Health Impact Assessment:

Raising the Legal Tobacco Purchase and Use Age to 21 in Utah

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Introduction

In the 2015 Utah legislative session, Representative Kraig Powell sponsored House Bill 130, a bill to raise the legal tobacco and related products use age (LTPA) to 21 years old[1]. The proposed bill would prohibit anyone under 21 to possess tobacco or a tobacco related product, to have a tobacco product distributed to them, or to enter a tobacco business. This same bill was proposed in 2014 by Representative Powell and Senator Stuart Reid[2]. Both attempts to pass this bill were unsuccessful. The purpose of this health impact assessment is to determine what the health implications are for raising the LTPA to 21 years old in the state of Utah.

Executive Summary

Background

Smoking is the leading cause of preventable death in the United States[3]. While the smoking rates in Utah are lower than the national average, the rates of e-cig use have doubled in the last 2 years[4]. According to recent studies, raising the legal tobacco purchasing age (LTPA) to 21 will decrease peer exchanges to youth and will be an effective form of prevention of lifelong addiction[5-7]. Thus, a change in age is likely to positively affect the health of the people of Utah. The proposal at hand is House Bill 130 (H.B. 130), a policy to raise the legal tobacco purchasing age (LTPA) for the state of Utah from age 19 to age 21. This policy includes any tobacco product, e-cigarettes or related paraphernalia[1]. Various counties across the nation have changed the legal tobacco purchase and usage age to 21. However, Hawaii is the only state to have done so thus far. A health impact assessment

(HIA) was conducted on this proposal to assess the impacts on the people of Utah of raising the legal tobacco purchase and use age to 21. The following questions were the primary focus of the HIA:

- How will raising the smoking age from 19 to 21 impact the mental and physical health of adolescents?
- How will raising the smoking age from 19 to 21 impact the economy of tobacco companies and of the health industry?
- How will raising the smoking age from 19 to 21 impact the economy of the state and local businesses?

This policy will affect all citizens indirectly, and will most directly affect persons under 21 and tobacco retailers. Youth are the target beneficiary of this policy, but retailers will be directly affected by the loss of sales to youth below the age of 21. This policy is likely to decrease the number of lifelong smokers thereby decreasing rates of smoking related illness and disease and other more serious economic factors totalling nearly $170 billion nationwide[8].

Methods

Researchers conducted a health impact assessment (HIA) to determine health outcomes of H.B. 130 in the state of Utah. HIAs are tools used to conduct and anticipate the outcomes of a policy that will impact health positively or negatively. A causal pathway (see Figure 1) emerged from this HIA and predicts health impacts including fewer health care costs from smoking related illness, better mental health, and lower rates of smoking related disease. The information and data used in this HIA came from a literature review, reports

by the Utah Department of Health (UDOH) and stakeholder input. The key stakeholders who provided information for this HIA include representatives from the UDOH, Tobacco Free Utah, Utah Retailers and Merchants Association (URMA), and the American Cancer Society (ACS). These stakeholders provided valuable opinions, research and experience that assisted in the health impact assessment process. Concerns from stakeholders regarding raising the legal age that are addressed in this HIA include the loss of state and retailer earnings, the importance of including a tax on e-cigarettes, and smokers that start before the legal age already established.

Key Findings

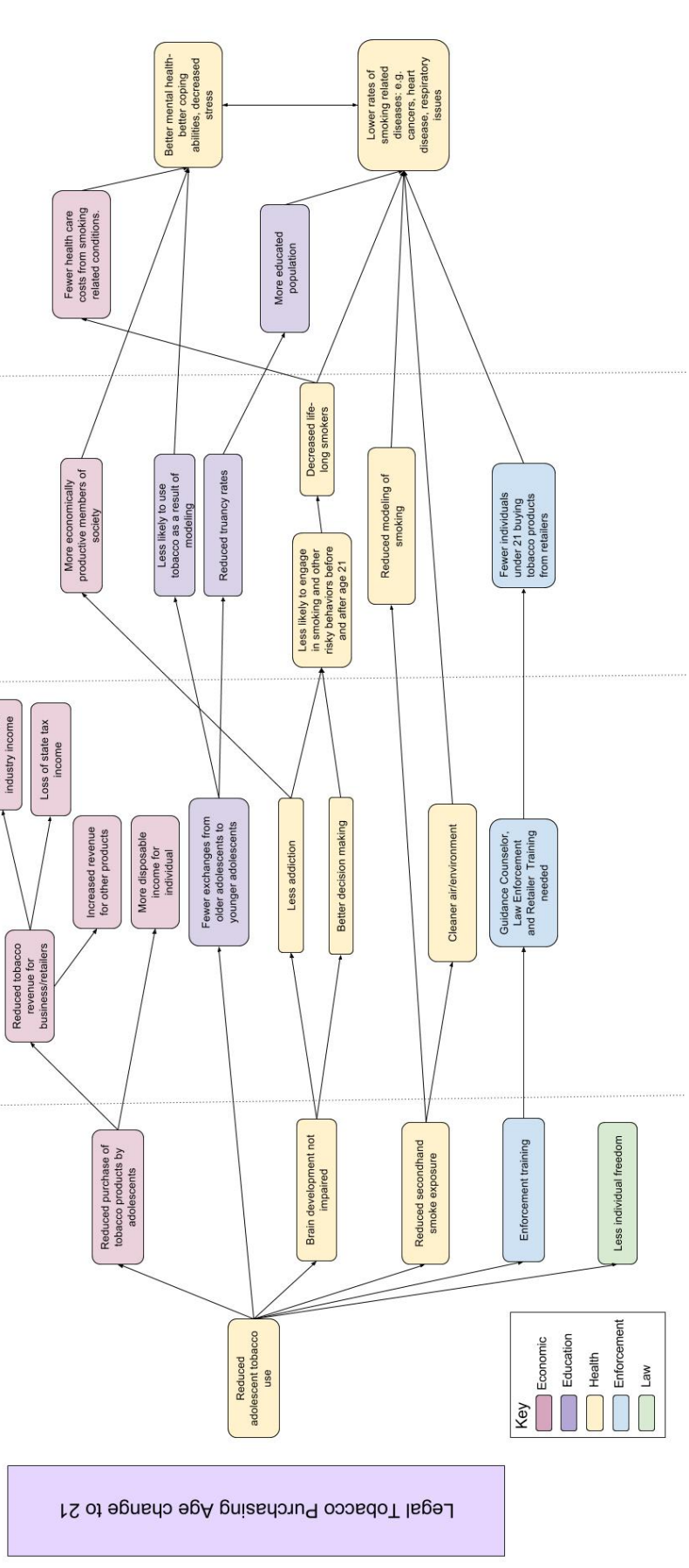
This HIA shows that the policy being assessed would have significant positive health impacts on health. After an assessment of the research findings, it is clear that an increase in the legal smoking age will lead to a number of improved health outcomes. The improved outcomes include significantly less spending on health care, a reduction of lifelong smokers, lower rates of nicotine addicted teens and adults, increased mental health levels, and a reduction in years of potential life lost. Provided below is a characterization of effects table (Table 1), which provides health-related outcomes of this change in legislation as well as their intensity, distribution, magnitude and the confidence level in which these assessments were made.

TABLE 1: CHARACTERIZATION OF EFFECTS TABLE FROM CAUSAL PATHWAY (FIGURE 1).

Health Related Outcomes	Likelihood	Intensity/ Severity	Distribution	Magnitude	Confidence Level
Reduction in the number of lifelong smokers	High	3	Individuals	High	High
Fewer Healthcare costs	High	3	Government, individuals	High	High
Better mental health	Medium	2	Individuals	Moderate	Medium
More educated population	Low	1	Individuals	Moderate	Low
Fewer rates of smoking related diseases	High	3	Individuals	High	High
Increased Productivity	Medium	2	Individuals	Moderate	Medium

Key:
Likelihood - Low (not likely to occur), Medium (somewhat likely to occur), High (very likely to occur)
Intensity/Severity - Scale from 0 to 3, where 3 is the most positive impact
Magnitude - Low (little effect on individuals/ businesses), Moderate (some effect on individuals/ businesses), High (great effect on individuals/ businesses)
Confidence Level (based on reliability of evidence): Low, Medium, High

FIGURE 1: CAUSAL PATHWAY FOR CHANGING THE LEGAL AGE OF TOBACCO PURCHASE AND USE FROM 19 TO 21 IN UTAH.



Conclusion

After evaluation of the health-related outcomes and receiving stakeholder input, it is recommended that the legal age for purchase and use of tobacco products be raised from 19 to 21. Below is a list of health-related outcomes that will result from this change in legislation and their likelihood. Adolescents are the primary beneficiaries of this policy, although it has the potential to impact all residents of Utah. For further details regarding these health outcomes, see Health Impacts page X.

Highly Likely

- Reduction in lifelong smokers
- Decreased health care costs
- Lower rates of smoking related disease
- Increased productivity

Likely

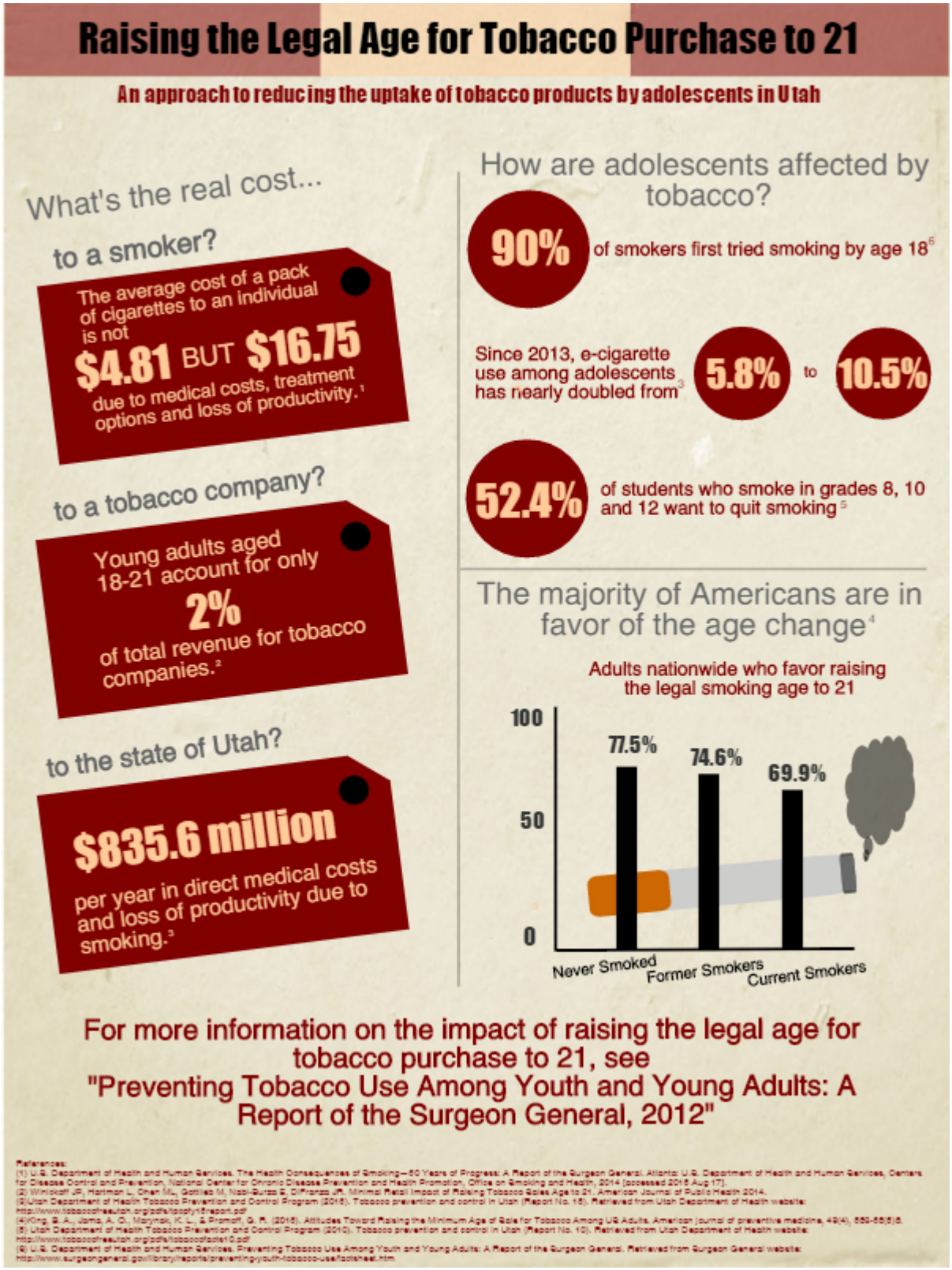
- Better mental health
- Plausible but not well supported
- More educated population

Plausible but not well supported

- More educated population

It is estimated that the benefits of raising the legal tobacco purchase and use age, such as the decrease in health care costs from smoking-related diseases and increased productivity, will outweigh the costs of this legislation.

Infographic available with basic information for legislators



Health Impact Assessment

A health impact assessment (HIA) is a "means of assessing the health impacts of policies, plans and projects .... using quantitative, qualitative and participatory techniques"[9]. The goal of this HIA was to evaluate the health impacts of the proposed legislation to raise the legal purchase and use age of tobacco (LTPA) from 19 to 21 in the state of Utah. This policy is of particular interest to the Utah Department of Health (UDOH) because of its potential to reduce the number of both adolescent smokers and lifelong smokers. The UDOH anticipates that the number of adolescent smokers will decrease as a result of this policy, due to the fact that less exchange will happen between those underage and those who are between 19 and 21 (Luke Chalmers, oral communication, September 2015). As a result, the number of smoking-related diseases, mental health problems and health care costs are expected to decrease. In order to assess whether or not these expectations are likely to happen, the researchers performed a literature review and received input from stakeholders from the UDOH, Utah County Health Department, American Cancer Society and Utah Retail Merchants Association.

Community Health Profiles

TABLE 2: UTAH BASELINE CONDITIONS FOR YOUTH AND ADULTS

Baseline Conditions		
	Youth *	**Adults**
Cigarette Smoking		
Tried cigarettes (2015)	13.1%[4]	n/a
Regular use of cigarettes (last 30 days) (2015)	3.4%[4]	n/a
Adult cigarette smoking (2014)	n/a	9.5%[4]
Smoking in third trimester of pregnancy	5.5%[17]	3.4%[17]
Electronic Cigarettes		
Tried e-cigarettes (2015)	22.9%[4]	n/a
Tried e-cigarettes (2014)	n/a	11.3%[4]
Tried e-cigarettes (2013)	12.0%[53]	13.2[52]
Regular use of e-cigarettes (last 30 days) (2015)	10.5%[4]	n/a
Regular use of e-cigarettes (last 30 days) (2014)	n/a	4.8%[2]
Regular use of e-cigarettes (last 30 days) (2013)	5.8%[53]	5.1%[52]
Secondhand Smoke Exposure	2%[51]**	38.8[4]***
Wanting to Quit	52.4%[5]	80%[55]
Cigarette Use on School Property	1.39%[17]	n/a
Health		
Asthma (Percentage)(2013)	6.7%[17]	9.1%[17]
Lung Cancer Incidence Rate (per 100,000)(2011)	n/a	27.8[17]
Coronary Obstructive Pulmonary Disease Hospitalizations (per 100,000)(2012)	n/a	810[17]
Seven or more days of poor mental health in the past 30 days(2014)	n/a	15.6[17]
In Favor of Age Change from 19 to 21		
Smokers	n/a	69.9%[13]
Never-smokers	n/a	77.5%[13]

*youth consists of students in grades 8, 10, and 12
**exposure in homes
***indoors or outdoors

Adolescents

The most vulnerable population of this HIA are adolescents. Some of the greatest public health problems either peak or start in adolescence. The human brain is not fully developed until the mid-twenties[10] . As the brain matures, the limbic system, the center for human emotions and emotion processing, develops quicker than the prefrontal cortex, the area of the brain dealing with planning, forethought, impulse control and decision-making[11,12] . Risk taking and reward seeking behaviors—risky behaviors—are oftentimes the result of such development. Risky behaviors are the biggest threat to adolescent health[12] . Examples include: smoking, substance use and abuse, homicide, suicide, sexually transmitted infections, teen pregnancies, unintentional injuries and homelessness[13] . Nicotine use has been linked to poor development of decision-making in the prefrontal cortex in adolescents[5,14]. In addition, youth exposed to nicotine are at an increased risk of developing depression or anxiety and substance abuse.

As an individual goes through adolescence, major cognitive abilities and executive functions develop and expand, creating newfound abilities. These abilities include thinking about possibilities (including hypothetical thinking), metacognition, multidimensional thinking, abstract thinking and relativistic thinking[12] . An increase in white matter in the brain and pruning of the synapses allows for better processing speed and fine-tuning of functional networks[12,16].

Despite the fact that Utah has the lowest smoking prevalence rates in the United States[16], individuals under the age of 19 are purchasing and using tobacco products such as cigarettes and electronic cigarettes, commonly known as e-cigarettes (Luke Chalmers, oral communication, September 2015) . In particular, the use of e-cigarettes has nearly doubled

among high school students in the last two years. The fifteenth annual report regarding tobacco prevention and control in Utah shows that in 2015, the regular use of e-cigarettes among 8th, 10th, and 12th graders in the state was 10.5% compared to 5.8% in 2013. Eighth, 10th, and 12th graders who had tried e-cigarettes jumped from 12.0% in 2013 to 22.9% in 2015[4]. Additionally, traditional cigarette smoking use and experimentation rates among youth in the state in 2015 were 3.4% and 13.1%[4]. Baseline conditions for social and health outcomes in Utah are generally better than the rest of the United States. However, the near doubling of e-cigarette use among youth in the state shows a high uptake rate and vastly increasing trend. The increase in e-cigarette use among adolescents could ultimately lead to an increased rate of adult smokers in the state of Utah, increasing incidence rates of asthma, lung cancer and upper respiratory diseases.

Of all 9th-12th grade students surveyed in the state, 1.39% reported having used cigarettes on school property. Among 12th graders, 2.9% reported using cigarettes on school property[17]. In discussing e-cigarette use with Linnea Fletcher (November 2015), researchers learned that many youth have shared incidences of e-cigarette use on school property, noting the ease of hiding an electronic cigarette under faculty supervision. Many e-cigarettes look like pens and can easily be hidden, worn out in the open in classrooms on lanyards, or distributed from youth to youth with little distraction. Legislation changing the legal use and purchase age of all tobacco products, including e-cigarettes, in the state of Utah from 19 to 21 would likely decrease the number of high school students with electronic cigarettes, especially in regards to peer exchanges.

Dave Davis, in discussing the potential legislation change (November 2015), spoke of the stigma associated with traditional cigarette use among teenagers. This stigma and

socialization have aided in the continual decrease and limited use of cigarettes among individuals under 19. However, he clearly stated that there is no such stigmatization for the use of e-cigarettes. Having no negative social stigmas associated with e-cigarette use is conducive to an atmosphere in which the use of tobacco and nicotine products, even amongst underage individuals, may increase. Many adolescents, who initially are opposed to traditional smoking, are quickly going from never smoking to smoking e-cigarettes to smoking conventional cigarettes[18].

Another item discussed with Linnea Fletcher (November 2015) was that high school aged individuals may have friends who are 19, have recently graduated from high school, and may legally purchase and use tobacco products. She noted that most high school students do not regularly associate with many 21-year old individuals, limiting and decreasing easy access of tobacco products, especially e-cigarettes, to underage individuals. Brooke Carlisle also mentioned in a conversation (November 2015) that many begin smoking before the age of 18. Smoking before 18 is not a recent trend[5,19]. Carlisle (November 2015) and Fletcher (November 2015) both stressed that many high school aged individuals have access to tobacco products from close friends and associates who are of legal age. Research has also found this trend to be true. Many 19 and 20 year olds who can legally buy cigarettes give them to friends and family or have been asked by underage individuals to purchase tobacco products[5,19,20]. Research has also shown that raising the LTPA to age 21 or higher results in a decrease of youth smoking and tobacco use[5,21]. It has also been shown that high school students are less likely to have social circles that involve 21 year old adults, thus decreasing opportunity and access to tobacco products[21]. Inhibiting the social circle access provides rationale and shows that decreasing access to tobacco

products by widening the legal-use age gap between youth and adults may be an effective way to reduce life-long smokers and negative health outcomes--a point also brought into play by Chalmers (September 2015), Carlisle (November 2015) and Fletcher (November 2015). The 2012 Surgeon General's report indicates that if young people can remain tobacco free, most will never start to smoke[7].

The Utah Tobacco Facts Report in 2010 showed that among youth who were currently smoking, 52.4% wanted to quit and reports of adults who were currently smoking showed that 80% wanted to quit[22]. This indicates that youth are becoming addicted to the nicotine found in cigarettes and may not have the resources or support to quit the habit.

Adults

The e-cigarette experimentation and use rates among adults in 2014 were, respectively 11.3% and 4.8%[4]. Adult cigarette smoking in 2014 was 9.5%[4]. Most data on smoking-related diseases was only available for adults. Asthma rates for adults in Utah in 2013 were over 9%[17]. In 2014, 15.6% of Utah adults reported seven or more days of poor mental health in the past 40 days[17]. In 2011, the lung cancer incidence rate, per 100,000, in Utah was 27.8[17]. The rate of coronary obstructive pulmonary disease (COPD) hospitalizations in 2012 was 810 per 100,000[17]. One limitation to these numbers is that it is unclear how many of the reports of asthma, lung cancer, COPD hospitalizations, and poor mental health cases can be attributed to smoking.

Characterization of Effects

After the creation of the causal pathway (see Figure 1) for the increase in legal tobacco purchase and use age (LTPA), several main health impacts on the population as a result of this change in legislation were identified. Their effects were then characterized with respect to their likelihood, intensity, distribution, magnitude and confidence level using the results of the literature review and stakeholder input. Likelihood refers to how probable it is that an outcome will occur, and was evaluated on a scale of low, medium, and high based on the degree of agreement in the evidence found. Intensity refers to the how large the effect will be on the lives of the population, and was evaluated on a scale from 1-3 with 3 being the largest impact. Distribution refers to the spread of the effects throughout the population, and includes those who will be affected by each health-related outcome. Magnitude refers to the expected size of the effect on the population (e.g. the number of people affected) and was evaluated on a scale of low, moderate and high. Confidence level refers to the certainty of evidence based on the credibility of the papers in the literature review and from stakeholders, and was evaluated on a scale of low, medium and high.

The Characterization of Effects Table (see Table 1, Executive Summary) will be used to evaluate the potential effects of this policy and to formulate recommendations based on their likelihood, intensity, distribution, magnitude and confidence level.

Health-Related Impacts

The outcomes that are most likely to occur include those that affect health and health care costs due to the decrease in the prevalence of lifelong smokers and adolescent smokers. Smoking has been identified as a risk factor for a variety of diseases, including

cancers, respiratory and cardiovascular diseases[6,23-24]. With the decrease in the number of lifelong smokers that is likely to occur with the implementation of this policy, rates for these diseases will also decrease. This will then lead to a decrease in the health care costs which result from smoking-related diseases. This legislation also is likely to lead to better mental health among those who may be deterred from smoking. However, with the latency period, or time between an exposure and the development of a disease, of some smoking-related diseases (such as lung cancer) being relatively long, researchers do not expect the effect of these impacts to be noticeable immediately.

There also has been speculation of a possibility that this legislation may not decrease the prevalence of adolescent smoking by one stakeholder, Dave Davis (oral communication, November 2015). Because many adolescents begin using tobacco products before the age of 19, he claims that increasing the legal purchasing age to 21, does not appear to "hit the root" of the problem in preventing adolescents from acquiring tobacco products and subsequently using them. If this were true, then the magnitude of these health outcomes would be smaller than expected. This view is refuted in the literature review[5], and an opposing opinion to that of Linnea Fletcher, who has received information that older peers are a significant source of tobacco products for adolescents (oral communication, November 2015).

The effect of this policy on education and productivity are unclear. While studies have linked truancy rates to smoking cigarettes[25], it is unclear which action leads to the other. There also is a lack of literature on the effect smoking tobacco has on productivity. Limited evidence has been identified to determine whether the reduction in smoking rates and smoking cessation will lead to individuals becoming more productive. However,

smoking has been identified as a risk factor for premature death[6-7], and it is expected that a reduction in smoking and smoking-related diseases will lead to a reduction in the years of potential life lost (YPLL). Smoking also leads to workplace productivity losses amounting to over 156 billion dollars in the United States[8]. Utah specific data is not available.

Economic Impacts

Although the tobacco industry is a large source for revenue, the potential for economic savings from HB 130 is great. With over 260 billion cigarettes sold nationwide in 2014[8], the revenue brought in by tobacco products contributes markedly to state governments and economies and the nation as a whole. Excise taxes on cigarettes alone brought in nearly $15.5 billion[26] in 2010. Despite the large amount of revenue brought in by tobacco companies, tobacco related illnesses cost state and the federal government even larger amounts of money. Costs due to smoking related illness including asthma, COPD, lung and oral cancers, rise above $300 billion each year[6].

These costs directly attributable to tobacco include over $156 billion in lost productivity, including over $5 billion in lost productivity due to secondhand smoke, and nearly $170 billion in adult medical care costs[27]. Each year, smoking related illness accounts for a significant portion of Medicare expenditures at 9.6% or $45 billion; 15.2% or $39.6 billion of Medicaid expenditures; and 32.8% or $23.8 billion of expenditures from other federal government-sponsored insurance programs[6]. A 2010 study[28] found that while a resident of Utah could buy a pack of cigarettes for $4.81, the true cost of combined medical expenses and lost productivity attributable to each pack totalled nearly $17. An in depth analysis on the cost-effectiveness of raising the LTPA in California was performed

with the result that the policy would generate no net costs and in fact save California and its residents a total of $24 billion over the next 50 years[29]. As California has the second lowest rate of adult smoking at 12.5%, behind Utah at 10.3%[31], Utah can expect to see similar economic benefits from the policy.

Overall Recommendations and Reporting

Background

The findings from this health impact assessment indicate that raising the legal age from 19 to 21 for tobacco purchase and use in the state of Utah may have several positive health impacts. Of most significance to the state is the potential to reduce the number of lifelong smokers, decrease healthcare costs and lower the number of cases of smoking related disease. The recommendations presented are based on what would be best to increase these positive health impacts according to research performed for this HIA. All of the HIA team members reached a consensus regarding these recommendations. Recommendations may also identify key areas in which future, or continued, research is necessary in regards to tobacco purchase and use in the state of Utah.

Each of these recommendations has limited evidence due to the novelty of the policy. However, each of the recommendations have been implemented throughout the country and appear to demonstrate reasonable and initial success.

Overall Recommendation

1. Raise legal age of purchasing and consuming cigarettes and other tobacco products from 19 to 21

Similar to New York City and the state of Hawaii it is recommended that Utah raise the legal age of purchase and consumption of tobacco products from 19 to 21. This change in legislation is likely to lead to a lower prevalence in habitual smoking, lower prevalence of smoking-related diseases, and better mental health. In particular, the rate of smoking among adolescents is likely to decrease, with fewer exchanges of tobacco occurring between those of legal age and adolescents due to a larger age gap. With the decrease in smoking-related diseases, a decrease in health care costs is also expected to occur. To accommodate those who are currently smoking cigarettes and are between the ages of 19-21, it is recommended that this law be grandfathered in, with a two year delay until it is fully in effect. However, it should be noted that this may delay any positive health impacts that will result from this change in legislation.

Additions/Alternatives

2. Use active law enforcement to improve compliance

In addition to raising the of age of tobacco purchase and use, it is recommended that law enforcement uses active enforcement of the new legal tobacco age to maximize the effects of this policy. Active enforcement includes compliance checks and clear and timely punishments. The Public Health Departments in Utah should regularly perform compliance checks for retailers selling tobacco to ensure that persons under 21 are unable to purchase tobacco products from retailers[31]. In order to improve compliance overall, it is recommended that compliance checks are completed not only on retailers, but also on social sources, such as individuals selling on the street (Massachusetts, Colorado, U.S.)[20,32-33].This comprehensive enforcement approach has been proven to be the most successful[31].

3. Taxation

Despite the long term savings of fewer lifelong smokers there is concern about the initial costs of changing the legal tobacco purchasing age. To account for the fiscal note costs and as an alternative to keep adolescents from smoking, additional tax on tobacco products, e-cigarettes or related paraphernalia may be implemented. Taxing has been found to be an effective means for a reduction in smoking rates[34]. With adolescents and young adults being very influenced by price increases, additional taxing on tobacco products could help reduce adolescent smoking rates (ex: Proposition 99 in California, 25 cent tobacco tax).

4. Education

In order to reduce overall underage tobacco use, it is recommended that education be closely coupled with enforcement. This was the finding of a study performed in Central Harlem, NY[33]. It is recommended that multi-media efforts be made to engage both retailers and the general public about the changes in the legal age of tobacco use. Education can be completed in many forms including, but not limited to, appropriate signage for retailers, mass media campaigns, and information packets to retailers. The Utah Department of Health, legislators, law enforcement and other nonprofit organizations can carry out these forms of education. Another recommended form of education for retailers is tobacco license renewal classes that will provide another form of needed information about enforcement and policy details[20].

Conclusion

Ultimately, evidence and research shows that implementing any of the recommendations presented in this HIA will have a positive impact on the population of Utah physically, socially, and environmentally. Economically the state can ensure even more immediate financial security by bundling any of these recommendations or policy changes with others, such as e-cigarette taxation. However, if all of the recommendations are implemented, the overall benefits for the people of Utah can expect to be maximized.

Monitoring

Monitoring & Evaluation

To evaluate the health effects of the change in legal age of tobacco purchase and consumption to 21, the Utah Department of Health, together with law enforcement, should continue to survey and publish their annual report of tobacco prevention and control. Of particular interest are the rates of smoking and e-cigarette use by adolescents, young adults and pregnant women. If this legislation has a two-year delay until fully in effect due to a potential grandfather clause, monitoring should continue every year, following the already established pattern for evaluating tobacco use in the state.

With the long latency period for many smoking-related diseases, such as lung cancer, monitoring will need to continue for a few decades until the generation of those currently under 21 has aged, having had time to experience the health outcomes of the proposed policy. At that point comparison of smoking-related illnesses, such as lung cancer and heart disease, can be made.

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Appendix A - Screening Overview

Purpose Statement

The purpose of this Health Impact Assessment (HIA) is to determine whether raising the legal tobacco age to 21 will decrease tobacco use in the adolescent population, will lead to less cancer and other tobacco related diseases and will indirectly decrease the use of other drugs in Utah's population.

Overview

The purpose of this screening is to determine the feasibility of conducting an HIA on raising the legal smoking age from 19 to 21 in the state of Utah in regards to buying, possessing or using a cigar, cigarette, electronic cigarette or tobacco. The goal in raising the legal smoking age is to ultimately reduce the number of individuals, particularly underage smokers, experimenting with, using and becoming addicted tobacco products and electronic cigarettes. Ultimately this will result in lower rates of cancer and disease related to tobacco and nicotine use, decreased governmental spending costs and a decrease in smoking prevalence and other drug use in the state of Utah. Conducting an HIA will add value to the debate around the proposed law change by including new information gained from other states, counties and cities which have already raised legal smoking age to 21.

Decision Makers/Stakeholders

The primary partners involved in this HIA are the Utah Health Department and Brigham Young University (BYU) Public Health Program. Stakeholders who have opposed this bill in the past are Utah Retail Merchants Association, the Utah Food Industry Association, some libertarians, and e-cigarette lobbyists[35-36]. Other possible stakeholders

in this HIA include, but are not limited to, the Utah Legislature, Utah Department of Health, Utah State Tax Commission, Utah's youth, the Utah Department of Education, PTA, tobacco companies, Tobacco Free Utah, the Division of Substance Abuse and Mental Health, law enforcement, and the media. The primary decision makers regarding the passing of this policy will be the state legislature. Supportive legislative members of this policy are likely to include: Rep. Kraig Powell and Sen. Stuart Reid who have all sponsored the bill in the past[2].

This HIA is created by Master of Public Health students at Brigham Young University. While the purpose of this HIA is to produce an unbiased analysis, it should be noted that BYU is sponsored by the Church of Jesus Christ of Latter-Day Saints, which teaches abstinence from tobacco[37].

Relevant Laws/Policies

This HIA will directly review the effects of a change to the following current Utah laws:

- 10-8-47, as last amended by Laws of Utah 2012, Chapter 140
- 26-38-2.6, as enacted by Laws of Utah 2012, Chapter 171
- 26-42-103, as last amended by Laws of Utah 2011, Chapter 96
- 51-9-203, as last amended by Laws of Utah 2012, Chapter 242
- 53-3-207, as last amended by Laws of Utah 2014, Chapter 85
- 53-3-806, as last amended by Laws of Utah 2010, Chapter 276
- 59-14-203.5, as last amended by Laws of Utah 2011, Chapter 96
- 59-14-301.5, as last amended by Laws of Utah 2011, Chapter 96

- 76-10-103, as enacted by Laws of Utah 1973, Chapter 196
- 76-10-104, as last amended by Laws of Utah 2010, Chapter 114
- 76-10-104.1, as last amended by Laws of Utah 2013, Chapter 278
- 76-10-105, as last amended by Laws of Utah 2010, Chapter 114
- 76-10-105.1, as last amended by Laws of Utah 2010, Chapter 114
- 76-10-112, as enacted by Laws of Utah 1989, Chapter 193
- 77-39-101, as last amended by Laws of Utah 2010, Chapters 114 and 276

If this policy were enacted in Utah it would be the second state to Hawaii to change its legal smoking age to 21. There are also 94 other municipalities that have raised legal tobacco use age to 21[38]. Utah law enforcement may choose to use similar policies and methods of enforcement as New York City or Hawaii such as sales and signage enforcement[39,40].

Supporting Data

This HIA will primarily evaluate the effects of the proposed law on health, particularly of adolescents, the economy and their overlap. Currently in the state of Utah, 13.1% of 8th, 10th and 12th grade students use cigarettes on a regular basis while 22.9% regularly use electronic cigarettes or vape products[4]. Although electronic cigarettes do not contain tobacco, a recent study published in the Journal of the American Medical Association shows a causal correlation that e-cigarette use among teens has led to regular combustible tobacco use[41]. Some risk factors for adolescent use of tobacco include low socioeconomic status, lack of support from parents and/or parental smoking and low self-esteem[42]. Smoking has been linked to a large variety of health conditions including, but not

limited to, cancer, respiratory disease (e.g. bronchitis, emphysema) and cardiovascular disease (e.g. ischemic heart disease)[23]. Adolescents who smoke are at risk for all of these conditions, as well as retarded lung growth and loss of lung function[43]. An estimated one third of young individuals who smoke will die prematurely from smoking related conditions[43]. In addition to these ailments, increasing evidence has shown the impact nicotine, one of the main ingredients in electronic cigarette vapor packs and a gateway to other harder substances, has on the developing brain and adolescent development. Tobacco and nicotine use are associated with lasting cognitive and behavioral impairments in youth, such as decreased working memory and attention and limited decision making abilities. Science shows that adolescent smokers are more likely than adults to become dependent on nicotine than adults[14]. Additionally, smoking during pregnancy has been linked to adverse birth outcomes, including higher rates of miscarriage, low birth weight and premature births[44]. Smoking during pregnancy is particularly prevalent among adolescents. In 2007, 46% of pregnant teenagers smoked during the first trimester and 58% of pregnant teenagers smoked during the third trimester[45]. The smoking habits that lead to these health outcomes are a result of daily smoking. 54% of daily smokers begin before age 18 and an additional 31% begin between 18-21[46].

The tobacco industry is a multibillion dollar industry[24]. In 2014, over 260 billion cigarettes were sold[8]. In 2010, the excise tax on cigarettes brought in nearly $15.5 billion[26]. In addition to the revenue it generates for the state and country as a whole, health related costs due to smoking related illness rise above $300 billion each year[6] surpassing the revenue brought in by tobacco products. This includes almost $170 billion in adult medical care costs, over $156 billion in lost productivity, including over $5 billion in lost

productivity due to secondhand smoke[27]. Each year, smoking related illness accounts for 9.6% or $45 billion of Medicare expenditures; 15.2% or $39.6 billion of Medicaid expenditures; and 32.8% or $23.8 billion of expenditures from other federal government-sponsored insurance programs[6]. A 2010 state by state study done by Rumberger et al[47] showed through data on Utah smokers, lost productivity, cost of cigarettes and smoking cessation treatments, that although the average retail price of a pack of cigarettes was $4.81, the combined medical costs and lost productivity attributable to each pack are nearly $16.76.

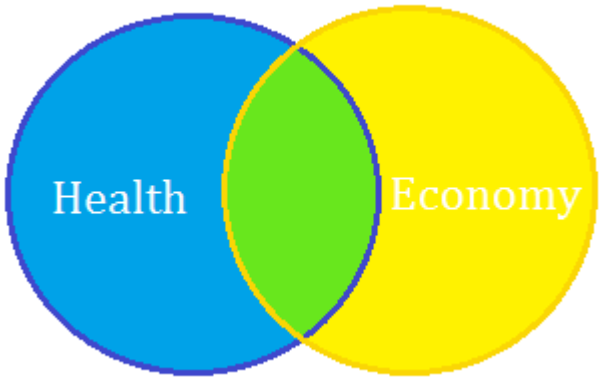

Figure 2: The impacts of the proposed law to raise the legal age of tobacco purchase and use to 21.

The Case for HIA

Changing the legal purchasing age of tobacco products will have widespread effects on individual and population health as well as on Utah's economy. As Hawaii has changed the legal purchasing age of tobacco to 21 and as California is considering the change there is more opportunity for conversation and a Health Impact Assessment can provide information that can influence the legal age change in the state of Utah. With the passing of this law elsewhere, there is new research and data available, giving sufficient data to

conduct an HIA. Due to the direct health, social and economic impacts associated with changing the legal smoking age from 19 to 21 in the state of Utah, an HIA is warranted. This HIA will be conducted from September 30, 2015 until December 9, 2015. It will then be passed on to the Utah State Legislature for the 2016 Utah Legislative Session.

Appendix B - Scoping Overview

Overview

This HIA scope includes a brief review of the direct, indirect, behavioral and health impacts of the proposed legislation through multiple perspectives. These perspectives include health, education, enforcement, legislative and economic views and changes that may occur as a result of increasing the legal tobacco purchasing age (LTPA) in the state of Utah. In particular, the following questions will be addressed in the HIA:

1. How will raising the smoking age from 19 to 21 impact the mental and physical health of adolescents?
2. How will raising the smoking age from 19 to 21 impact the economy of tobacco companies and of the health industry?
3. How will raising the smoking age from 19 to 21 impact the economy of the state and local businesses?

In setting up the HIA scope it was essential to look at the considered legislation change from multiple viewpoints. Broad impacts of changing the legal purchasing and use age of tobacco from 19 to 21 were first considered, e.g. reduced adolescent tobacco use, in creating the scope. From there, a discussion on the direct impacts on health, education, enforcement, legislation and the economy took place leading to the development of indirect, behavioral and health impacts resulting from the proposed age change.

Stakeholder Input

The stakeholder input received during the scope process was minimal. The HIA team received mentoring and input from the Utah State Health Department on the causal pathway model. Researchers viewed the arguments for and against the policy that were discussed in years past as mentioned in the media when the bill was proposed[48-50]. These arguments influenced the focus of the causal pathway and scoping process.

Demographics

The most relevant populations that will be affected by changing the legal age for tobacco product and use from 19 to 21 are residents of Utah (excluding military veterans[2]) and more specifically, individuals of low socioeconomic status, adolescents under 21 and minorities. These groups have the highest rates of tobacco use in the state of Utah[4]. Researchers consider these groups to be particularly vulnerable to health, economic, social, and educational impacts of the tobacco.

Others who may be affected by this change in legislation include stakeholders such as: the Utah State Health Department, the Utah Retail Merchants Association, the Utah Food Industry Association and e-cigarette lobbyists, the Utah Legislature, the Utah State Tax Commission, the Utah Department of Education, the PTA, tobacco companies, Utah Tobacco-Free Alliance, the Division of Substance Abuse and Mental Health, law enforcement, and the media.

House Bill 130, the proposed change in LTPA, did not pass this year and the next opportunity for this policy change will be in January 2016[1].

Methods

Due to a lack of time and resources, no original quantitative data analysis or modeling will be conducted for this HIA. Instead, a review of available reports and data from the current state of smoking in Utah and from states and counties which have also conducted an analysis of the impact of raising the smoking age to 21 will be completed.

For the assessment, team members primarily analyzed preexisting data from those states that have either already changed the legal tobacco purchasing age to 21 or have a similar interest in doing so (e.g. Hawaii and California). The HIA group also considered data from cities and counties throughout the country which have passed and enforced law changes supporting no tobacco use until age 21 (e.g. New York City). Due to of the relevance of this issue, there have been many studies in recent years on the societal impact of changing the age to 21 from which researchers were able to make a complete assessment.

A source for the percentage of taxes from tobacco revenue from those who are between the ages of 19-21 in Utah has yet to be identified. However, the percentage of taxes from tobacco revenue for those between the ages of 18-21 has been identified nationally (Winickoff et. al., 2014), and that figure will be used to address the issue of the economic impact of raising the smoking age to 21.

Causal pathway diagram

The causal pathway diagram is organized into 5 categories: Economic, Education, Health, Enforcement, and Legal impacts. The direct impacts of a raise in the LTPA are a

reduction of tobacco purchases, better brain development in youth, reduced secondhand smoke exposure, additional training for enforcers, and infringements upon individual freedom. The economic pathway shows that while there will be reduced income for the state, retailers, and the tobacco companies, there will be an increase of individual disposable income, increase in revenue of other products and reduced healthcare costs. Educationally, this policy will reduce the likelihood of exchanges occurring between legal users and adolescents under 21 which will lead to better school attendance and as a result, a more educated and healthy population. Regarding health, researchers found that as a result there would be less addiction and better decision making among under 21 year olds. The reduction in smoking among adolescents would result in less secondhand smoke exposure, less risky behaviors that tend to trend among smokers and improved health. This policy would require new retailer training, law enforcement training, and guidance counselor training. These actions will lead to fewer individuals accessing tobacco under age 21 and overall health would improve for the individual and society.

Concerns

With the growing popularity of the legislation to change the LTPA to 21 across the United States, team members anticipate that more studies will be conducted and become available for use in this HIA. As new information becomes available, this HIA will be updated and relevant information placed into appropriate sections for further review by decision makers. Researchers also have yet to receive direct input from stakeholders. As the HIA team continues to reach out to stakeholders, their input will also be considered and placed into relevant sections in the HIA.

Appendix C - Assessment Methodology

The data for this HIA was collected through an in-depth literature review of many different sources. Baseline information was collected on the state of Utah through the use of the annual "Tobacco Prevention and Control in Utah" reports generated by the Utah Department of Health Tobacco Prevention and Control Program and the use of the Public Health Indicator Based Information System (IBIS) published online by the Utah Department of Health (UDOH). Of particular interest were sections in the database related to tobacco, cancer, asthma/ respiratory diseases and mental health. Additional information on the health impacts of the legislation to raise the legal purchase age of tobacco was collected using the Surgeon General's reports on smoking and health and prevention among youth and adolescents.

Stakeholder input was gathered and reported from the UDOH and the Utah County Health Department. In addition, team members spoke with Linnea Fletcher, tobacco prevention and control program manager from the Utah County Health Department to receive a youth advocacy perspective on the proposed law change; Dave Davis, president and chief legal officer of the Utah Food Industry Prevention/ Utah Retail Merchants Association for a business and economic perspective; Brooke Carlisle, director of government relations at the American Cancer Society Action Network in Salt Lake City, for a policy perspective, and Luke Chalmers, tobacco policy analyst from the UDOH for a health impact perspective. These views were obtained in order to gain further insights into possible outcomes from the proposed policy change.

Appendix D: Assessment Research Summary Table

Hypothesis of causal pathway	**Summary of article or dataset findings**	**Study Type (self-report survey, program assessment, observational, longitudinal, etc)**	**Variables of Interest**	**Analysis Methods**	**Study Validity**	**Source**
Reduced adolescent tobacco use leads to reduced secondhand smoke exposure	SHS exposure has decreased in recent years, most likely due to smoke-free laws, voluntary smoke-free environments, changes in social norms of smoking, cigarette smoking prevalence has declined.	Data from 1999-2012 National Health and Nutrition Examination Survey SHS exposure assessed using serum cotinine (analysis of blood samples)	SHS exposure	Wald CIs, t-tests	Published study, valid	"Vital Signs: Disparities in Nonsmokers' Exposure to Secondhand Smoke"
Reduced secondhand exposure leads to cleaner air/environment	"Levels of CO in a smoke-filled room could reach concentrations equal to and even above standards for ambient air"	Review.	carbon monoxide levels	Not sure	Surgeon General report, valid	The Health Consequences of Smoking- 50 years of progress
Cleaner air/environment leads to lower rates of smoking related diseases	"those who breathed 'environmental tobacco smoke' suffered from decreased lung function and increased risk of lung cancer"	Epidemiologic research - probably observational (Hirayama study - prospective population study)	Lung function and rates of lung cancer	Mantel extension chi for Hirayama	Surgeon General Report and published study, valid	The Health Consequences of Smoking - 50 Years of Progress & Non-smoking wives of heavy smokers have a higher risk of lung cancer: a study from Japan
Reduced secondhand exposure leads to reduced modeling of smoking	Youth are at a time of great vulnerability for modeling, heightened sensitivity to normative influences	Info from survey by Dalton et. al	Risk of established smoking	Relative risk, attributable risk	Surgeon General Report and published study, valid	Preventing Tobacco Use Among Youth and Young Adults & Early Exposure to Movie Smoking...
Reduced secondhand exposure leads to reduced modeling of smoking	Smoke free laws are associated with a lower prevalence of smoking	Longitudinal cohort study	Prevalence of smoking	Time survival analysis, hierarchical linear modeling	Published study, valid	"Association of Smoke-Free Laws With Lower Percentages of New and Current Smokers Among Adolescents and Young Adults" http://archpedi.jamanetwork.com/article.aspx?articleid=2430959

Reduced modeling of smoking leads to lower rates of smoking related diseases.	Less modeling leads to lower prevalence of smoking which leads to less smoking related diseases.	CDC Report	Rates of coronary heart disease, stroke, lung cancer	NA	CDC Fact Sheets with references to primary literature, valid	http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/
Reduced adolescent tobacco use leads to fewer exchanges from older adolescents to younger adolescents	In CA, most adolescents were receiving their cigarettes from friends, with most being between 18 and 20 years of age.	California Tobacco Survey	Source of cigarettes	Cross tabulations	Fact sheet with references to published studies, valid	https://www.tobaccofreekids.org/research/factsheets/pdf/0073.pdf
Fewer exchanges from older adolescents to younger adolescents leads to reduced truancy rates	1. Truants are 5 times as likely to take drugs than other schoolchildren going to try and find a better source, both are in the UK 2. "Schools with better than expected school-level examination results and truancy rates, given the socio-demographic characteristics of their pupil populations (high value-added schools), were associated with a lower incidence of regular smoking"	Smoking, Drinking and Drug Misuse Among Young People (England) Data from Ineffective intervention trial	Truancy rates and smoking prevalence	1. News report, no analysis 2. Odds Ratios, Random effects logistic regression	1. News article, not sure what study, may not be valid 2. Published study, valid	1. http://www.theguardian.com/society/2003/jul/29/drugsandalcohol.drugs 2.http://www.ncbi.nlm.nih.gov/pubmed/18081615
Reduced adolescent tobacco use leads to reduction in purchase of tobacco by adolescents	increasing the MLA for tobacco products will likely prevent or delay initiation of tobacco use by adolescents and young adults. The age group most impacted will be those age 15 to 17 years.	lit review			institute of medicine of national academies; valid	https://iom.nationalacademies.org/~/media/Files/Report%20Files/2015/TobaccoMinAge/tobacco_minimum_age_report_brief.pdf
Reduced purchase of tobacco products by adolescents leads to reduced tobacco revenue for business/retailers	small % but yes - If one assumes that the number of cigarettes smoked by 18- to 20-year-old smokers corresponds to the number of cigarettes sold to them or to others on their behalf, the	review?	retail impact		AJPH - valid	Paste: "Retail impact of raising tobacco sales age to 21 years American Journal of Public Health [0090-0036] Winickoff yr:2014 vol:104 iss:11 pg:e18." into lib.byu.edu

	maximum immediate loss of sales would be just 2% of the total cigarette sales in the United States					http://web.a.ebscohost.com.erl.lib.byu.edu/chc/pdf?sid=b72490b4-ea58-4720-8985-add2cfaa5888%40sessionmgr4001&vid=1&hid=4001
Reduced purchase of tobacco products by adolescents leads to more disposable income for individual						
Reduced tobacco revenue for business/retailers leads to loss of tobacco industry income	The 27% decline in smoking rates from 1997 to 2002 among high school seniors (36.5% to 26.7%) represented a loss of more than $4 billion in future revenue, for a single graduating cohort.	cohort	revenue loss		yes -but outdated 2006	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2563563/#ref6
Reduced tobacco revenue for business/retailers leads to loss of state tax income	chart with state tobacco tax revenue 2012 utah had $123,988 - if we take the 2% then it only reduces it by like $2500				taxpolicycenter.org valid	http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=403
Reduced tobacco revenue for business/retailers leads to increased revenue for other products						
Less addiction leads to more economically productive members of society	More than $156 billion in lost productivity, including $5.6 billion in lost productivity due to secondhand smoke exposure	CDC report			CDC fact sheet with reputable sources - valid	http://www.cdc.gov/tobacco/data_statistics/fact_sheets/economics/econ_facts/

Decreased lifelong smokers leads to fewer health care costs from smoking related conditions.	Nearly $170 billion for direct medical care for adults	CDC report			CDC sheet with sources - valid	http://www.cdc.gov/tobacco/data_statistics/fact_sheets/economics/econ_facts/
Reduced adolescent tobacco use leads to brain development not being impaired	sufficient evidence suggesting nicotine impairs brain development may have "lasting adverse consequences for brain development"	various	health consequences of smoking/ cigarette use/ tobacco use	various	U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease	http://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm
Reduced adolescent tobacco use leads to brain development not being impaired	nicotine use in adolescence disrupts brain development (maturing into 20s), nicotine gateway to other substances (ex: cocaine)	lit review	brain/ brain development/ nicotine in e-cigs	review of other studies	peer reviewed journal	England, L. J., Bunnell, R. E., Pechacek, T. F., Tong, V. T., & McAfee, T. A. (2015). Nicotine and the Developing Human: A Neglected Element in the Electronic Cigarette Debate. *American journal of preventive medicine*.
Reduced brain development impairment leads to better decision making	smoking cigarettes= lasting cognitive/ behavioral impairments (ex: working memory/ attention, reduced prefrontal cortex activation (decision making))	lit review	brain/ brain development/ nicotine in e-cigs	review of other studies	peer reviewed journal	England, L. J., Bunnell, R. E., Pechacek, T. F., Tong, V. T., & McAfee, T. A. (2015). Nicotine and the Developing Human: A Neglected Element in the Electronic Cigarette Debate. *American journal of preventive medicine*.

Reduced brain development leads to less addiction	adolescent smokers are more likely than adults to become dependent on nicotine	lit review	brain/ brain development/ nicotine in e-cigs	review of other studies	peer reviewed journal	England, L. J., Bunnell, R. E., Pechacek, T. F., Tong, V. T., & McAfee, T. A. (2015). Nicotine and the Developing Human: A Neglected Element in the Electronic Cigarette Debate. *American journal of preventive medicine*.
Adolescents being less likely to smoke and participate in other risky behaviors before and after 21 leads to decreased life-long smokers	less premature death	survey	health consequences of smoking/ cigarette use/ tobacco use	YPLL, mortality rates, productivity losses	Center for Disease Control. Smoking Attributable Mortality, Years of Potential Life Lost, and Productivity Losses --- United States, 2000-2004. Atlanta, GA	http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm
Decreased life-long smokers leads to lower rates of smoking related diseases	Smoking linked to respiratory disease, cancer, cardiovascular disease,	survey	health consequences of smoking/ cigarette use/ tobacco use	YPLL, mortality rates, productivity losses	Center for Disease Control. Smoking Attributable Mortality, Years of Potential Life Lost, and Productivity Losses --- United States, 2000-2004. Atlanta, GA	http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm
Decreased life-long smokers leads to lower rates of smoking related diseases	Smoking linked to respiratory disease, cancer, cardiovascular disease decreased for adolescents as well as limited loss of lung function/ stunted growth	various	health consequences of smoking/ cigarette use/ tobacco use	various	U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease	http://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm

Enforcement training is necessary	In 2013, Utah had a retailer violation rate of 5.3% of selling to underage smokers	Self-report from each state	Violation rate among retailers	Frequency chart	SAMHSA report, published with data from CDC and US Dept of Health	http://store.samhsa.gov/shin/content//SYNAR-14/SYNAR-14.pdf
Majority want the age changed to 21	75% of non-smokers and 69% of smokers are in favor of legal age of smoking to go to 21.	Self report online survey	Favor of law change, smoker/non-smoker, education level, much more	SUDAAN, version 9.2. Point estimates and 95% CIs were calculated. Multivariate logistic regression	Published in American Journal of Preventive Medicine	http://www.sciencedirect.com/science/article/pii/S0749379715002524
Hypothesis of causal pathway	**Summary of article or dataset findings**	**Study Type (self-report survey, program assessment, observational, longitudinal, etc)**	**Variables of Interest**	**Analysis Methods**	**Study Validity**	**Source**