Understanding consumer perceptions and misconceptions of industrial hemp

Nicolle Clements, Ph.D.
Saint Joseph's University

Abstract

This study examined Pennsylvania consumers' perceptions of hemp, its' properties, its similarities and dissimilarities to marijuana, and the likelihood of consumers to purchase a hemp-based product. An online survey was distributed in early 2023 to Pennsylvania residents. The data was analyzed from the 548 respondents. Demographic factors were collected for insights into the educational and outreach steps required for hemp industry expansion in Pennsylvania. Results indicate that misconceptions exist in Pennsylvania consumers about hemp properties and hemp-based products. Negative attitudes toward hemp increase with respondent's age. Further, analysis revealed that consumer's likelihood of purchasing hemp-based products was predicted by their objective knowledge of hemp properties. Thus, early communication and education of the public is important for the viability and success of the hemp agricultural industry in Pennsylvania.

Keywords: Hemp, consumer misconceptions, marijuana, Pennsylvania, agriculture

INTRODUCTION

Industrial hemp (Cannabis sativa L.) is a historically refined plant native to Central Asia that is appreciated for its fiber, food, and medicinal uses (Rupasinghe, 2020). In the United States, industrial hemp was an economically productive crop during the early 1900's (Wright, 1942). There are several misconceptions and misunderstandings that exist between hemp and marijuana, primarily due to their similar appearance and the fact that they both belong to the Cannabis plant genus. While they both belong to the Cannabis genus, they are different varieties with distinct characteristics. Hemp is typically defined as cannabis with low levels of THC (tetrahydrocannabinol), the psychoactive compound that produces a "high" when consumed. Marijuana, on the other hand, contains higher levels of THC. Many people mistakenly believe that consuming hemp products can get you high. In reality, hemp contains very low levels of THC (usually less than 0.3%), which is not enough to produce psychoactive effects. Hemp is grown primarily for industrial and agricultural purposes, such as making textiles, paper, food, and CBD products.

Some of the negative associations between hemp and marijuana led to it being banned as part of the 1970s Controlled Substance Act (The Federal Comprehensive Drug Abuse Prevention & Control Act, 1970). It wasn't until the 2014 Farm Bill that the U.S. legalized hemp to launch research programs for growing hemp (H.R. 2642, 2014). After the successful pilot programs concluded, the crop's production was legalized in the 2018 Farm Bill (H.R.2, 2018). As such, hemp has gained the attention of consumers and farmers alike. The 2018 Farm Bill was a catalyst for growing demand of hemp products including textile, oils, food, and medicinal products. In 2014, CBD and hemp sales in the United States were more than 100 million dollars. Four years later in 2018, over 1,000 companies produced hemp in the U.S. market, and sales were in surplus of 500 million dollars (Dabrowska, 2020). Hemp sales are projected to exceed 2 billion in 2023.

Additionally, the number of licensed hemp growers in 2019 showed a 475% increase over 2018 (Drotleff, 2020). Despite the hemp being legal to grow, there still exist political, educational, and supply chain challenges facing this budding industry. The need for consumer behavior research on how consumers receive and perceive hemp products is strong (Brightfield Group, 2019).

Hemp offers a variety of consumer advantages due to its versatility and the various parts of the plant that can be utilized for different purposes (Schluttenhofer & Yuan, 2017). Hemp is considered an environmentally friendly crop because it grows quickly, requires minimal pesticides and herbicides, and can thrive in variable climates. It also has deep roots that help prevent soil erosion. Prospects for the hemp industry have increased in recent years with the acknowledgement that the crop offers many uses for its oils, fibers, and seed. Several studies found that hemp grains are beneficial for livestock feed and food supplements because they are rich in fatty acids, vitamins and minerals, and protein. (Xu, 2020). For human consumption, hemp seeds are a source of complete protein with amino acids, making them an important option for those with a vegetarian diet. Hemp oil, which is rich in omega-3 and omega-6 fatty acids, is often used in cosmetics and skincare products because of its benefits in skin health (Fike, 2016).

Hemp fibers are used to make a wide range of products, including rope, textiles, plastics, clothing, paper, construction materials, food and beverages, and personal care items (Small & Marcus, 2002). Hemp fibers are strong and durable, making them suitable for a variety of industrial applications. As such, there is a large market potential in the Pennsylvania agricultural

industry for growing hemp and producing. However, negative consumer perception of hemp and the preexisting association between marijuana and hemp must first be addressed.

In spite of significant advances in the US hemp industry since 2018, there are considerable gaps in consumer awareness and education (Owen, 2020). In 2019, the USDA launched a grant program called theNIFA Supplemental and Alternative Crops Competitive. The intent was to plan, conduct, and report on a hemp research and industry opportunities. Findings of the grant included initiating a multiyear hemp education outreach to consumers to advance the sustainable development of the hemp industry (Ellison, 2021).

Public perception of growing and processing hemp is a critical factor when considering the expansion of the hemp crop widely across Pennsylvania. Consumer buy-in is crucial to the feasibility of expanding growth, production, and sales of hemp products. Unfortunately, hemp is negatively impacted by socio-politics, thus warranting effective outreach strategies for hemp education and marketing efforts. Understanding public opinion, attitudes, and perceptions early can be essential to obtaining widespread support for hemp production and purchasing.

Previous research about perceptions of hemp and cannabidiol products suggest that the average consumer has a misunderstanding regarding hemp's absence of psychoactive properties. Some recent studies suggest that most consumers learned about CBD from a non-credible source like the Internet. Less than 10% of consumers obtained their hemp knowledge from a physician. Government agencies and health experts are credible sources for consumers, making them the appropriate starting point to drive out hemp misconceptions and provide accurate information on its properties and benefits. (Goodman, 2022)

This study was conducted to examine Pennsylvania consumers' perceptions of hemp, its' properties, its similarities and dissimilarities to marijuana, and the likelihood of consumers to purchase a hemp-based product. Demographic factors were collected for insights into the educational and outreach steps required for hemp industry expansion in Pennsylvania.

METHODS

An online survey using Qualtrics platform was employed for this study. In February and March of 2023, respondents were recruited using two paid market research panels: Amazon mTurk and Cloud Research. All participants were verified to have lived in Pennsylvania by their respective panels. Respondents who did not complete at least 50% of the survey or did meet the requirements of being a Pennsylvania resident older than age 18 were omitted from analyses. Useable survey data was obtained from 548 Pennsylvanians. The demographic breakdown of respondents is visualized in a Tableau Dashboard. A snapshot is show in Figure 1 (Appendix).

The questionnaire was used to estimate consumer's objective and subjective knowledge of hemp benefits, properties, and uses. First, objective knowledge of hemp statements (e.g., hallucinogenic properties, sustainability, etc.) was assessed using 10 items with a seven-point Likert-type scale: 1 = very likely false; 2 = likely false; 3 = probably false; 4 = unsure; 5 = probably true; and 6 = likely true; 7 = very likely true. T-tests were used to analyze statistical differences from the neutral/midpoint. Additionally, responses were collapsed (0 = incorrect; 1 = correct) and analyzed. Second, objective knowledge of the uses of hemp in product (e.g. oils, building materials, plastic substitutes, etc.) was assessed using a multiple choice response of Yes, No, or I Don't Know. T-tests were also used to analyze statistical differences from the neutral/midpoint and responses were recoded (0 = incorrect; 1 = correct) for further analysis.

Subjective knowledge and perception was measured using four items each using a seven-point Likert scale. Survey participants were asked “What is your perception of Hemp?”, "How likely would you be to purchase a product that has hemp for consumption purposes?", "How likely would you be to purchase a product that has hemp for non-consumption purposes?", and "To what extent is hemp similar or dissimilar to marijuana?". For each subjective question, t-tests were used to analyze statistical differences from the neutral/midpoint. Also, the objective knowledge scores were tested as predictors of likelihood to purchase hemp products.

Lastly, to further assess perceptions and misconception of hemp, respondents were asked "What comes to your mind when you think of hemp?" and "What are the similarities and/or differences in your mind between hemp and marijuana?" using an open-ended text-entry formats. Word clouds visualize the most commonly used words and phrases.

RESULTS

Knowledge of hemp statements were assessed individually for each item by conducting a t-test on how different the responses were from Neutral. One of the ten statements was significantly associated consumer misconception: “Hemp has potential use as a recreational drug” ($p = 0.0008$). The summary of each statement’s analysis is in Table 1 (Appendix). A single asterisks (*) denotes statistical significance in the direction of the correct answer. A double asterisks (**) denotes statistical significance in the direction of the wrong answer.

The objective hemp statements were also measured in totality by computing a single test score of the percentage of correct answers supplied. Participant’s total test scores ranged from 0 to 100% and respondents answered correctly 5.31 of the 10 items on average, for an mean test score of 53.1% (SD = 25.4%). Additionally, as the respondent’s age increased, their test score decreased significantly ($p = 0.006$, with an average of 1 less question correct for an increase of 20 years of age). The most significant contributors of incorrect answers (hemp misconceptions) were that hemp has addictive properties and has potential use as a recreational drug. These misconceptions indicate significant confusion between hemp and marijuana. Figure 2 (Appendix) displays each objective hemp statement and the share of participants who selected each Likert-scale answer choice. Accurate answer choices are indicated on the left, with the first 4 being false and the last 6 being true. Using the Tableau Dashboard, viewers can interact with Figure 2 (Appendix) and see how the responses change by age group.

Similarly, knowledge of hemp uses in certain products were assessed individually for accuracy as well as in total by averaging the total number of correct responses out of the total number of questions to produce a test score. Participant’s test scores ranged from 0% to 100%, with an average of 4.59 correct answers of the 10 items, for an mean test score of 45.9% (SD = 27.2%). The most significant contributors of incorrect answers were that hemp *can* be used as a hallucinogenic product and that hemp *cannot* be used in biodegradable plastic substitutes, insulation, and biofuel. Again, these misconceptions indicate confusion between hemp and marijuana. Figure 3 (Appendix) displays each product and the proportion of participant’s who selected each option. Correct answers are marked with a green check mark. Using the Tableau Dashboard, viewers can interact with Figure 3 (Appendix) and see how the responses change by age group.

Subjective knowledge and perceptions were measured using 7-point Likert scales. Results are shown in Figure 4 (Appendix). To the survey question “What is your perception of hemp?”, respondents indicated that their overall perception was positive ($M = 4.85$, $SD = 1.53$),

which is statistically significant ($p < 0.0001$). However, as the respondent's age increases, the perception of hemp shifts towards being negative ($p = 0.0005$).

The survey question asking "How likely would you be to purchase a product that has hemp for *consumption* purposes?" indicated mixed opinions of consumers' willingness to purchase hemp for consumption ($M = 4.19$, $SD = 2.01$). Specifically, older respondents were significantly less willing to purchase a hemp product for consumption ($p = 0.0002$). When asked "How likely would you be to purchase a product that has hemp for *non-consumption* purposes?", respondents across all ages indicated a much higher willingness to purchase non-consumption hemp-based products ($M = 4.72$, $SD = 1.80$, $p < 0.0001$).

When asked "To what extent is hemp similar or dissimilar to marijuana?", respondents indicated significant confusion and the inability to differentiate between marijuana and hemp ($M = 4.39$, $SD = 1.49$, $p < 0.0001$).

The summary of each subjective question's analysis is in Table 2 (Appendix). A single asterisks (*) denotes statistical significance in the direction of a positive answer. A double asterisks (**) denotes statistical significance in the direction of a misconception.

Pairwise correlational analyses was conducted between respondent's total test score on objective knowledge of hemp properties and their likelihood of purchasing a hemp product for consumption. The Pearson correlation coefficient was $r = 0.55$ ($p < 0.0001$) which indicates a significant, positive correlation. In other words, respondents who had fewer incorrect answers (i.e. a higher test score) generally indicated that they would be willing to purchase a hemp product for consumption compared to respondents who had greater misconceptions about hemp properties (i.e. a lower test score). Similar findings were found for purchasing non-consumption hemp products ($r = 0.51$, $p < 0.0001$).

Lastly, the open response questions were analyzed through a Word Cloud (Figure 5, Appendix). When respondents were asked "What comes to mind when you think of hemp?", the most frequently appearing words and phrases included marijuana, weed, pain and cbd suggesting general confusion amongst the population.

CONCLUSIONS & RECOMMENDATIONS

As of 2018, hemp is a legal crop to grow and produce in the United States. In Pennsylvania, there are producers, processors, and stakeholders who are eager to be a part of this budding industry. However, results from this study indicate that misconceptions exist in Pennsylvania consumers about hemp properties and hemp-based products. These misconceptions need to be addressed through an educational outreach program to support the advancement of the hemp industry. Specifically, this study found that negative attitudes toward hemp increase with respondent's age. No other associations were found between hemp perceptions and respondent's demographic information (gender, ethnicity, income, education, marital status, occupation). Further, likelihood of using hemp for consumption was correlated with respondents' objective knowledge of hemp properties.

Significant confusion between marijuana and hemp was observed in both the quantitative and qualitative findings. The most pronounced misconception was that hemp has the potential to be used as a recreational drug. The misunderstandings between hemp and marijuana is consistent with previous consumer behavior research. Because of this, early public communication and education on differences between marijuana and hemp is recommended.

This research is restricted to the Pennsylvania subset of the United States. The intent for this study was to provide important insights for data driven decision making in the PA hemp industry. Additional data collection and analysis is warranted in developing an educational outreach plan for increasing public awareness of hemp. This would include data collection from additional hemp stakeholders, policymakers, farmers, and industry members to find potential differences in stakeholder perceptions and to enhance the future viability of the hemp market.

ACKNOWLEDGEMENTS

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APPENDIX

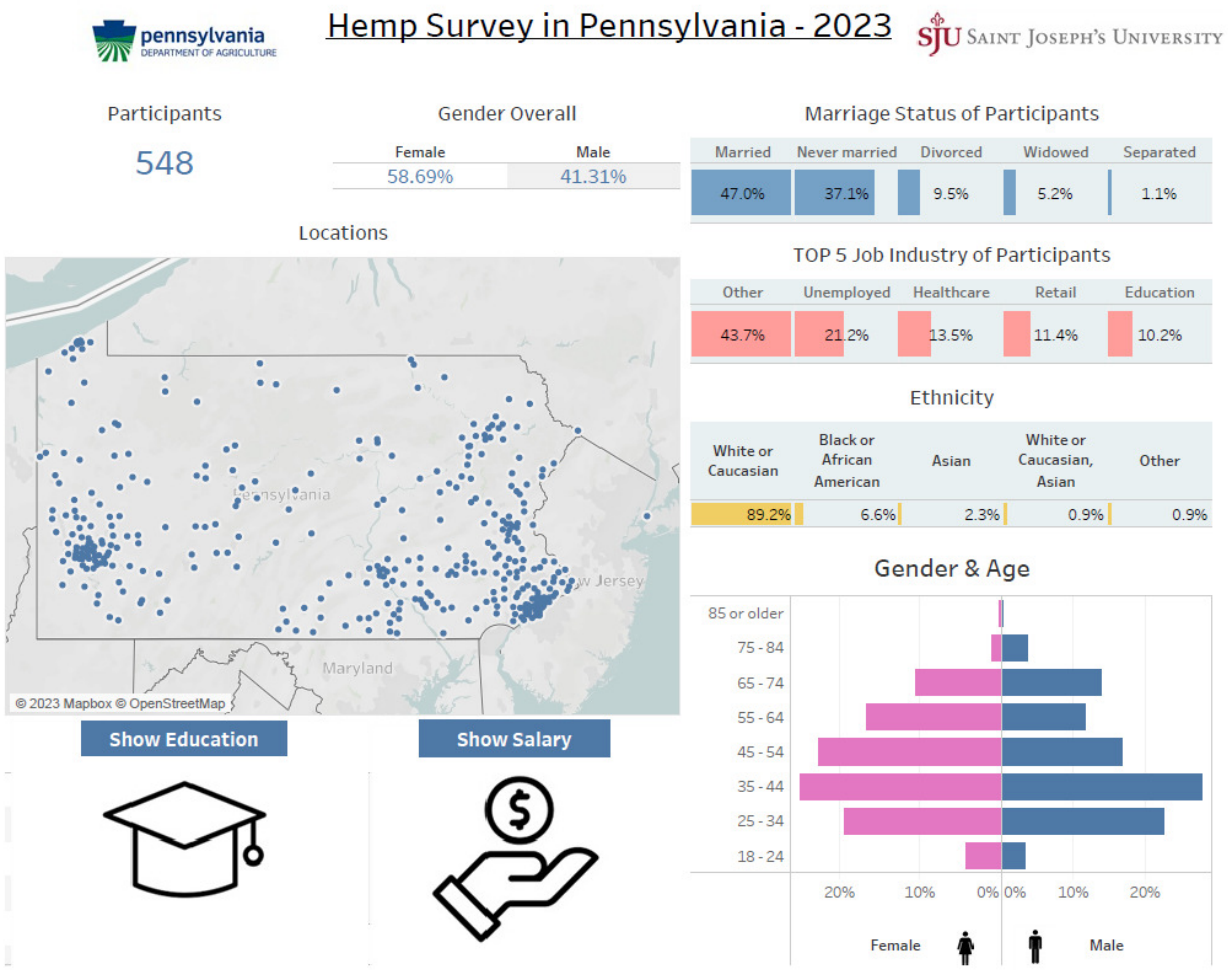

Figure 1: A demographic breakdown of the 548 Pennsylvania respondents on their perception of hemp. Click the figure to be directed to the interactive Tableau dashboard.

Figure 2. Respondents answers on hemp statements, ranging from likely to be False to likely to be True. Green bars indicate correct responses and red bars indicate incorrect responses. Click the figure to be directed to the interactive Tableau dashboard.

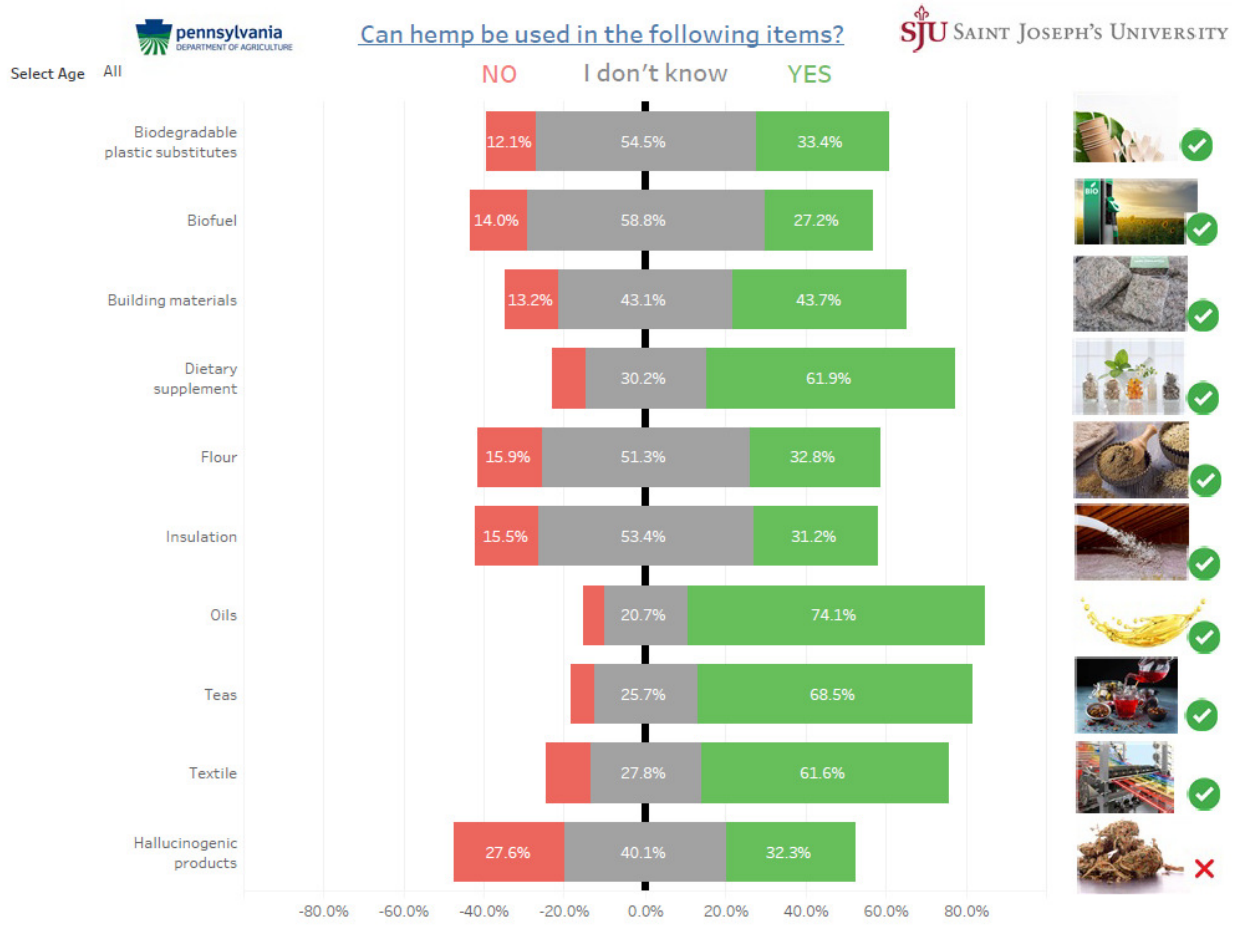

Figure 3 shows the results of consumers surved on which products can be produced using hemp. Click the figure to be directed to the interactive Tableau dashboard.

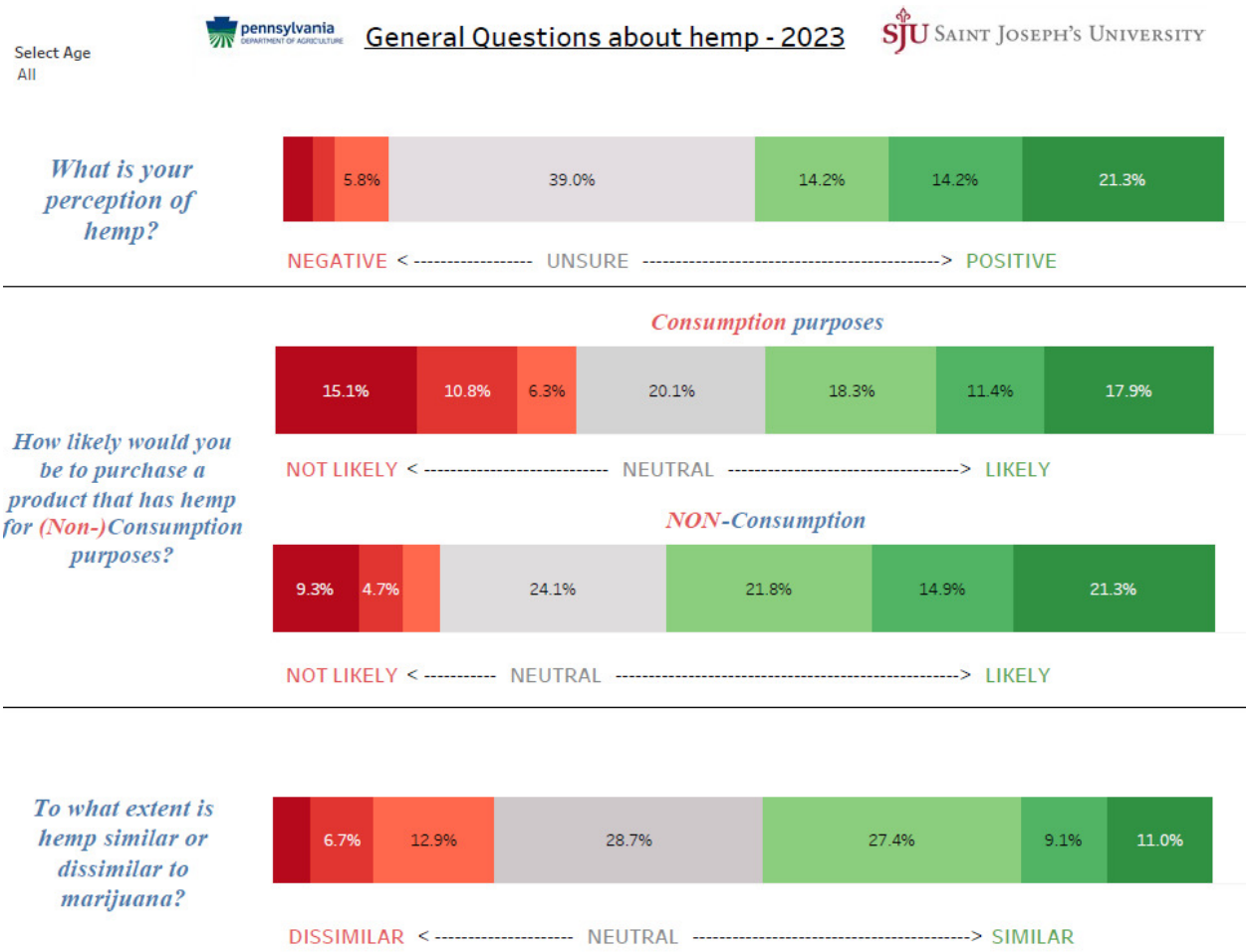

Figure 4. Subjective knowledge and perceptions results using 7-point Likert scales. Click the figure to be directed to the interactive Tableau dashboard view how the responses change by age group.

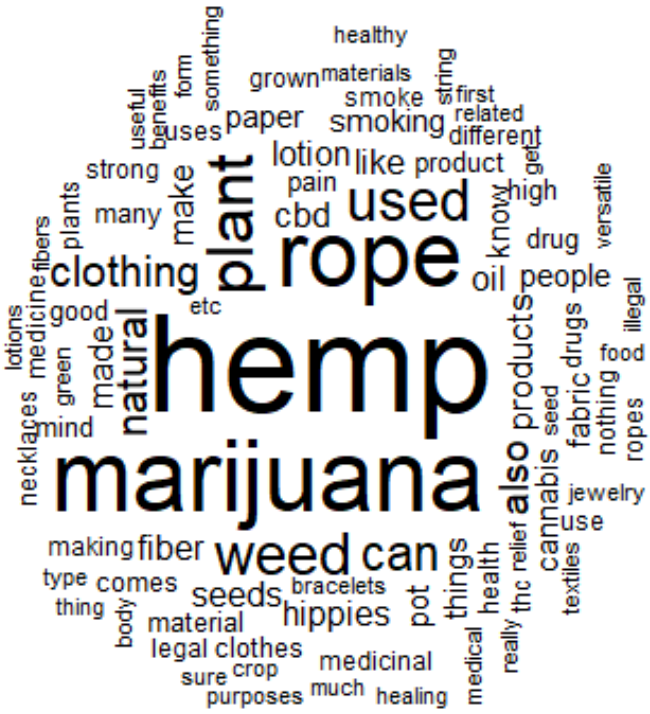

Figure 5: Word Cloud displaying the most frequently appearing words and phrases when respondents indicate what comes to mind when they think of hemp.

Table 1: Hemp Statements with responses on a 7-point Likert scale with higher values indicating higher beliefs. One statement has significant misconceptions by consumers, as noted by the double asterisks.

Hemp Statement	Mean (SD)
Has Usage other than Consumption	5.81 (1.41) *
Is Legal to Buy	5.43 (1.49) *
Has Sustainability Properties	5.18 (1.39) *
Has Pain-Relieving Properties	5.03 (1.51) *
Has Health Benefits	5.03 (1.41) *
Has Renewable Energy Source Properties	4.47 (1.55) *
Has Potential Use as a Recreational Drug	4.28 (1.95) **
Is Expensive	3.94 (1.44)
Has Addictive Properties	3.46 (1.79) *
Has Hallucinogenic Properties	3.40 (1.81) *

Table 2. Subjective questions on consumer perceptions and likelihood to purchase hemp. A single asterisks (*) indicates statistical significance in the direction of a positive answer. A double asterisks (**) indicates statistical significance in the direction of a misconception. On average, there is a statistically positive response to the purchasing and perception questions. When asked how similar hemp is to marijuana, consumers indicated significant similarities between the two.

Question	Mean (SD)
What is your perception of hemp?	4.84 (1.52) *
How likely are you to purchase a hemp product for non-consumption?	4.71 (1.80) *
To what extent is hemp similar or dissimilar to marijuana?	4.39 (1.49) **
How likely are you to purchase a hemp product for consumption?	4.19 (2.01) *

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