because ENDS were a behavioral substitute.</p> <p><u>Withdraw</u>: 5% used to deal with cravings, stress, or nerves.</p>
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*Note*: Some % approximate due to rounding and variations in sample size. Cig = regular tobacco cigarette. ENDS = electronic nicotine delivery system. Mg = milligram. Ml = milliliter. Educ = education. NRT = nicotine replacement therapy (e.g., patch, gum, varenicline). - = not applicable. Dual use only reported if data are available on current ENDS use. Cost = the cost of ENDS. Gateway = use of ENDS causing smoking initiation. Health = health, safety, and side effects of ENDS. Quit = quitting and reducing tobacco use. Restrict = using ENDS to avoid restrictions on smoking. Satisf = satisfaction with ENDS' taste, smell, and product quality. Similar = similarity of ENDS to regular cigarettes in taste, smell, or feeling of use. Withdraw = withdrawal symptoms, desire to smoke, and cravings.