

THE TRIANGULUM: TOBACCO, MARIJUANA, AND E-CIGARETTES

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# The Epidemiology of Poly Substance Use Among Youth and Adults

Kelvin Choi, PhD, MPH

Stadtman Investigator

Division of Intramural Research



**NIH** National Institute  
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# Disclaimer

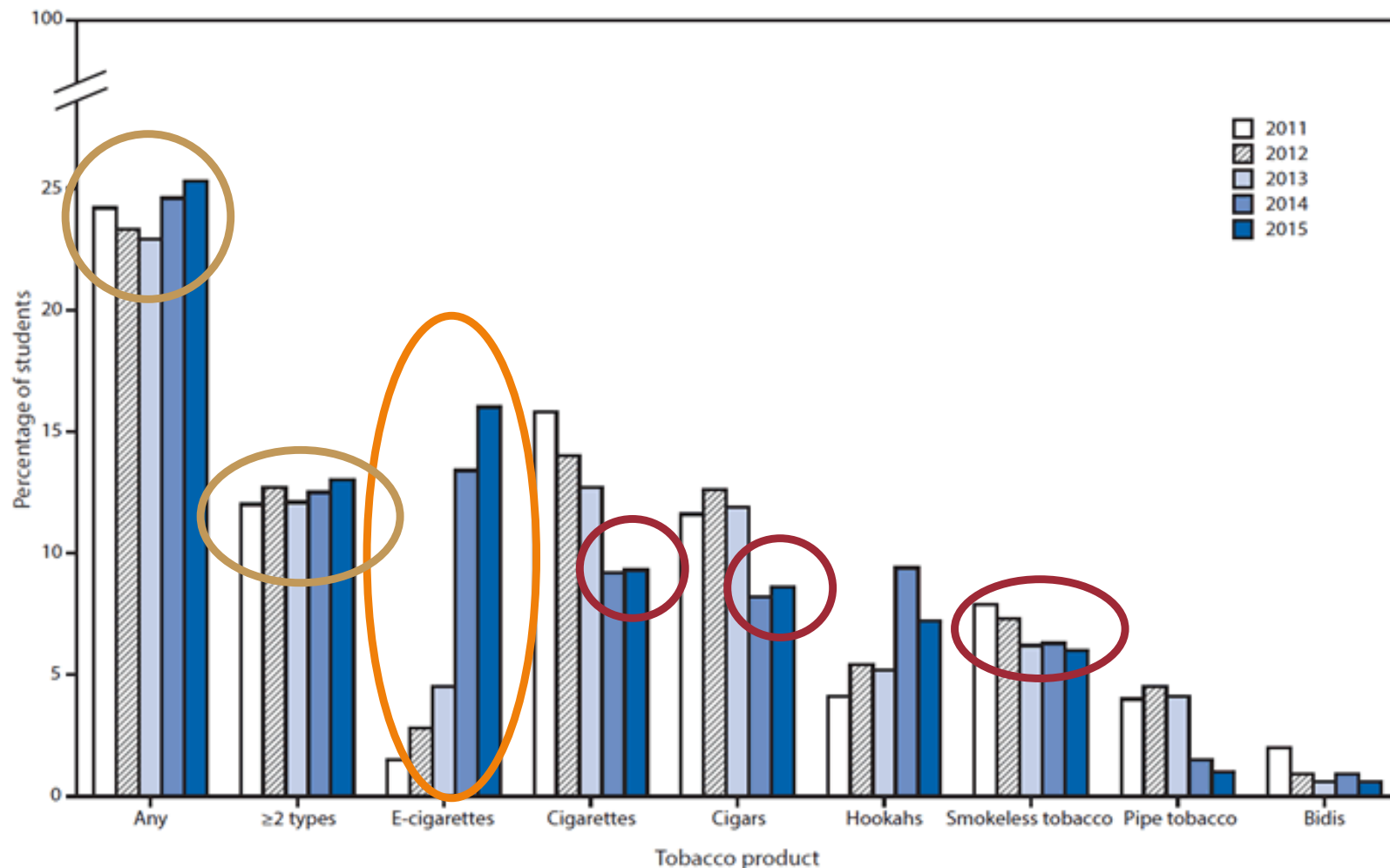
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FIGURE 1. Estimated percentage of high school students who currently use any tobacco products,\*  $\geq 2$  tobacco products,<sup>†</sup> and select tobacco products<sup>‡</sup> — National Youth Tobacco Survey 2011–2015

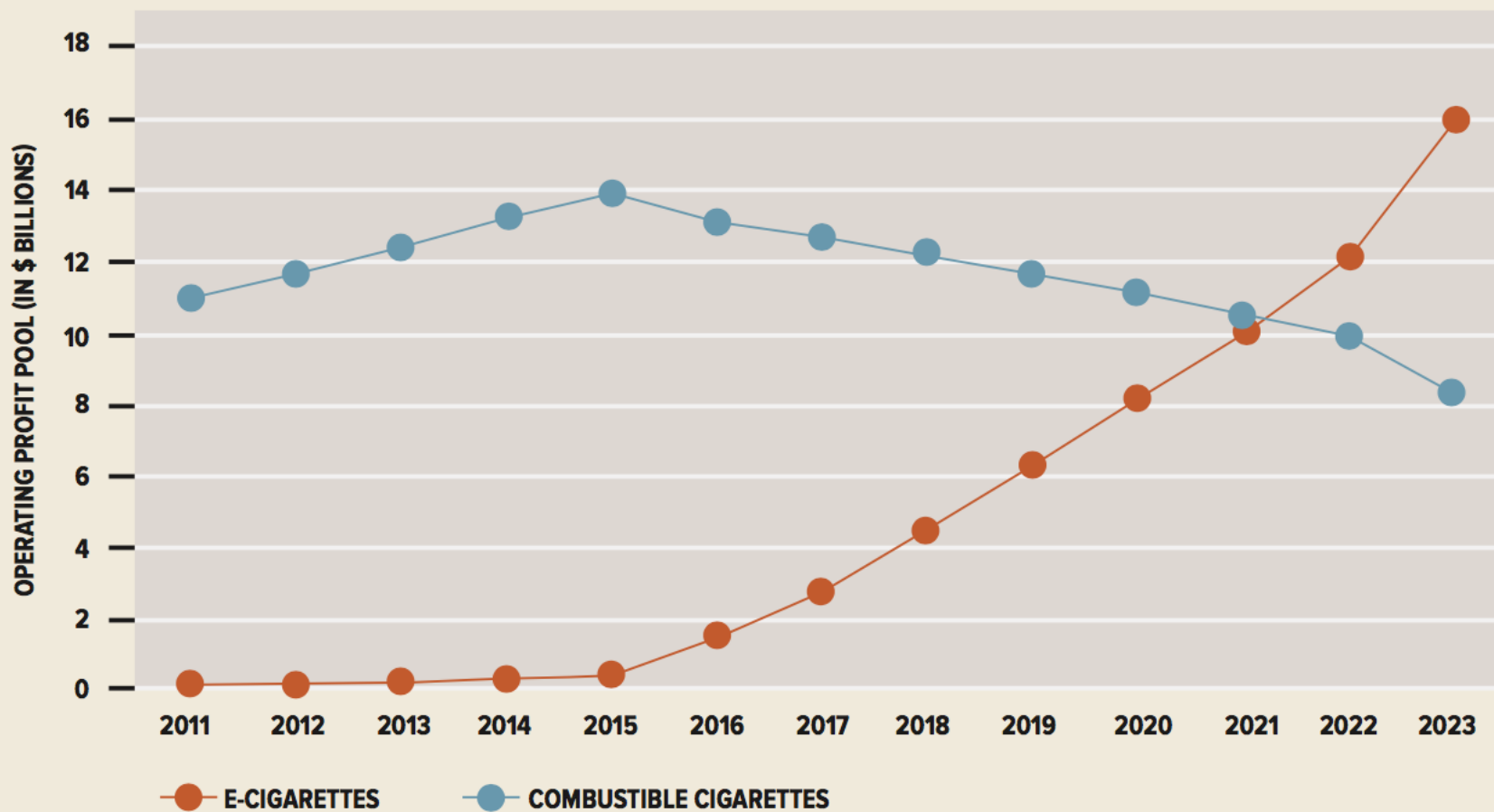


\* Any tobacco product use is defined as past 30-day use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.

<sup>†</sup>  $\geq 2$  tobacco product use is defined as past 30-day use of two or more of the following product types: cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, pipe tobacco, and/or bidis.

<sup>‡</sup> E-cigarettes and hookahs demonstrated a nonlinear increase ( $p < 0.05$ ). Cigarettes and smokeless tobacco demonstrated a linear decrease ( $p < 0.05$ ). Cigars, pipe tobacco, and bidis demonstrated a nonlinear decrease ( $p < 0.05$ ).

## E-CIGARETTE PROFITS COULD SURPASS THOSE OF COMBUSTIBLE CIGARETTES WITHIN 10 YEARS

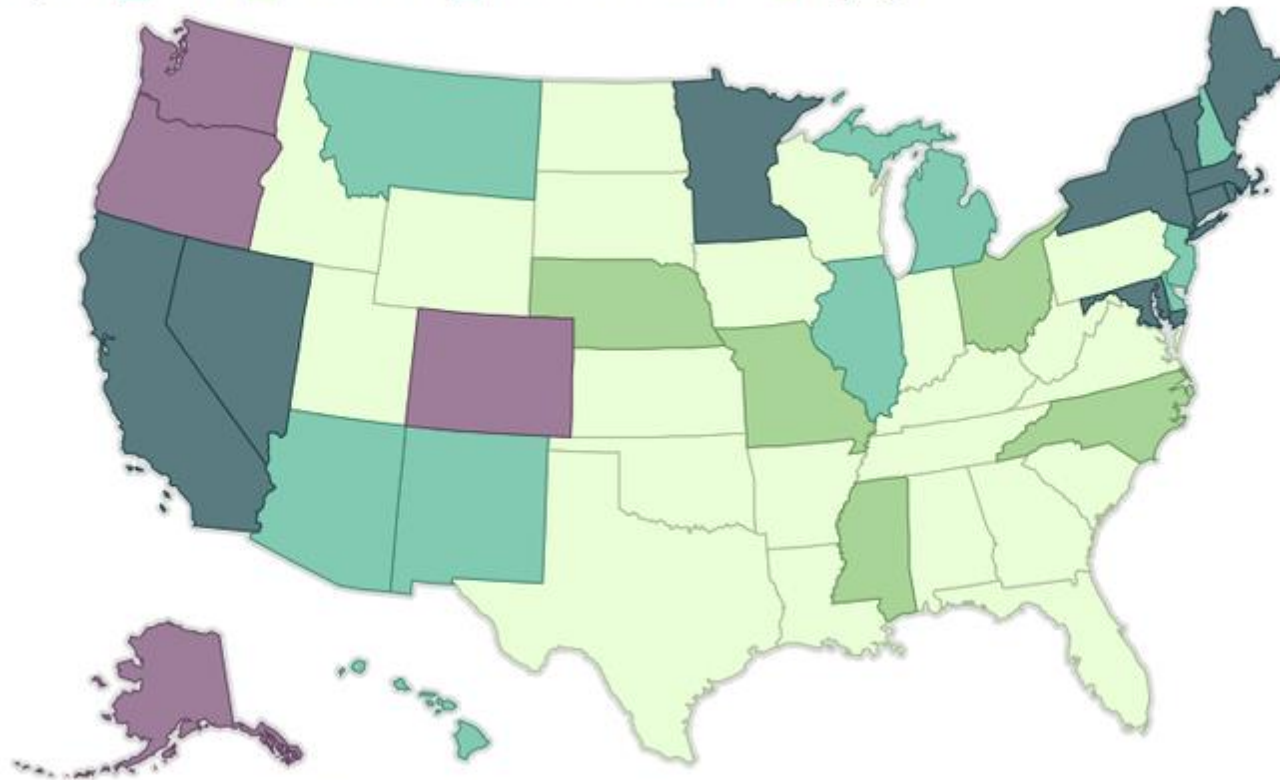


Source: Company data and Wells Fargo Securities LLC estimates. Data for 2011–2013 are actual. Data for 2014–2023 are estimated.

# Marijuana regulations in the US today...

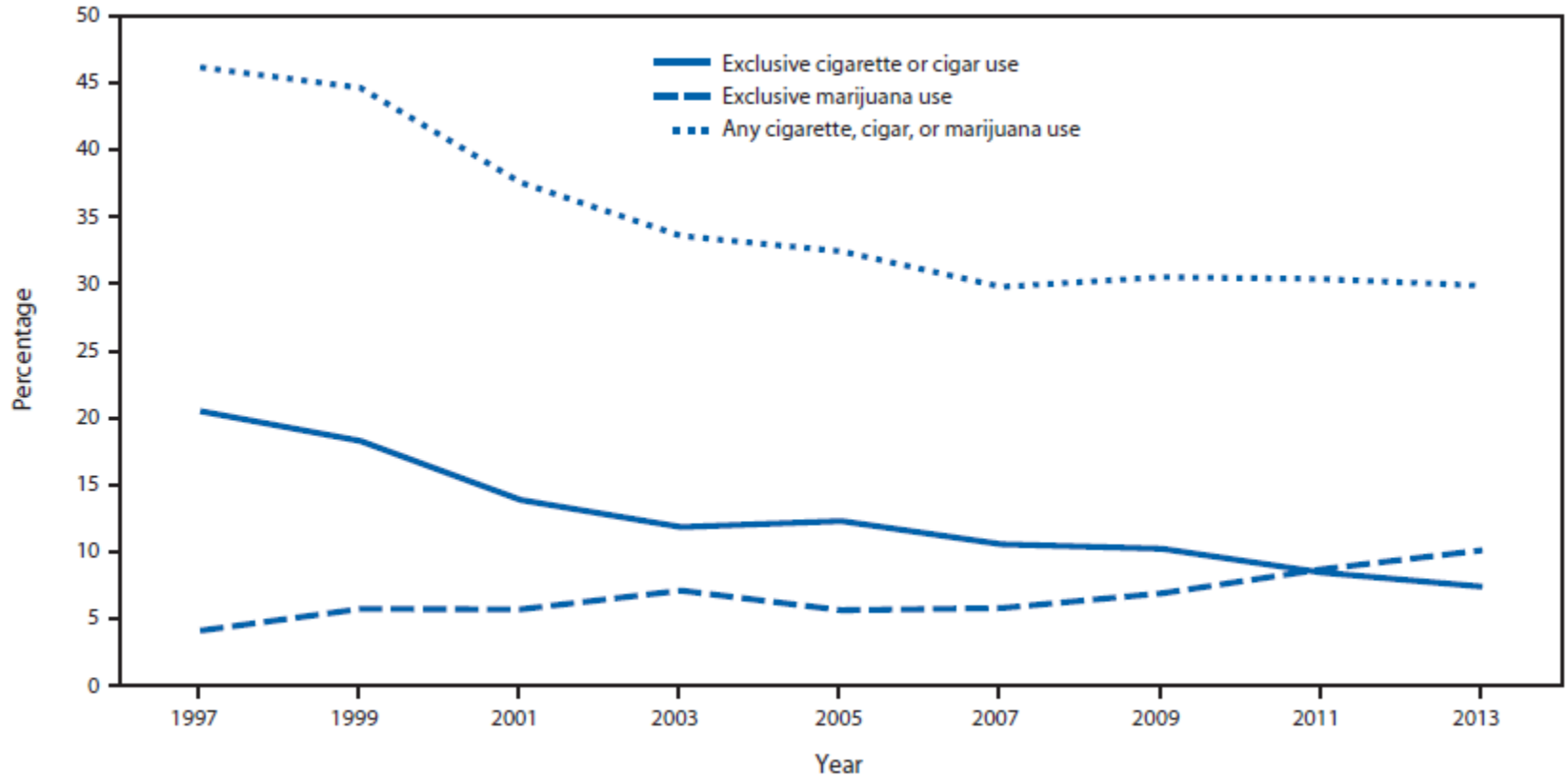
## Status of marijuana laws in the United States

Legend: Legalized (purple), Medical (teal), Decriminalized (light green), Medical and decriminalized (dark teal), Fully illegal (yellow-green)



Source: NORML, Drug Policy Alliance, and the Marijuana Policy Project

# Prevalence of marijuana, cigarette, and cigar use among US 12<sup>th</sup> graders (YRBS)







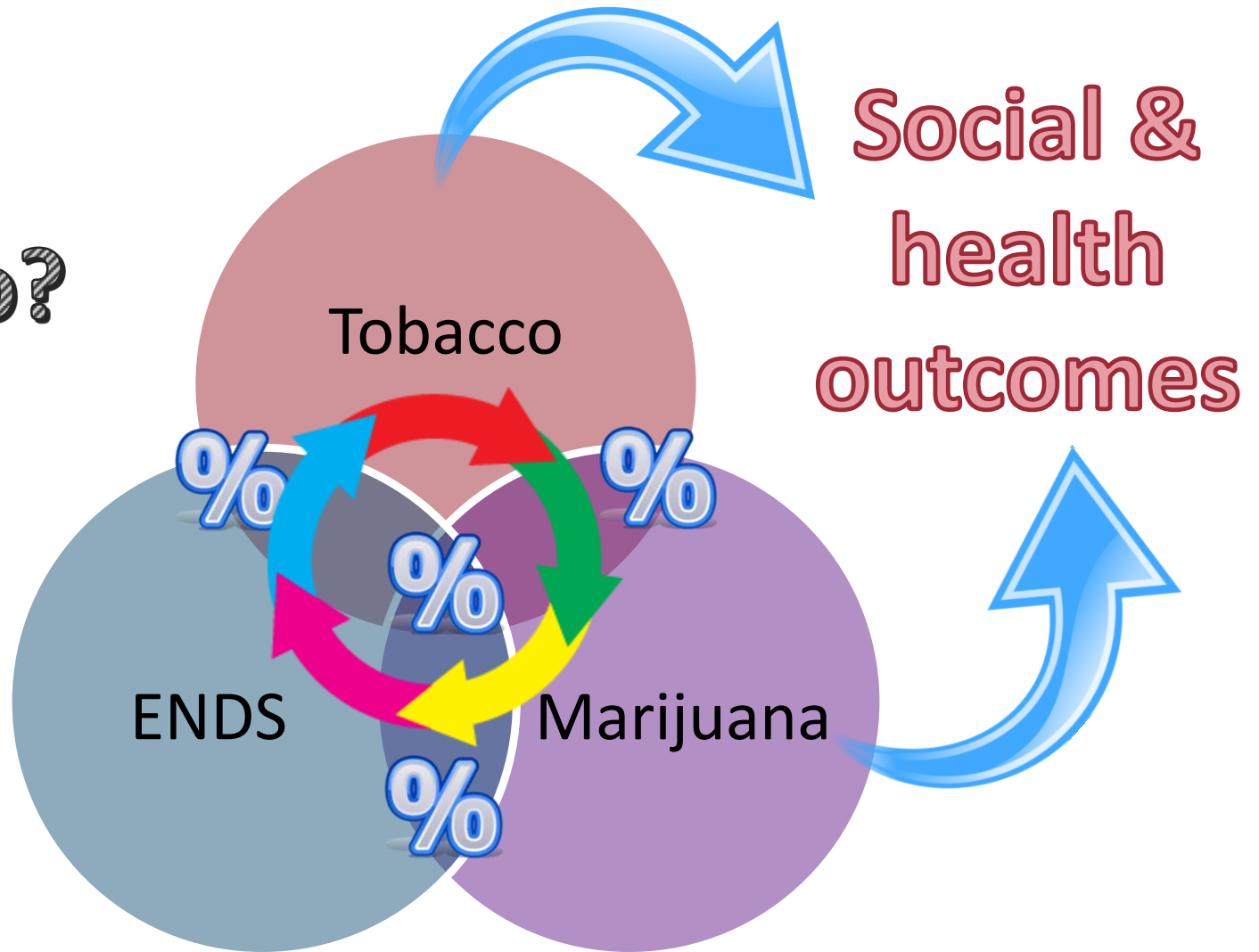
“The HIGH TIMES Cannabis Cup is the world’s leading marijuana trade show, celebrating the world of ganja through competitions, instructional seminars, expositions, celebrity appearances, concerts and product showcases.”

<http://www.cannabiscup.com/>



Today...

**Who?**





## Note:

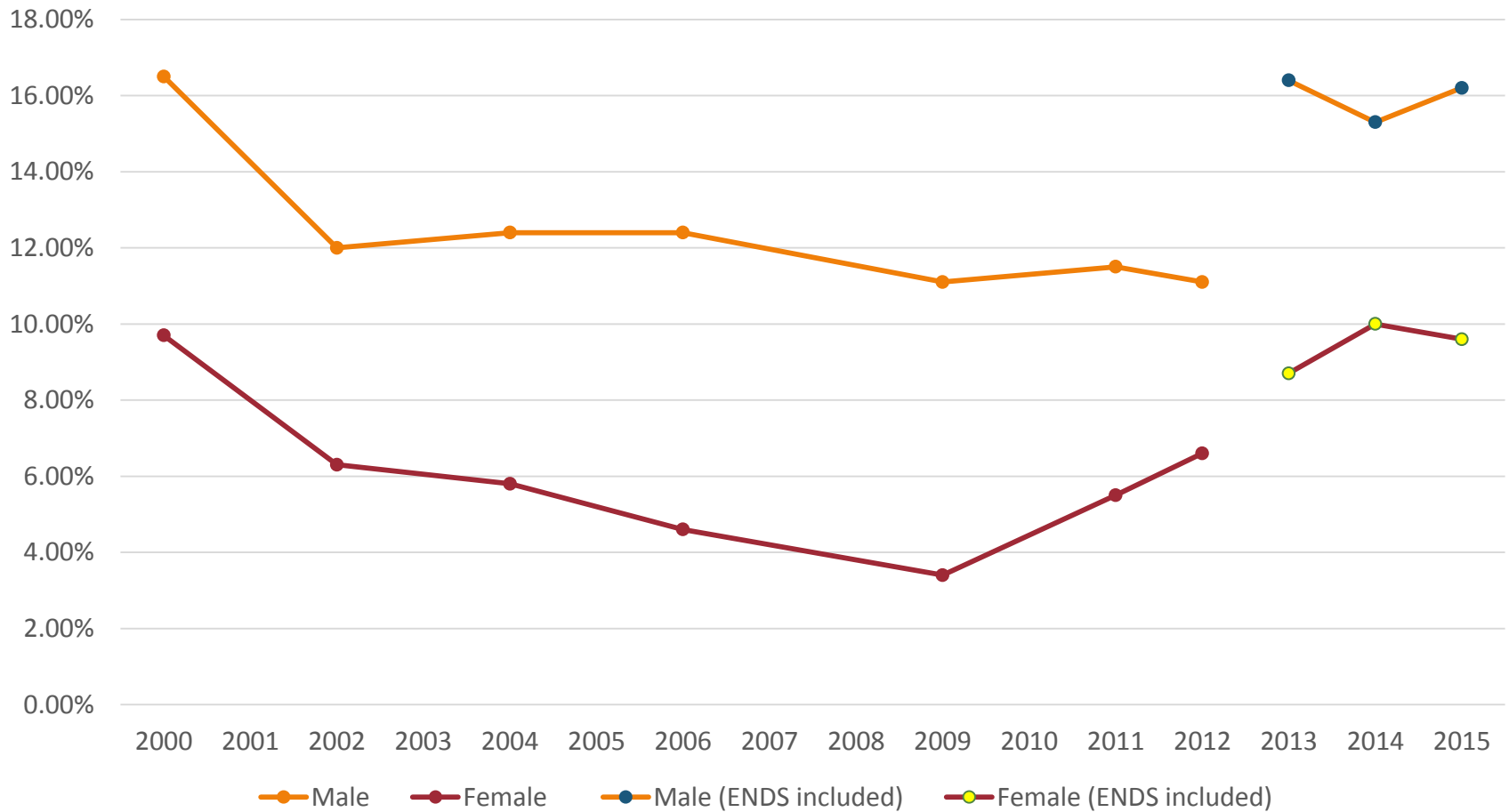
- This is not a systematic review.
- This is a highlight of studies that tried to answer these questions.

## Act 1: Tobacco and ENDS Use



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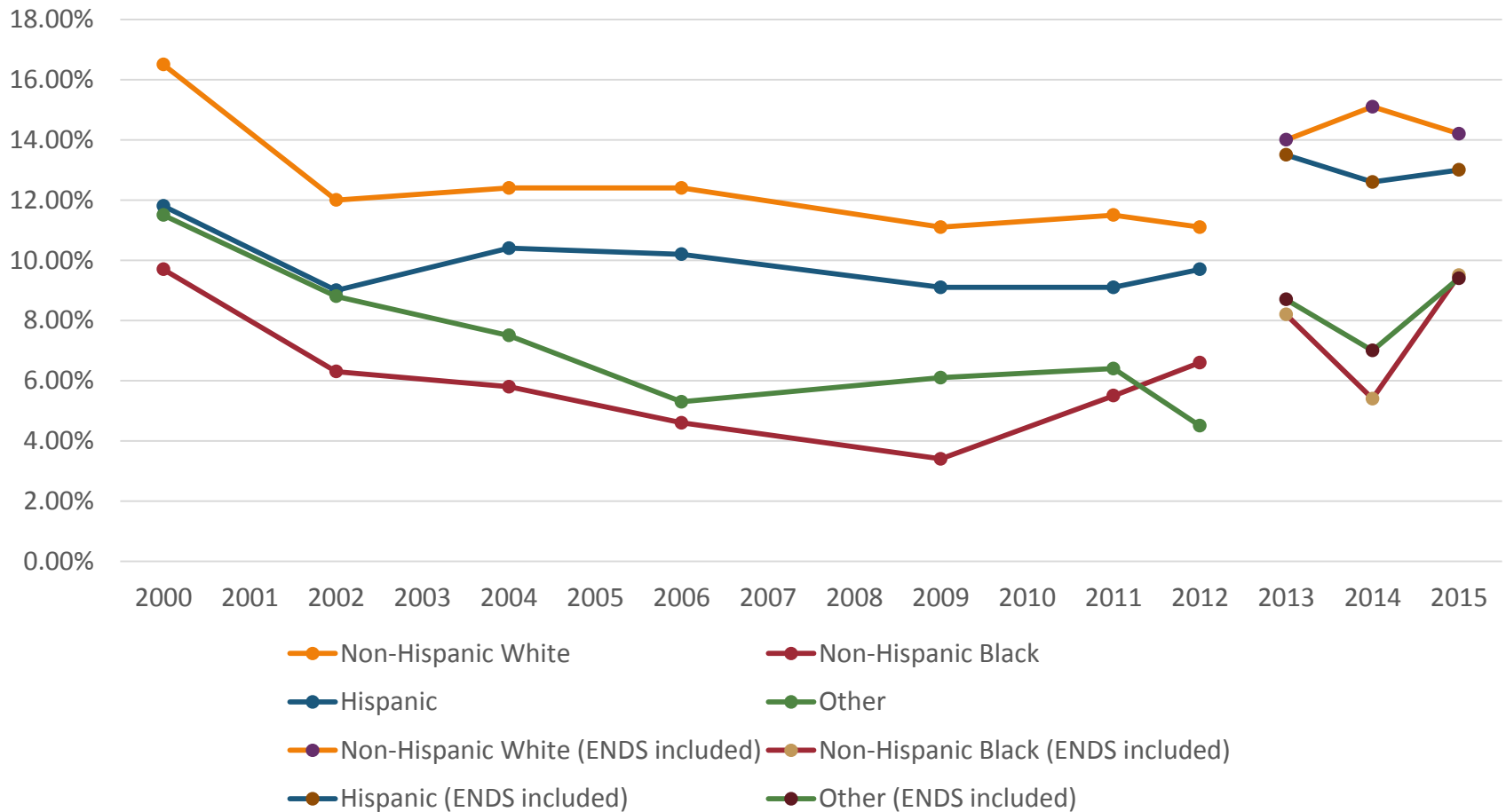
# Current polytobacco use (2+) in US high school students by sex



(Arrazola et al, 2014a; Arrazola et al, 2014b; Arrazola et al 2015; Singh et al, 2016)



# Current polytobacco use (2+) in US high school students by race/ethnicity

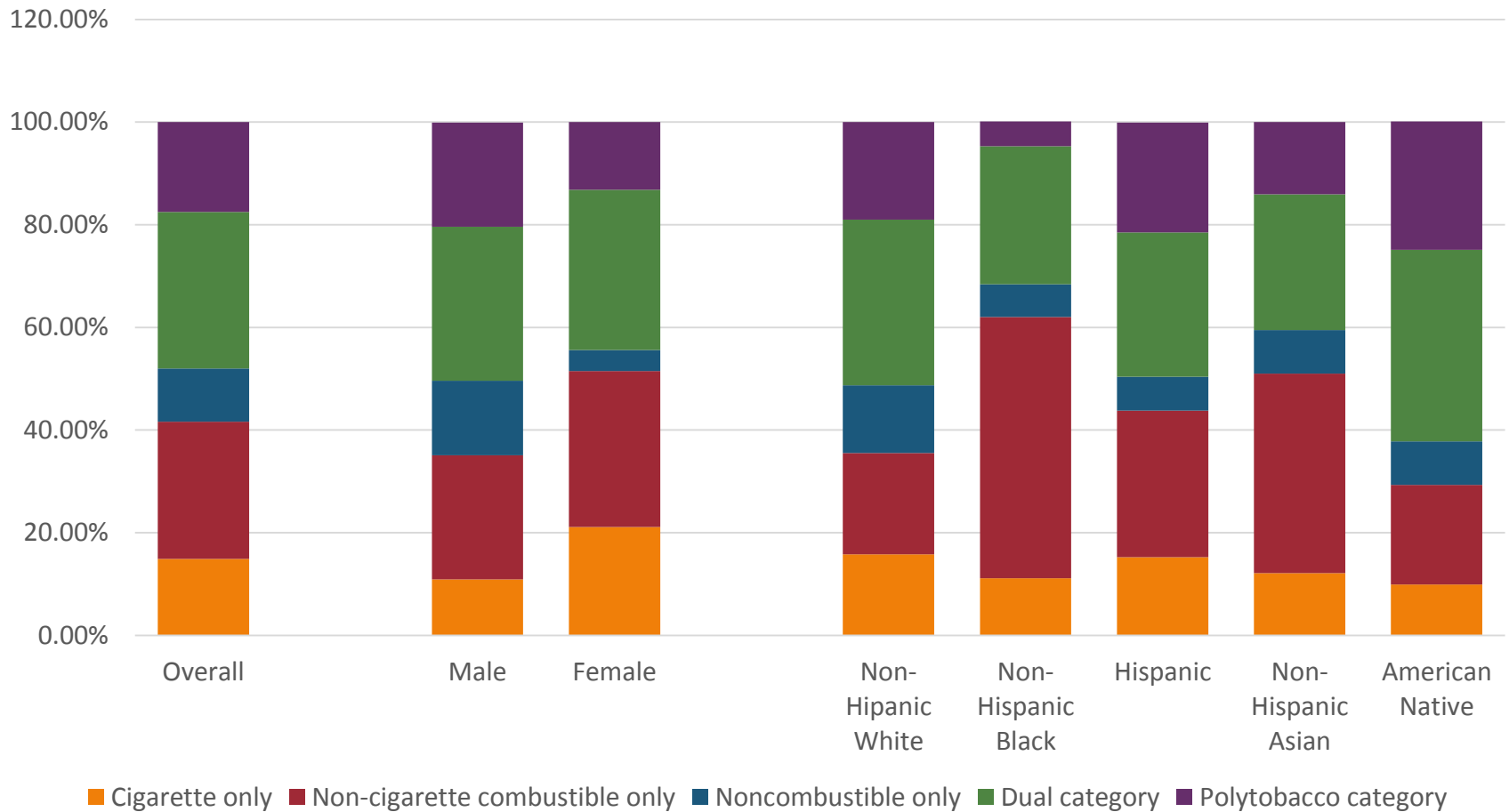


(Arrazola et al, 2014a; Arrazola et al, 2014b; Arrazola et al 2015; Singh et al, 2016)





# NYTS 2012 middle and high school current tobacco users



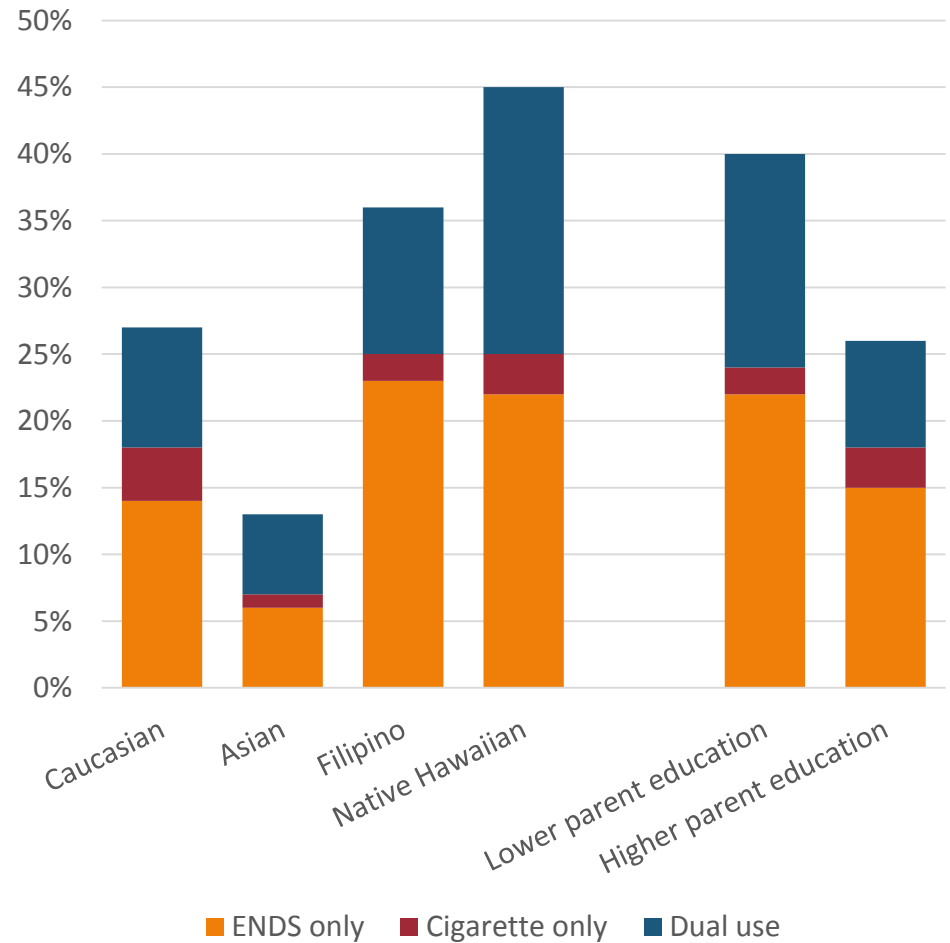
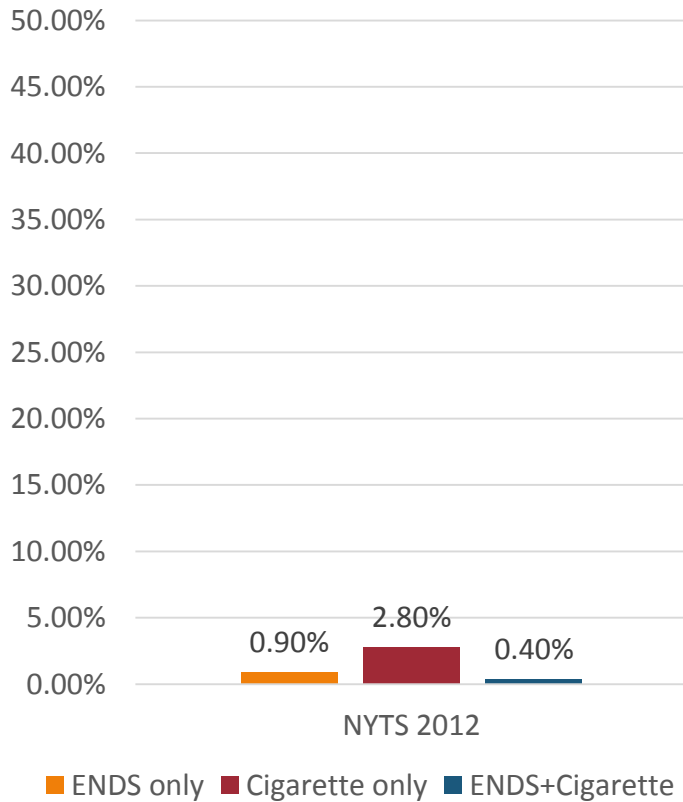
# Correlates of youth tobacco product use patterns

	Cigarette only	Non-cigarette combustible only	Non-combustible only	Dual product category	Polytobacco product category
Perceived ease of access	Ref.				+
Exposure to ads	Ref.				+
Exposure to coupons	Ref.			+	+
Exposure to promotions	Ref.	+	+	+	+
Denied smoking is cool	Ref.	+	+		-
Thought all tobacco products are dangerous	Ref.			-	-

Adjusted for age, gender, race/ethnicity, and living with tobacco users.



# Youth dual use of cigarettes and ENDS



(Lee et al, 2015; Wills et al, 2015)



# Youth ENDS only vs. Dual ENDS and Cigarette Users in Hawaii

	ENDS only	Dual use	p-value
<b>Social-cognitive protective factors</b>			
Parental support	23.3	21.8	0.03
Parental monitoring	20.0	19.0	0.01
Grades past year	3.9	3.5	0.001
<b>Social-cognitive risk factors</b>			
Smoking expectancies	10.1	14.3	0.01
Peer smoking	1.5	2.8	0.001
Sensation seeking	15.8	17.8	0.001
<b>Other substance use</b>			
Marijuana (0-6 pts)	0.6	2.6	0.001

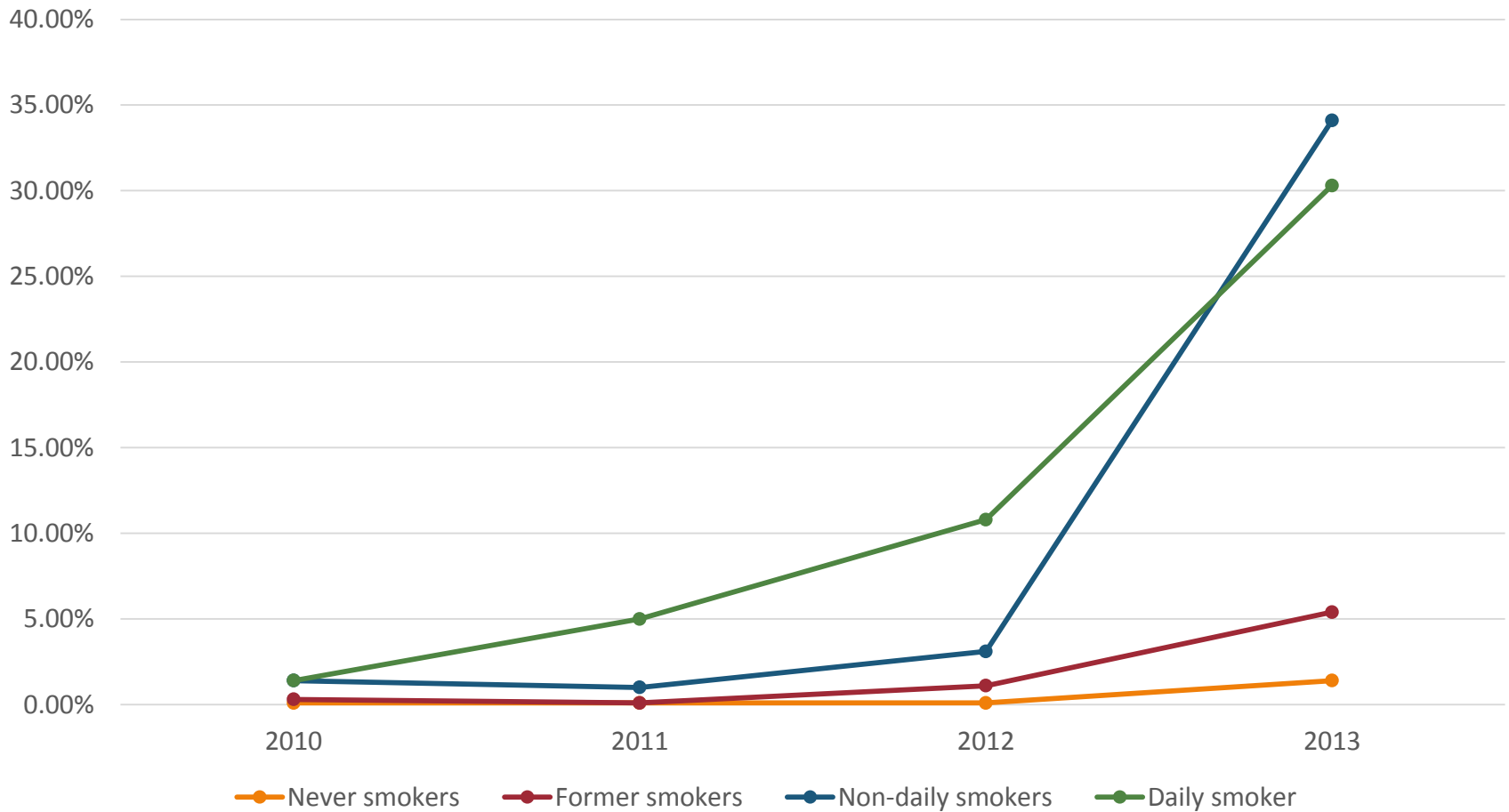
Adjusted for gender, grade, family structure, ethnicity, parental education, and accounted for school clustering.

# Youth ENDS ↔ Tobacco use

- Tobacco → ENDS
  - Youth smokers are more likely to use ENDS, but no evidence of a complete switch
  - Influence of other tobacco products on ENDS initiation is unknown
- ENDS → Tobacco
  - Leventhal et al, 2015
    - 14 year-old never combustible tobacco user from 10 public high schools in Los Angeles, CA, followed for 12 months
    - ENDS ever use at baseline predicted ever using cigarettes, cigars, and hookah at follow-up
  - Primack et al, 2015
    - National sample of 16 to 26 year-old never cigarette smokers who were attitudinally non-susceptible to smoking cigarettes (n=694), followed for a year
    - ENDS ever use at baseline predicted ever using cigarettes at follow-up



# Tobacco and ENDS use in US Adults

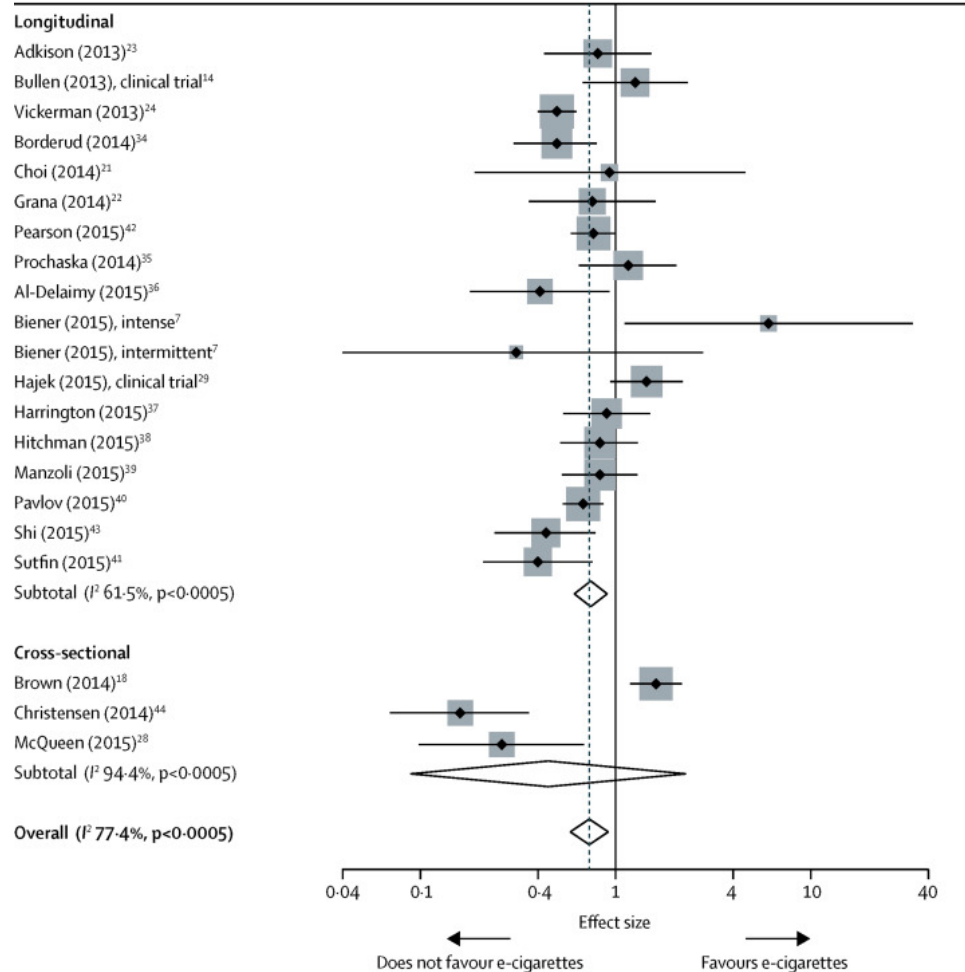


(McMillen et al, 2015)



# Adult ENDS ↔ Tobacco use

- Tobacco → ENDS
  - RCTs: Insufficient evidence
  - Observational: not occurring
- ENDS → Tobacco? Unknown



# Act 2: Tobacco and Marijuana Use

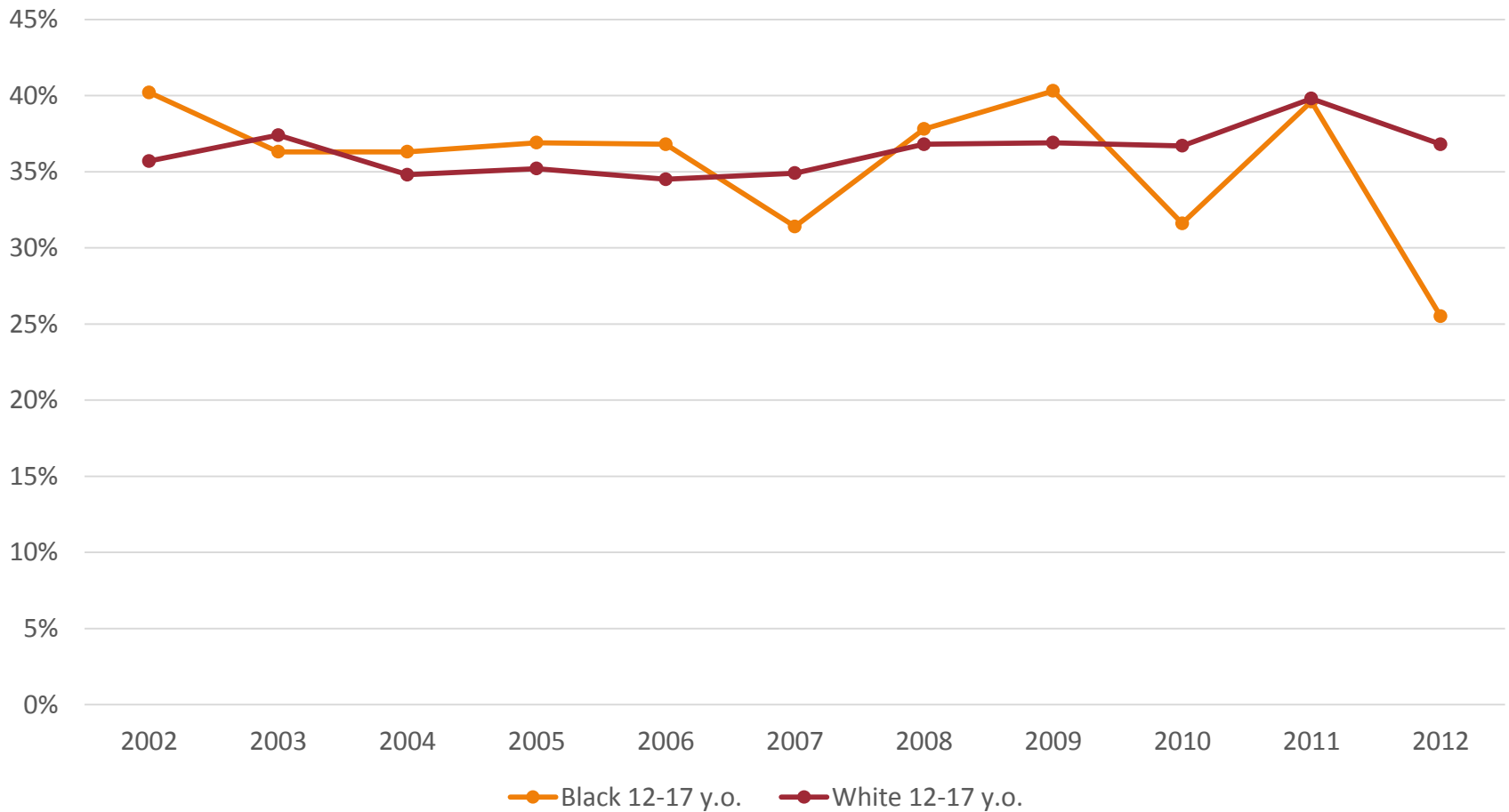
First, let look at some trends...



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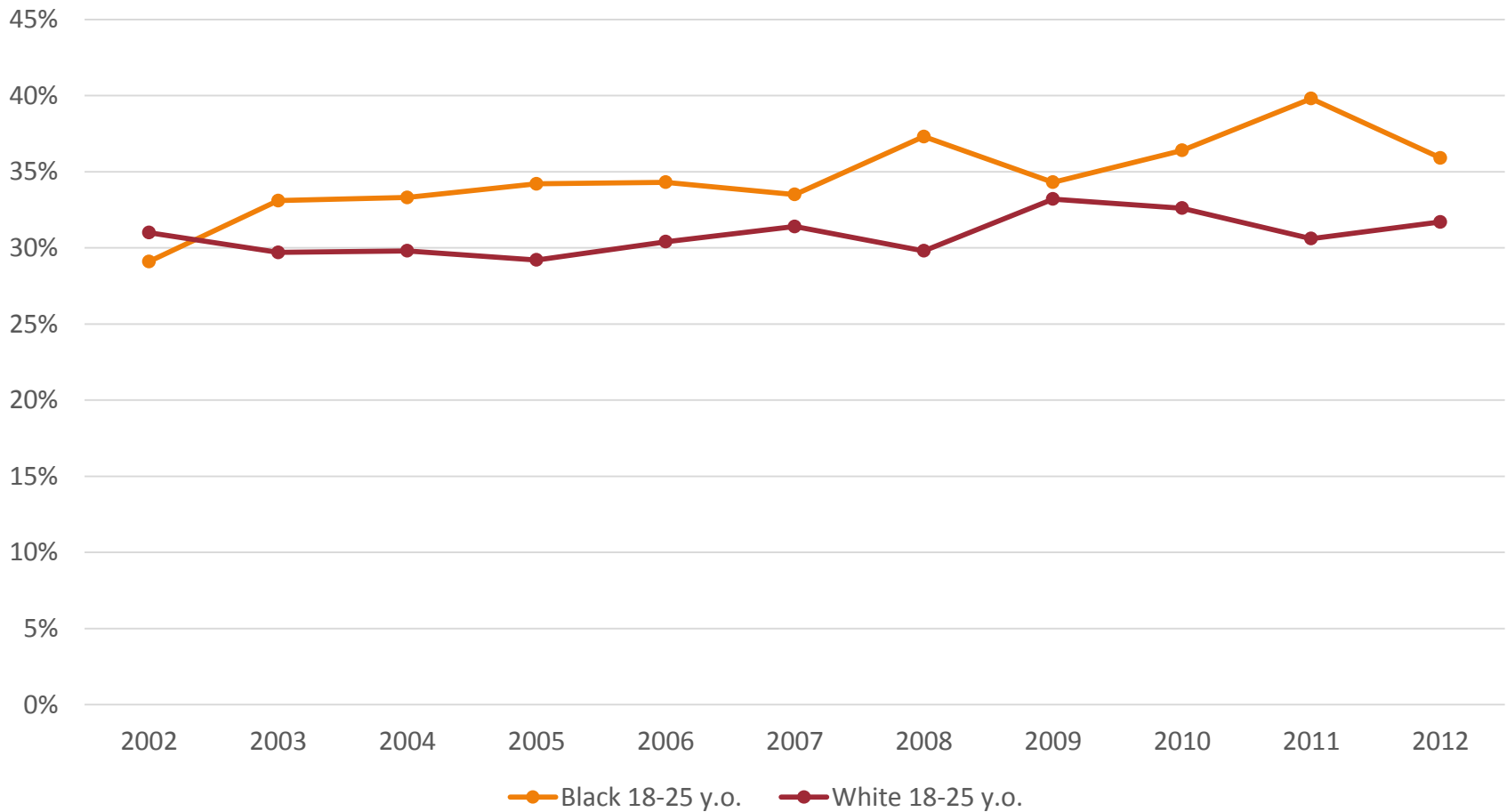
# Past 30 days cigarette/cigar + marijuana use among youth reported product use (NSDUH)



(Kennedy et al, 2016)



# Past 30 days cigarette/cigar + marijuana use among young adults reported product use (NSDUH)



(Kennedy et al, 2016)



# Correlates and consequences of marijuana and tobacco co-use

- Correlates
  - Older age (2/3 studies, 66%)
  - African American (5/6 studies, 83%)
  - Mental health (e.g., externalizing symptoms, anxiety symptoms; 10/15 studies, 66%)
  - Parenting characteristics (e.g., authoritative parenting style; 2/2 studies, 100%)
  - School characteristics (e.g., education enrollment, good grades; 4/4 studies, 100%)
  - Exposure to violence (e.g., childhood sexual abuse; 2/2 studies, 100%)
- Consequences
  - Engaging in health risk behaviors (e.g., drug driving, unsafe sex; 3/3 studies, 100%)
  - Mental health symptoms (e.g., depressive symptoms and diagnosed depression; 4/4 studies, 100%)

# Tobacco $\leftrightarrow$ Marijuana: “Gateway”

- Tobacco  $\rightarrow$  Marijuana
  - 24 longitudinal studies
  - Most studies found a positive association between tobacco use and subsequent marijuana use
- Marijuana  $\rightarrow$  Tobacco
  - 15 longitudinal studies
  - Most studies found a positive association between marijuana use and subsequent tobacco use

# Tobacco → Marijuana dependence

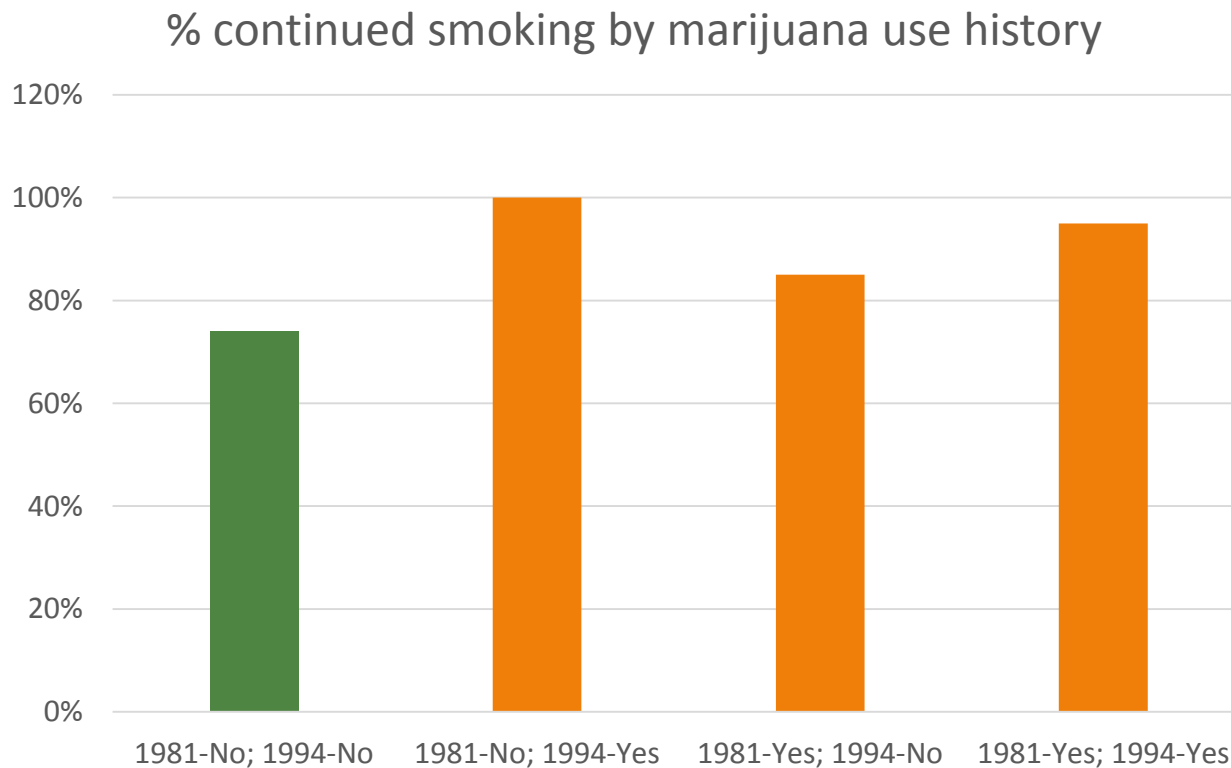
- National Epidemiologic Survey on Alcohol and Related Conditions
  - 2001-2002, 43,093 US representative adults surveyed in 2001-2002

Tobacco type	Smoked only (AOR, 95% CI)	Smokeless only (AOR, 95% CI)	Both (AOR, 95% CI)
Cannabis abuse /dependence	<b>1.55 (1.31, 1.83)</b>	1.04 (0.69, 1.58)	<b>1.68 (1.35, 2.10)</b>

Adjusted for age, gender, race, poverty, education, census region, nativity, conduct disorder, major depression, anxiety disorder, panic disorder, social anxiety disorder, nicotine dependence, alcohol dependence, other illicit drugs, family history.

# Marijuana → Nicotine addiction

- Baltimore Epidemiologic Catchment Area study
  - 431 adults <45 year-old smokers followed from 1981 to 1993-4 (13 years)





# Act 3: Tobacco, ENDS, and Marijuana Use

Few studies have examined all three substance in the same sample.

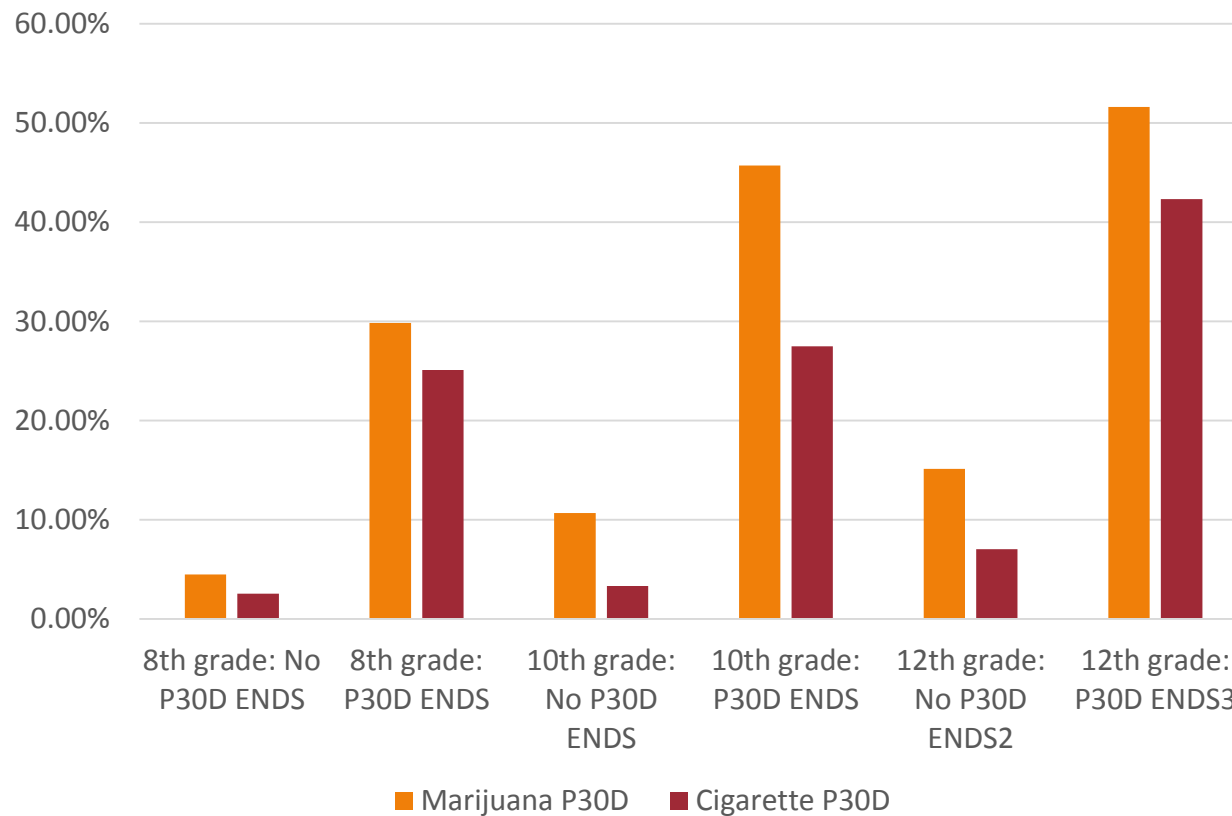
Here are three examples, one focused on youth, one focused on young adults.



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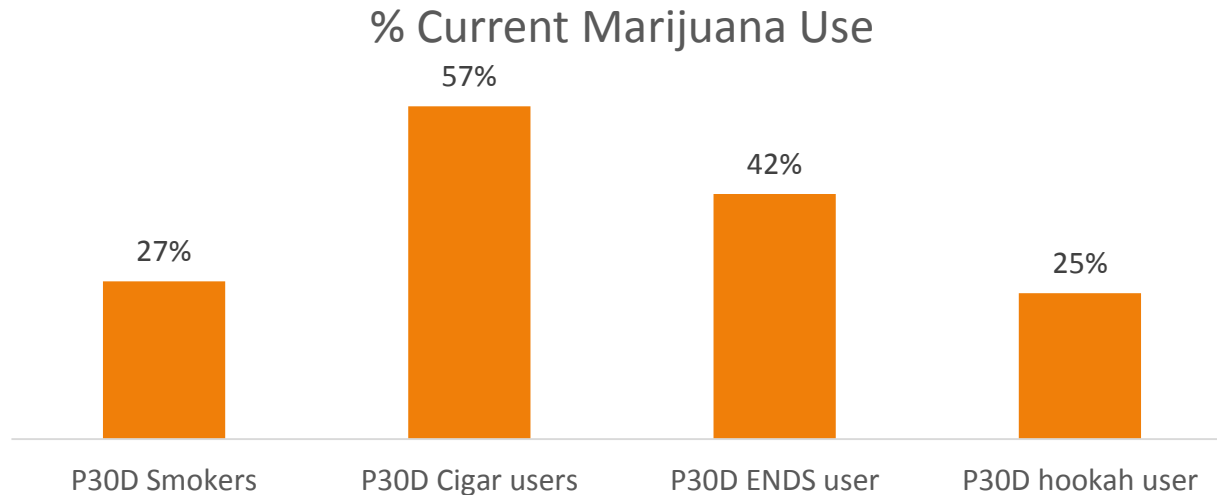
# Monitoring the Future Study 2014

- 41,551 nationally representative 8<sup>th</sup>, 10<sup>th</sup>, and 12 graders



# Legacy Youth Adult Cohort 2013

- 4,288 nationally representative 18-34 year-olds



	P30D Smoking (AOR)	P30D Cigars (AOR)	P30D ENDS (AOR)	P30D Hookah (AOR)
Current marijuana use	<b>2.31*</b>	<b>8.06*</b>	<b>3.53*</b>	1.93

Adjusted for age, gender, race/ethnicity, education.

So... sky fallin























<http://quotesgram.com/armageddon-bible-quotes/>  
<http://bluecollarvaper.tumblr.com/post/107072767388/cloud-junkies-blowin-it-up-oregonvapefestival>



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# Summary

	%	Who?	Why?	Effect on use of other substance	Social & Health outcomes
Tobacco and ENDS					
Tobacco and marijuana					
ENDS and marijuana					
Tobacco, ENDS, and marijuana					

# Future research questions

- Are characteristics of marijuana users after legalization the same as those before legalization?
- Does ENDS worsen marijuana dependence? Or does marijuana worsen nicotine dependence through ENDS? Or both?
- What are the social and health outcomes of ENDS and marijuana co-use? Are they the same as those of tobacco and marijuana co-use?
- What are the trajectories of tobacco, ENDS, and marijuana co-use over time?
- How does the co-use of these products affect tobacco use disparities?



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Questions?

My email: [kelvin.choi@nih.gov](mailto:kelvin.choi@nih.gov)

Special thanks to my fellows:

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Ms. Sarah Krosnick

