Dab

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Executive Summary

Contents

1 Global Assumptions

- Sources of information, data, and models in this investigation pertain only to the United States population.

- Differences in factors between genders will be ignored because the input data is gender agnostic and any gender-based lurking variables will equalize within the sample size of data and simulations.

- One year is equal to 365 days.

- A high school is a closed-system, besides socioeconomic factors.
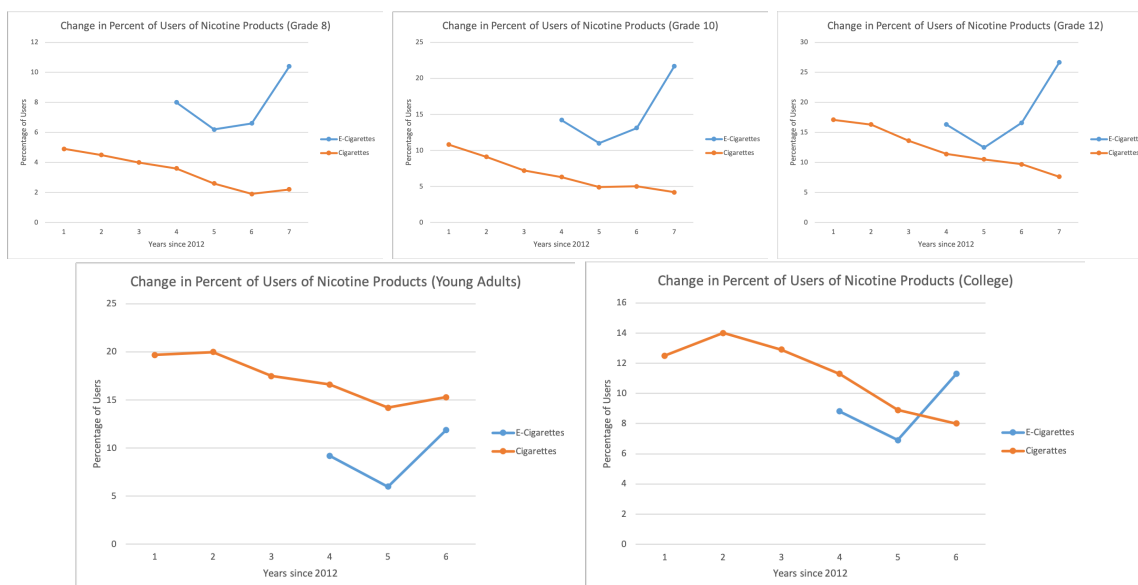
2 Darth Vapor

Figure 1: Vape vs. Cigarette Usage by Age Group [1]

2.1 Local Assumptions

- One cigarette contains 12 mg of nicotine [2]

- The rate of absorption of nicotine from one cigarette is 1 mg per cigarette because

there is loss from the combustion of the cigarette and filtering. Our unit of 1 cigarette of nicotine indicates the rate of nicotine intake, 1 mg per cigarette, and not nicotine content, 12 mg per cigarette. [3, p. 501]

- One cigarette is worth 10 puffs. [4]

- One pack of cigarettes costs \$5 and contains 20 cigarettes.

- The current smoking rate among adults in the US is 14%.

- Our model assumes JUULs as the unit of vape consumption and encapsulates e-cigarettes for this model.

- The JUUL device kit costs \$35 for the device and charger and is the base cost of entry for JUUL. [5]

- Four JUUL pods cost \$16. [6]

- A JUUL pod has negligible nicotine waste becasue there is no combustion or filter.

- One JUUL pod 41 mg or approximately 41 cigarettes worth of nicotine absorption. [7]

- Our model only considers a death directly from overdose of nicotine, which is so unlikely that we have not accounted for it in our model.

2.2   Cost Analysis of JUULs vs. Cigarettes

To determine which nicotine vector is more cost effective over time, two linear equations were constructed for each, where y is the total cost and x is each additional cigarette (synonymous with each additional intake of 1 mg of nicotine).
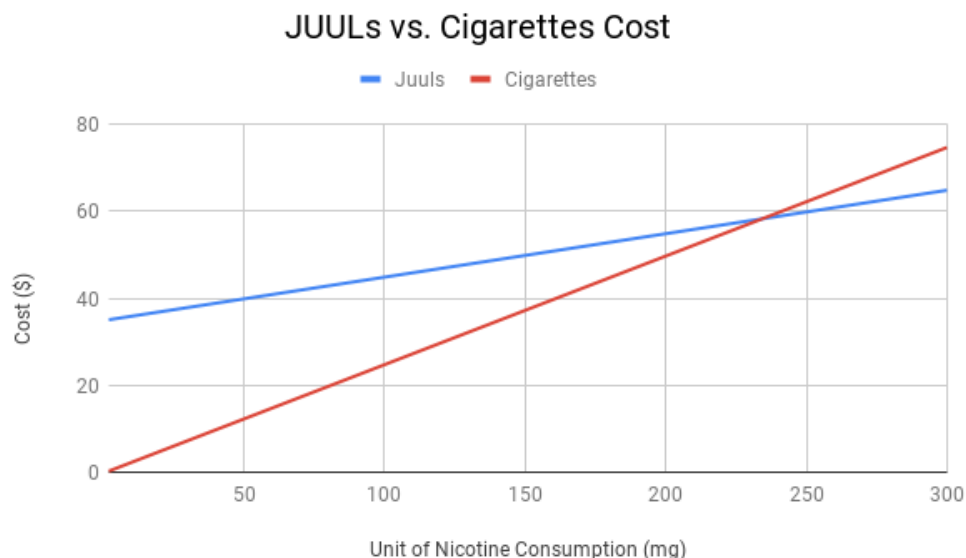
Figure 2: JUULs vs. Cigarettes Cost

JUUL: $y = \frac{16}{160}x + 35$

- Slope $\frac{16}{160}$ = cost per each additional cigarette, aka each additional cigarette worth of nicotine intake (1 mg).

    16 = the cost of four JUUL pods; JUUL pods are sold in packs of four for \$15.99.

    160 = the number of milligrams of nicotine in 4 pods (approximately 40 milligrams of nicotine per pod).

- 35 = cost of device kit (\$34.99), which includes a JUUL device and charger.

Cigarette: $y = \frac{5}{20}x$

- Slope $\frac{5}{20}$ = Cost per each additional cigarette, aka each additional cigarette's worth of nicotine intake (1 mg).

    5 = simplified cost per pack of cigarette.

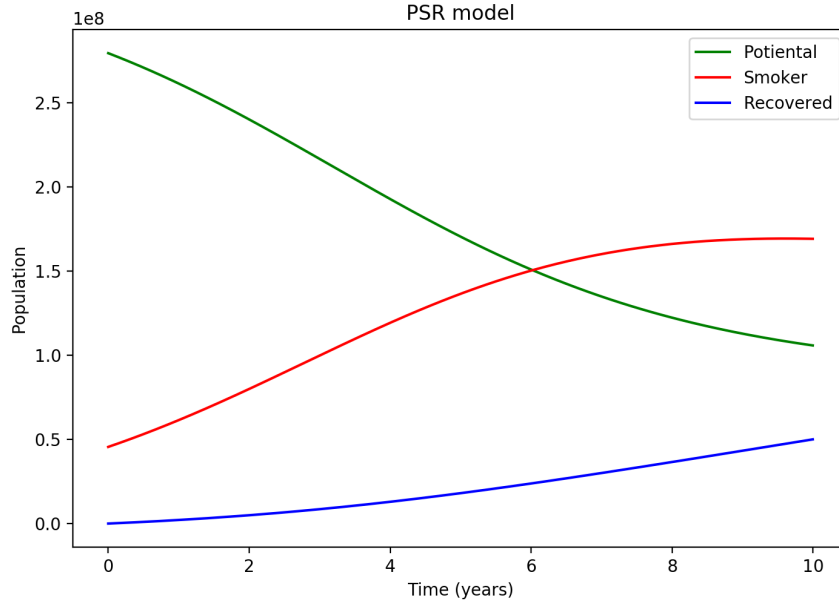   20 = number of milligrams of nicotine absorbed per pack.

2.3 Model

Figure 3: PSR for the total US population

$$
\begin{aligned}
\frac{dP}{dt} &= \beta \frac{PS}{N} + \alpha(1 - \epsilon)S \\
\frac{dS}{dt} &= \beta \frac{PS}{N} - \alpha S \\
\frac{dQ}{dt} &= \alpha \epsilon S
\end{aligned}
\tag{1}
$$

S = Smokers

P = Potential smokers

β = Rate of transmission

α = Rate of recovery

$1 - \epsilon$ = Rate of relapse

Q = Smoking quitters

N = Total population

3 Above or Under the Influence?

3.1 Local Assumptions

- The proportion of deaths caused by opium overdose is negligible.

- The gateway nature of ateway nature of marijuana doesn't need to be identified as its own variable because the reasons (behind why marijuana leads to opioid usage) can be woven into the other variables.

3.2 Model

Variables

$S =$ Socioeconomic factors

$P =$ People (social circles)

$\beta =$ Baseline (derived from previous years)

$N =$ Population

$h =$ Health

$x =$ Number of people

$D =$ Death constant

4 Ripples

4.1 Variables

$C =$ Total cost of drug

$T =$ Tax

$c_j =$ Cost of jail

p_j = Percent of drug users in jail

p_r = Percent in rehab

c_r = Cost of rehab

M = Medical costs

4.2   Local Assumptions

4.3   Conclusion

1.

References

[1] *College-Age & Young Adults*, en, Government, Feb. 2018. [Online]. Available: https://www.drugabuse.gov/related-topics/college-age-young-adults (visited on 03/03/2019).

[2] C. Matthews, *How Much Nicotine Is in a Cigarette and a Pack?* en-US, Oct. 2017. [Online]. Available: https://vapingdaily.com/nicotine-in-cigarette/ (visited on 03/03/2019).

[3] N. L. Benowitz and P. J. Iii, "Daily intake of nicotine during cigarette smoking," *Clinical Pharmacology and Therapeutics*, vol. 35, no. 4, pp. 499–504, Apr. 1984, ISSN: 0009-9236, 1532-6535. DOI: 10.1038/clpt.1984.67. [Online]. Available: http://doi.wiley.com/10.1038/clpt.1984.67 (visited on 03/03/2019).

[4] *E-Cigarette Use: The Fallacy of Puff Counts — White Cloud*, en, Jul. 2014. [Online]. Available: https://www.whitecloudelectroniccigarettes.com/blog/fallacy-puff-counts/ (visited on 03/03/2019).

[5] *JUUL Slate Device Kit — Free Shipping — JUUL*, en. [Online]. Available: https://www.juul.com/shop/devices/basic-kit (visited on 03/03/2019).

[6] *Buy JUUL Pods (Pack of 4) — Official Store — All JUUL Flavors — JUUL*, en. [Online]. Available: https://www.juul.com/shop/pods (visited on 03/03/2019).

[7] *JUULpods and E-Liquid FAQs - JUUL Support*. [Online]. Available: https://support.juul.com/home/learn/faqs/juulpod-basics (visited on 03/03/2019).

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