

# Plant Benefit Perceptions Influence Consumers' Likelihood to Buy and Differs across Age Cohorts<sup>1</sup>

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## Abstract

Plants provide many benefits (e.g., social, physiological, emotional, mental) but some consumers may be unaware of those benefits. Here, we investigate the effects of social, physiological, and emotional and mental health benefits of plants on consumers' likelihood to buy (LTB) a plant based on those messages. A sample of 497 Americans participated in an online survey in 2021. All three plant benefit messages increased consumers' LTB a plant, but differences were observed among age cohorts. Compared to the oldest age cohort (consumers born before 1965), Generation Z (born after 1996) responded most positively to the emotional and mental health benefit message followed by the physiological benefit, but did not respond to the social benefit. Compared to the older cohort, Millennials (persons born between 1981–1996) responded more favorably to all three benefit messages. Generation X (people born between 1965–1980) responded favorably to the emotional and mental health benefit message followed by the social benefit but not the physiological benefit. Generally, as education level and income increased, effects of the plant benefit messages decreased. Respondents who made plant purchases online responded favorably to the emotional and mental health plant benefits. Individuals who did not buy any plants did not respond favorably to any of the plant benefit messages. Plant sellers should employ benefit messages tailored to the age cohort target market(s) for the greatest impact.

**Index words:** Emotional and mental health benefits, Generation X, Generation Z, Millennial, online survey, physiological benefits, social benefits.

## Significance to the Horticulture Industry

Plant benefit messages may encourage customers to engage with and purchase more plants. This study addressed how three different benefit messages (i.e., emotional and mental, social, and physiological) impacted customers' plant purchasing behavior among different age cohorts (Gen Z, Gen X, Millennials, older). Differences were observed with Millennials responding the most favorably across benefit messages. Gen Z responded favorably to the physical and emotional and mental health benefit messages. Gen X responded positively to the emotional and mental health benefit message. As younger consumers engage more with plants, understanding the relationship between age and benefit message along with tailoring in-store promotions to communicate these benefits is increasingly important. Garden centers and other plant retailers could profit by implementing signage and other promotions indicating these benefit messages. In turn, if the retailer knows the age cohort they are appealing to, the effectiveness of those promotions could be amplified.

## Introduction

Marketers have long recognized the different levels of a product, among which are core benefits and the actual product itself (Levens 2012). Ford et al. (1988) classified product attributes as search (those that can be readily identified prior to purchase), experience (difficult to evaluate

without direct experience), and credence (may be unidentifiable even after purchase). Search attributes may include mature plant height and width; experience attributes may include the floral fragrance or flavor of edible greens; and credence attributes may include sustainable or organic production methods. Many experience and credence attributes can be classified as benefits. Product benefits are essentially a conversion of product features or attributes into the utility of the product to the consumer. For example, an automobile transports an individual or cargo from one location to another. An appeal to product benefits focuses consumer attention on the “ends” while an appeal to product features directs attention to purchase and search attributes (Hernandez et al. 2015). In other words, the automobile may provide benefits by transporting individuals or cargo with higher gas mileage (experience attribute) or with greater environmental sustainability than alternatives (credence attribute). For plants, Zhu et al. (2017) demonstrated that the presence of a plant benefit message on a display sign for a higher priced plant (compared to low- and moderately-priced, digitally identical plants) increased the intent to purchase.

Given that the product's benefits influence consumer choice (Meyvis and Janiszewski 2002) and often vary by age (Gurău 2012), a deeper understanding of the relationship between benefit perceptions, consumer behavior, and demographic differences is important when determining marketing strategies. In the ornamental plant industry, plant benefits are numerous and diverse; however, their influence on consumer behavior and how that varies by age is not well understood. Hall and Knuth (2019a, b, c) summarized the research showing the diversity of plant benefits and identified three major plant benefit themes: emotional and mental health benefits (Hall and Knuth 2019a), physiological or physical exercise benefits (Hall and Knuth 2019b), and social benefits (Hall and Knuth 2019c). Yet, while the research demonstrating those plant

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benefits has been summarized and categorized, scant work has been done to determine the impact of diverse plant benefits on purchase intention.

Age influences consumers' purchasing intention and product choice behavior in many industries (Chen et al. 2017, Gurău 2012), including the ornamental plant industry (Dennis and Behe 2007, Rihn et al. 2012). Age cohorts, unlike chronological age, better reflect the impact of life events on purchasing behavior (Chen et al. 2017). Several age cohorts are frequently referenced in the literature: Baby Boomers, Generation X (Gen X), Millennials, and Generation Z (Gen Z). Baby Boomers, individuals born between 1946 and 1964 (Fry 2020), are entering retirement (Chen et al. 2017). They are described as having substantial disposable income, which is attractive for marketers of a variety of products (Chen et al. 2017). This age cohort buys more floral products than Gen X and Millennials do and is often identified as the "core consumer" of plants (Dennis and Behe 2007, Rihn et al. 2012). Gen X and Millennials, two distinct and younger age cohorts, have had a substantial influence on the domestic economy (Littrell et al. 2005, Roberts and Manolis 2000). Gen X consists of 44 million people in the U.S. born between 1965 and 1980 (Fry 2020) who value autonomy in the workplace (Mhatre and Conger 2011) and are characterized as self-reliant and practical (Littrell et al. 2005). Millennials, 72 million Americans born between 1981 and 1996 (Fry 2020), are the most ethnically and culturally diverse age cohort in the U.S.; nearly 25% of this age group is African-American and 18% is Hispanic (Licsandru and Cui 2019). Millennials are digital natives, meaning they have always had access to the internet and are comfortable with many technological innovations (Dacosta et al. 2013). Gen Z, individuals born after 1996, are also digital natives and heavy users of social media (Thigpen and Tyson 2021). Whiting and Cohen (2021) reported that youths (classified as persons 18-34 years old) are driving a large portion of the houseplant purchases and make the most online plant purchases of any age group. Campbell and Campbell (2019) also found generational differences in plant production method preferences with younger consumers (e.g., Gen X and Millennials) preferring water-conserving and energy-conserving plant production practices compared to Baby Boomers and older participants. Recent evidence suggests a shift in the ornamental plant industry, with younger consumers engaging more with and spending more on ornamental plants than in years past (Whiting and Cohen 2021). Given the distinct differences between the age cohorts and the increased interest of younger consumers in plants and gardening, a better understanding of the influence of promotional information on their purchase behavior is needed to help direct future industry communication efforts.

Existing literature highlights that consumer demographics (including age) influence gardening motivations and interactions with plants. For example, women and more educated individuals were more likely to express feeling calmer around plants, while younger persons (ages 18-24 years) were less likely to do so (Relf et al. 1992). Dennis and Behe (2007) reported that Baby Boomers were, relatively, the age cohort with the greatest number of plant

purchasers. Furthermore, consumers with constrained incomes, specifically those facing economic hardship, were more likely to engage in home gardening (Schupp and Sharp 2012). McFarland et al. (2018) found that for gardening activities, the motivators of food, health, nutrition, and nostalgia were more influential for men while personal productivity (e.g., hands-on learning, exploring, reduced idleness) was more influential for women. However, men and women have similar perceptions of the therapeutic value of gardening (McFarland et al. 2018). Together, these studies suggest that demographic differences influence the promotional value of different plant benefits depending upon the target market of interest.

To date, very few studies have addressed the relationship between plant benefit information and consumer demographics. One exception is Zhu et al. (2017), who demonstrated that the presence of a plant benefit message improved purchase intention. Another exception is Behe et al. (2022), who based their experiment on Beard and Ragheb's (1980) leisure satisfaction scale, which measured satisfaction with psychological, educational, social, emotional, physiological, and aesthetic dimensions of leisure activities. The six dimensions measured in the Beard and Ragheb (1980) leisure satisfaction scale align with many of the plant benefit categories described by Hall and Knuth (2019a, b, c) and have high validity and reliability (Beard and Ragheb 1980). Their results showed that the social benefit increased LTB the most for Millennials compared to Baby Boomers and Gen X (Behe et al. 2022). Other plant benefits were differentially perceived. This evidence of experiencing plant benefits differently suggests that these benefits may influence consumers' purchasing behavior toward plants and that age may play a role in that behavior.

Another important factor in consumer behavior toward ornamental plants is the retail outlet where the participant frequently buys plants. This factor is important because consumers view floriculture crops from different retail outlets differently (Campbell and Campbell 2019, Yue and Behe 2008). For instance, independent garden centers are perceived as having better customer service, more knowledgeable staff, higher quality products, and more expensive products relative to plants from less specialized retailers (Campbell and Campbell 2019, Yue and Behe 2008). Conversely, home improvement centers and mass merchandisers are viewed as having more competitive prices and/or the lowest priced plants (Campbell and Campbell 2019). Given the perceptual differences between retail outlets, it is important to incorporate retail outlets into marketing research related to ornamental plants.

Since Behe, et al. (2022) demonstrated a difference in perceived plant benefits by age cohort, we build on their work and hypothesize that different types of plant benefit information will differentially influence purchase intention by age cohort. This study expands previous work by implementing an online survey to better understand the impact of different types of plant benefits on likelihood to buy, retail outlet choice, and sociodemographic characteristics.

## Materials and Methods

Researchers developed an online questionnaire and consent form on the Qualtrics platform (Provo, UT) and utilized the platform's panel of several million consumers as the basis for sample selection. Participants were screened to ensure they were  $\geq 18$  years old at the time of the study. Researchers obtained approval for the survey instrument and protocol from Michigan State's ethics committee (Exempt approval study number 00005555). A total of 497 people participated in the survey.

The online survey consisted of the following sections: the influence of benefit information on likelihood to buy (LTB) a plant, the leisure satisfaction measures developed by Beard and Ragheb (1980) and adapted by Behe, et al. (2022) to quantify the plant benefits classified by Hall and Knuth (2019a, b, c), retail outlet frequented, and demographic questions. Three benefit messages were created to reflect each of three categories identified by Hall and Knuth (2019a, b, c): "how plants can help you relate socially with others," "how plants can improve your physical well-being," and "how plants can improve your emotional and mental health." These messages were used to assess the potential for the different general benefit categories to affect consumers' LTB plants. Participants indicated how that information would influence their LTB a plant using a 7-point Likert scale where 1=strongly decrease, 4=neither increase nor decrease, and 7=strongly increase.

Participants' preferred plant retail outlet was identified by having participants select where they most often purchase plants from a list of six retailer options, with an "I don't buy plants" option. The six retailer options were grocery stores, independent garden centers, mass merchandisers (e.g., Wal-Mart), home improvement stores (e.g., Home Depot, Lowes), farm-direct, and online; participants could only select one retailer option. The retailer variables were coded as binary, where 1=selected and 0=otherwise. Standard sociodemographic metrics related to age, gender, ethnicity, education, income, household size, and household composition (adults, children).

*Econometric analysis.* Given that the independent variable is ordinal (i.e., likelihood to buy [LTB], where 1=strongly decrease; 4=neither increase nor decrease; 7=strongly increase), an ordered logit model was used to estimate the relationship between the observed and latent variables. Ordinal models relax the assumptions of linear regression models, which assume the distances between categories are equal (Long and Freese 2006). Following Long and Freese (2006), ordinal regression models can be presented as latent-variable models, where  $y^*$  is the latent variable ranging from  $-\infty$  to  $\infty$  to an observed variable  $y$ . With  $J$  categories in the ordinal metric, the relationship between the observed and latent variables can be expressed as:

$$y_i = m \text{ if } k_{m-1} \leq y_i^* < k_m \text{ for } m = 1 \text{ to } J \quad (1)$$

where the  $k$ s are the cut-point thresholds for each  $m$  category in the distribution of  $y^*$ ; a category change occurs once these thresholds are crossed. The final categories of 1 and  $J$  can be shown as open-ended intervals  $k_0 = -\infty$ ,

and  $k_J = \infty$  which are the seven LTB ratings (1=strongly decrease; 7=strongly increase) and stated as:

$$y_i = \begin{cases} 1 & \text{if } k_0 = -\infty \leq y_i < k_1 \\ 2 & \text{if } k_1 \leq y_i < k_2 \\ \vdots & \vdots \\ 7 & \text{if } k_6 \leq y_i^* < k_7 = \infty \end{cases} \quad (2)$$

The structural model is:

$$y_i^* = x_i \beta + \varepsilon_i \quad (3)$$

where  $x_i$  is a row vector of values for  $i$ th observations,  $\beta$  is the column vector of parameters to be estimated, and  $\varepsilon$  is the random error term which is assumed to have a logistic distribution with a mean of 0 and variance of  $\pi^2/3$ , with the probability distribution  $\lambda(\varepsilon) = \exp(\varepsilon)/[1 + \exp(\varepsilon)]^2$  and cumulative distribution of  $\Lambda(\varepsilon) = \exp(\varepsilon)/1 + \exp(\varepsilon)$ .

The error term assumption of distribution allows for the relating of outcome probabilities ( $y$ ) given values of  $x$ , which can be expressed as (Long and Freese 2006):

$$Prob(y_i = m | x_i) = Prob(k_{m-1} \leq y_i^* < k_m | x_i) \quad (4)$$

A substitution of  $x_i \beta + \varepsilon_i$  for  $y_i^*$  in equation 4 results in the probability of the observed outcome  $y_i = m$ , where  $x_i$  can be generalized as the difference between cumulative distribution functions at any  $m$  value and expressed as:

$$Prob(y_i = m | x_i) = F(k_m - x_i \beta) - F(k_{m-1} - x_i \beta) \quad (5)$$

with  $F$  indicating the cumulative distribution function. Based on equation 5, the probability of the observed variable  $y_i$  (i.e., LTB rating) for the  $i$ th observation can be expressed as:

$$p_i \begin{cases} Prob(x_i, \beta, k) & \text{if } y = 1 \\ Prob(x_i, \beta, k) & \text{if } y = m \\ Prob(x_i, \beta, k) & \text{if } y = 7. \end{cases} \quad (6)$$

The likelihood equation is:

$$L(y, X) = \prod_{i=1}^N p_i. \quad (7)$$

The analysis was conducted using StataSE 17 using the ologit command (StataCorp LLC, College Station, TX). Three models were estimated where the dependent variable was LTB and the survey question was how knowing the following information about plant benefits would impact your LTB a plant. The first plant benefit information (dependent variable in Model 1) was social, described as "how plants can help you relate socially with others." The second plant benefit information (Model 2) was physiological, described as "how plants can improve your physical well-being." The third plant benefit information (Model 3) was emotional and mental health, described as "how plants can improve your emotional and mental health." Marginal effects estimates were generated based on the models to assess differences

**Table 1. Summary sociodemographic statistics (mean, standard deviation, minimum, maximum) for participants (n=497) in an online study about the influence of plant benefits on likelihood to buy a plant.**

Variable	Definition	Mean	SD	Min	Max
Age	Participant age (years)	48.195	16.896	21	84
Gender	Participant gender; 1=male; 0=otherwise	0.465	0.499	0	1
White	Participant is white/Caucasian; 1=yes; 0=no	0.815	0.388	0	1
Black	Participant is black/African American; 1=yes; 0=no	0.095	0.293	0	1
Hispanic	Participant is Hispanic; 1=yes; 0=no	0.046	0.210	0	1
Asian	Participant is Asian; 1=yes; 0=no	0.036	0.187	0	1
Other	Participant is other ethnicity; 1=yes; 0=no	0.004	0.063	0	1
No_ethnicity	Participant did not disclose ethnicity; 1=yes; 0=no	0.004	0.063	0	1
Higher education	Participant had a 4-year college degree or higher; 1=yes; 0=no	0.606	0.489	0	1
Income	Mean household income in 2020 (\$1,000s)	73.849	49.712	15	210
Household Adults	Number of household members (adults and children)	2.728	1.536	1	11
Children	Number of adults in the participant's household, excluding the participant	1.211	1.041	0	8
Children	Number of children ( $\leq 18$ years old) living in household	0.517	0.924	0	5
Generation Z	Participant was born between 1997 and 2012; 1=yes; 0=no	0.062	0.242	0	1
Millennials	Participant was born between 1981 and 1996; 1=yes; 0=no	0.330	0.470	0	1
Generation X	Participant was born between 1965 and 1980; 1=yes; 0=no	0.254	0.435	0	1
Older	Participant was born during or before 1964; 1=yes; 0=no	0.354	0.478	0	1
<i>Retail Outlet</i>					
Grocery	Participant most frequently purchased plants from grocery stores; 1=selected; 0=not selected	0.093	0.290	0	1
Independent garden center	Participant most frequently purchased plants from independent garden centers; 1=selected; 0=not selected	0.237	0.426	0	1
Mass merchandiser	Participant most frequently purchased plants from mass merchandisers; 1=selected; 0=not selected	0.119	0.323	0	1
Home improvement	Participant most frequently purchased plants from home improvement stores; 1=selected; 0=not selected	0.384	0.486	0	1
Farm-direct	Participant most frequently purchased plants from farm-direct sources (e.g., farmers markets, CSA, etc.); 1=selected; 0=not selected	0.052	0.223	0	1
Online	Participant most frequently purchased plants from online outlets; 1=selected; 0=not selected	0.032	0.177	0	1
I don't buy plants	Participant does not buy plants; 1=yes; 0=no	0.082	0.275	0	1

in predicted probabilities of attributes at different LTB ratings.

## Results and Discussion

Table 1 shows the summary statistics of the sample. A total of 497 people participated in the survey from across the U.S. in May 2021. On average, participants were 48 years old; 47% of the sample were male; and 82% were Caucasian/white, 9.5% Black, 4.6% Hispanic, 4% Asian, and less than 1% indicated other ethnicities or did not indicate their ethnicity. Nearly 61% of the sample had obtained a 4-year college degree or higher at the time of the study. Participants' 2020 mean household income was \$73,849 with an average of 2.7 household members. Most households included an additional adult beyond the participant and averaged 0.5 children. Slightly over 6% of the sample were classified as Gen Z, 33% were Millennials, 25% were Gen Xers, and 35% were older than Gen X (i.e., Baby Boomers and older). The largest portion of the sample purchased plants from home improvement stores (38%), followed by independent garden centers (24%), mass merchandisers (12%), grocery stores (9%), farm-direct sources (5%), and online sources (3%). Approximately 8% of the sample did not buy plants. The sociodemographic characteristics of this sample are consistent with those of other national samples

addressing plant purchasing behavior (Whitinger and Cohen 2021).

All plant benefits positively impacted LTB (Table 2). In the total sample, information about the benefits of improved emotional and mental health had the strongest positive impact on LTB, followed by information about improved physical well-being, and then social benefits, results which are consistent with Whitinger and Cohen (2021).

In comparing the perception of these three types of plant benefits across the age cohorts, Gen Z and Millennial participants rated the emotional and mental health benefits higher compared to older participants (Table 2). This finding is consistent with a report from the American Psychological Association (2018) that indicated Millennials experienced more stress and anxiety about a range of contemporary issues than older age cohorts, meaning they may value products and services that aid emotional and mental health more so than other generations. Gen X rated the emotional and mental health benefit similar to the Millennial age cohort, with values falling between the Gen Z and older (i.e., Baby Boomers plus) groups.

Millennials rated the physical well-being benefit the highest among the four age groups, followed by the Gen Z and Gen X participants, with the older participants rating the physical benefit the lowest (Table 2). Fitness declines with age (Warner 2005) so these results may reflect the

**Table 2. Impact of different plant benefits (social, physiological, and emotional and mental health) on consumers' likelihood to buy a plant (mean and standard deviation) by age cohort (n=497)<sup>z</sup>.**

Benefit Statement <sup>z</sup>	Total sample		Generation Z		Millennial		Generation X		Older	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Benefits from how plants can help you relate socially with others.	5.010	1.295a	4.972	1.555Aa	5.287	1.370Ba	4.984	1.134Aa	4.756	1.254Ca
Benefits from how plants can improve your physical well-being.	5.491	1.215b	5.444	1.066Ab	5.689	1.333Bb	5.524	1.111Ab	5.284	1.182Cb
Benefits from how plants can improve your emotional- and mental-health.	5.614	1.192c	5.778	1.084Ac	5.774	1.231ABc	5.706	1.091Bc	5.358	1.207Cc

<sup>z</sup>The benefits' impact on purchase likelihood was measured using a 7-point Likert scale where 1=strongly decrease, 4=neither increase nor decrease, and 7=strongly increase LTB. Significance between age cohorts was determined using ANOVA and Tukey's honest significance test while significance between the benefits was tested using pairwise t-tests. Capital letters indicate significance across age groups at the 5% level. Within each column (e.g., Generation Z, Millennial, Generation X, Older) all means were significantly different between the three benefits at the 5% level, as indicated by the lowercase letters.

general fitness levels of Americans as they age and their perception of its importance.

Lastly, a pattern was observed for the social benefit statement similar to that of the physical well-being benefit, with Millennials rating it the highest, followed by Gen Z and Gen X, and then the older participants (Table 2). Given that Millennials and Gen Z are digital natives and heavy users of social media (Thigpen and Tyson, 2021), this finding was not surprising. However, it was not consistent with Behe et al. (2022), who collected data during the height of the COVID-19 pandemic in summer 2020 when many states had imposed lockdowns and individuals were not able to socialize in-person. The lockdowns had been lifted when the data for the present study were collected, which may have altered the perceptions of the social benefits of plants.

Three ordered logit models were estimated using participants' likelihood to buy (LTB) plants as the dependent variable (Table 3). In Model 1, the dependent variable was a social plant benefit described as "how plants can help you relate socially with others." Only Millennials were more likely to buy plants based on this benefit than older consumers, consistent with the findings of Behe et al. (2022). Gen Z and Gen X participants indicated a similar response to the social benefit message as the older generation. Males were more likely to buy plants based on the social benefits message relative to non-male (females and those participants who elected not to indicate their gender) participants, a finding that may facilitate some marketing messages to men. Participants who indicated they were of Hispanic, Asian, and "other" or "no" ethnicity were more likely to buy plants with the social benefit message compared to participants who identified as Caucasian. Participants with higher education levels had a higher LTB a plant than less-educated participants. However, as income increased, the LTB plants with the social benefit message decreased. Thus, if a plant is marketed at a lower price point, a social benefit message may be helpful to encourage purchasing behavior. As the number of children and adults in the home increased, so did LTB. People who purchased plants primarily from grocery stores, independent garden centers, mass merchandisers, and home improvement stores were

more likely to buy plants with the social benefit statement compared to people who purchased plants through farm-direct sources. Not surprisingly, people who did not buy plants were less likely to buy plants with the social message relative to farm-direct purchasers. Although this group did not buy plants prior to the study, they were included to capture potential future purchasers and how the benefits may impact their purchasing behavior.

Based on Model 1, the marginal effects were estimated. The marginal effects demonstrate an increasing probability of selecting a higher LTB rating due to a social benefit message if the participants were Millennials, males, from lower income households, or in households with more adults or children (Table 4). Conversely, a higher income level decreased the probability of buying a plant with a social benefit message. Frequently purchasing plants from any of the listed retailers improved the probability of buying the plants, while those selecting "do not buy" decreased purchase intention.

In Model 2, the dependent variable was related to physiological benefits of plants, expressed as "plants improving physical well-being," which also increased LTB (Table 3). Gen Z and Millennial participants were more likely to buy plants with a physical benefit message compared to the older generation. Relative to the older generation, Gen X participants' LTB was not influenced by the physical benefit information. Males were less likely to buy a plant with the physical benefit information compared to non-males, and all ethnic groups except Hispanic were less likely to buy than Caucasian participants. Participants with more education were more likely to buy plants with a physical benefit message than participants with less education. As household income decreased, participants' LTB decreased. As the number of adults or children in the household increased, LTB also increased. Participants who purchased plants primarily from independent garden centers, home improvement stores, or online were more likely to buy plants with the physical benefit message compared to farm-direct plant purchasers. Participants who didn't buy plants were much less likely to buy a plant with the physical well-being message relative to farm-direct plant purchasers.

Marginal effect estimates for Model 2 align with the coefficients of Gen Z, Millennials, females, Caucasian and

**Table 3. Ordinal logit model estimates for the impact of plant benefit statements (social, physiological, and emotional and mental well-being) on participants' purchase likelihood to buy a plant in relation to demographics (n=497)<sup>z</sup>.**

Demographics	Model 1 Benefits from how plants can help you relate socially with others.		Model 2 Benefits from how plants can improve your physical well-being.		Model 3 Benefits from how plants can improve your emotional- and mental-health.	
	Coef.	SE	Coef.	SE	Coef.	SE
Generation Z	0.004	0.087	0.195	0.081**	0.787	0.085***
Millennial	0.595	0.045***	0.514	0.045***	0.501	0.045***
Generation X	-0.019	0.045	-0.041	0.046	0.202	0.046***
Older	0.000		0.000		0.000	
Male	-0.164	0.034***	-0.208	0.035***	-0.408	0.035***
African	-0.041	0.063	-0.303	0.059***	-0.357	0.060***
Hispanic	0.350	0.082***	-0.092	0.083	-0.432	0.080***
Asian	0.181	0.094*	-0.296	0.099***	0.059	0.103
Other Ethnicity	1.774	0.361***	0.758	0.395*	0.427	0.337
No_ethnicity	0.864	0.254***	-0.488	0.250*	-0.426	0.263
Higher education	0.122	0.039***	0.085	0.039**	0.132	0.039***
Income	-0.004	0.000***	-0.002	0.000***	-0.003	0.000***
Adult	0.059	0.018***	0.147	0.019***	0.045	0.019**
Child	0.414	0.021***	0.453	0.022***	0.411	0.022***
<i>Retail outlet</i>						
Grocery store	0.165	0.099*	-0.006	0.101	0.005	0.099
Independent garden center	0.397	0.087***	0.292	0.090***	0.445	0.088***
Mass merchandiser	0.138	0.093	0.148	0.096	0.033	0.094
Home improvement	0.404	0.084***	0.333	0.087***	0.297	0.085***
Online	0.261	0.121**	0.244	0.124**	0.477	0.123***
Do not buy	-1.243	0.103***	-1.338	0.105***	-1.413	0.105***
<i>Threshold parameters</i>						
/cut1	-4.121	0.119	-4.232	0.125	-4.851	0.138
/cut2	-3.262	0.103	-3.817	0.115	-4.137	0.117
/cut3	-2.393	0.096	-3.222	0.106	-3.906	0.113
/cut4	-0.174	0.092	-1.112	0.095	-1.398	0.094
/cut5	1.082	0.092	0.502	0.095	0.128	0.093
/cut6	2.201	0.094	1.679	0.096	1.270	0.093
Log Likelihood	-17855.411		-16675.714		-16226.889	

<sup>z</sup>The dependent variables were participants' ratings for how knowing the following benefit information would impact their likelihood of buying a plant where 1=strongly decrease; 4=neither increase nor decrease; 7=strongly increase.

\*\*\*\*\*, and \* indicate significance from the base variables at the 1%, 5%, and 10% levels.

“other” ethnicity, number of adults, and number of children; all had an improved LTB of plants with the physical benefit message (Table 5). Conversely, a higher income decreased the probability of buying plants with this message. Participants who purchased plants primarily from independent garden centers, or home improvement stores were more likely to buy plants promoted with this benefit than those who purchased plants primarily from mass merchandisers.

In Model 3, the dependent variable was a plant benefit related to the emotional and mental health dimension, expressed as “plants improve emotional and mental health.” Generally, this message improved participants' LTB plants (Table 3). Gen Z, Millennial, and Gen X participants were more likely to buy plants based on emotional and mental health benefits than the older age cohort. Males were less likely to buy than non-male participants. Participants who identified as being of African American or Hispanic ethnicity were less likely to buy plants with the emotional and mental health benefit compared to Caucasian participants. Participants of Asian, other, and no reported ethnicity were not affected by the emotional and mental health benefits message. As education level increased, participants were

more likely to buy plants with the emotional and mental health benefits. As the number of children or adults increased in the household, LTB also increased. Participants who purchased plants primarily from independent garden centers, home improvement stores, or online outlets were more likely to buy a plant based on this benefit than were people who buy plants from farm-direct sources. People who did not buy plants were less likely to buy plants with the emotional and mental health benefit message compared to farm-direct purchasers. Participants who purchased plants primarily from mass merchandisers were not influenced by the emotional and mental health plant benefit message when compared to farm-direct plant purchasers. The marginal effects indicate that Gen Z, Millennials, Gen X, non-males, Caucasians, as well as the number of adults and children in the household all improve the LTB plants promoted using emotional and mental health benefits (Table 6). Similar to the previous two models, a higher income level decreased the participants' LTB plants based on this benefit. Participants who ‘do not buy’ plants were less likely to buy a plant with the emotional and mental health plant benefit message.

In conclusion, research has demonstrated the diverse benefits plants bring to human life (Hall and Knuth 2019a, b, c).

**Table 4. Marginal effects estimates for the impact of social benefit information (Model 1) on participants' likelihood to buy plants<sup>2</sup>.**

	Rating=1	Rating=2	Rating=3	Rating=4	Rating=5	Rating=6	Rating=7
Generation Z	-0.000	-0.000	-0.000	-0.001	0.000	0.000	0.001
Millennial	-0.006***	-0.008***	-0.017***	-0.103***	-0.001	0.059***	0.076***
Generation X	0.000	0.000	0.001	0.003	-0.000	-0.002	-0.002
Male	0.002***	0.002***	0.005***	0.029***	-0.002***	-0.017***	-0.019***
African/Black	0.000	0.001	0.001	0.007	-0.001	-0.004	-0.005
Hispanic	-0.003***	-0.004***	-0.009***	-0.060***	-0.003	0.034***	0.046***
Asian	-0.002**	-0.002**	-0.005**	-0.032*	0.000	0.018**	0.023*
Other ethnicity	-0.009***	-0.012***	-0.028***	-0.230***	-0.135***	0.068***	0.346***
No ethnicity	-0.006***	-0.008***	-0.019***	-0.138***	-0.037	0.072***	0.137***
Higher education	-0.001***	-0.002***	-0.004***	-0.022***	0.002**	0.012***	0.014***
Income	0.000***	0.000***	0.000***	0.001***	-0.000	-0.000***	-0.001***
Adult	-0.001***	-0.001***	-0.002***	-0.010***	0.001	0.006***	0.007***
Child	-0.005***	-0.006***	-0.013***	-0.073***	0.005	0.042***	0.049***
Grocery store	-0.002*	-0.002*	-0.005*	-0.029*	0.001	0.017*	0.021
Independent garden center	-0.004***	-0.005***	-0.011***	-0.069***	-0.001	0.040***	0.051***
Mass merchandiser	-0.001	-0.002	-0.004	-0.024	0.001*	0.014	0.017
Home improvement store	-0.004***	-0.006***	-0.012***	-0.071***	0.002**	0.041***	0.050***
Online retailer	-0.003**	-0.003**	-0.007**	-0.045**	-0.001	0.026**	0.034**
Do not buy	0.024***	0.029***	0.058***	0.190***	-0.085***	-0.114***	-0.102***

<sup>2</sup>The dependent variables were participants' ratings for how knowing the following benefit information would impact their likelihood of buying a plant where 1=strongly decrease; 4=neither increase nor decrease; 7=strongly increase.

\*\*\*\*\*, and \* indicate significance from the base variables at the 1%, 5%, and 10% levels.

Here we explored the relationship between consumers' LTB plants displaying benefit information and how the LTB varies by age cohort, ethnicity, education, income, and retail outlet preferences. Given the shift in the ornamental plant industry, where younger consumers are engaging more with plants (Whitinger and Cohen 2021), identifying the benefits that encourage younger consumers to purchase plants and how that relates to the retail location has real-world implications for the ornamental plant industry.

Results from the present study show that the three plant benefit messages (social, physiological, and emotional and mental health benefits) positively influence consumers' purchase intentions for plants but do so differently across the age cohorts. Interestingly, Millennial participants responded most favorably to all three benefit type messages compared to the other age cohorts. Similar results were obtained by Behe et al. (2022) who found Millennials responded favorably to social, educational, physiological, and psychological benefits on plants. These results may stem

**Table 5. Marginal effects estimates for the impact of physiological well-being benefit information (Model 2) on participants' likelihood to buy plants<sup>2</sup>.**

	Rating=1	Rating=2	Rating=3	Rating=4	Rating=5	Rating=6	Rating=7
Generation Z	-0.002***	-0.001**	-0.002**	-0.022**	-0.023**	0.012***	0.036**
Millennial	-0.004***	-0.002***	-0.005***	-0.057***	-0.059***	0.032***	0.096***
Generation X	0.000	0.000	0.000	0.005	0.004	-0.003	-0.007
Male	0.002***	0.001***	0.002***	0.024***	0.022***	-0.015***	-0.037***
African / Black	0.003***	0.002***	0.004***	0.038***	0.029***	-0.025***	-0.050***
Hispanic	0.001	0.000	0.001	0.011	0.010	-0.007	-0.016
Asian	0.003**	0.002**	0.003***	0.038***	0.028***	-0.025***	-0.049***
Other ethnicity	-0.005***	-0.002***	-0.006***	-0.070***	-0.099*	0.023***	0.159*
No ethnicity	0.006	0.003	0.006	0.065*	0.039***	-0.044*	-0.075**
Higher education	-0.001**	-0.000**	-0.001**	-0.010**	-0.009**	0.006**	0.015**
Income	0.000***	0.000***	0.000***	0.000***	0.000***	-0.000***	-0.000***
Adult	-0.001***	-0.001***	-0.002***	-0.017***	-0.016***	0.011***	0.026***
Child	-0.004***	-0.002***	-0.005***	-0.053***	-0.049***	0.033***	0.080***
Grocery store	0.000	0.000	0.000	0.001	0.001	-0.000	-0.001
Independent garden center	-0.002***	-0.001***	-0.003***	-0.033***	-0.034***	0.019***	0.054***
Mass merchandiser	-0.001	-0.001	-0.001	-0.017	-0.017	0.010*	0.027
Home improvement store	-0.003***	-0.001***	-0.003***	-0.038***	-0.037***	0.023***	0.060***
Online retailer	-0.002**	-0.001**	-0.002**	-0.027**	-0.029*	0.015**	0.046*
Do not buy	0.022***	0.011***	0.024***	0.200***	0.043***	-0.129***	-0.170***

<sup>2</sup>The dependent variables were participants' ratings for how knowing the following benefit information would impact their likelihood of buying a plant where 1=strongly decrease; 4=neither increase nor decrease; 7=strongly increase.

\*\*\*\*\*, and \* indicate significance from the base variables at the 1%, 5%, and 10% levels.

**Table 6. Marginal effects estimates for the impact of emotional- and mental-health benefit information (Model 3) on participants' likelihood to buy plants<sup>2</sup>.**

	Rating=1	Rating=2	Rating=3	Rating=4	Rating=5	Rating=6	Rating=7
Generation Z	-0.003***	-0.003***	-0.002***	-0.073***	-0.101***	0.006*	0.176***
Millennial	-0.003***	-0.003***	-0.001***	-0.056***	-0.060***	0.020***	0.103***
Generation X	-0.001***	-0.001***	-0.001***	-0.023***	-0.024***	0.009***	0.041***
Male	0.002***	0.002***	0.001***	0.048***	0.047***	-0.021***	-0.080***
African / Black	0.002***	0.002***	0.001***	0.046***	0.037***	-0.023***	-0.066***
Hispanic	0.003***	0.003***	0.002***	0.057***	0.043***	-0.030***	-0.078***
Asian	-0.000	-0.000	-0.000	-0.007	-0.007	0.003	0.012
Other ethnicity	-0.002	-0.002	-0.001	-0.044	-0.054	0.011***	0.092
No ethnicity	0.003	0.003	0.002	0.057	0.041**	-0.030	-0.076*
Higher education	-0.001***	-0.001***	-0.000***	-0.016***	-0.015***	0.007***	0.026***
Income	0.000***	0.000***	0.000***	0.000***	0.000***	-0.000***	-0.001***
Adult	-0.000**	-0.000**	-0.000**	-0.005**	-0.005**	0.002**	0.009**
Child	-0.002***	-0.002***	-0.001***	-0.048***	-0.048***	0.021***	0.081***
Grocery store	-0.000	-0.000	-0.000	-0.001	-0.001	0.000	0.001
Independent garden center	-0.002***	-0.002***	-0.001***	-0.048***	-0.054***	0.016***	0.093***
Mass merchandiser	-0.000	-0.000	-0.000	-0.004	-0.004	0.002	0.007
Home improvement store	-0.002***	-0.002***	-0.001***	-0.034***	-0.035***	0.014***	0.060***
Online retailer	-0.002***	-0.002***	-0.001***	-0.048***	-0.061***	0.012***	0.103***
Do not buy	0.016***	0.016***	0.008***	0.223	0.063***	-0.122***	-0.203***

<sup>2</sup>The dependent variables were participants' ratings for how knowing the following benefit information would impact their likelihood of buying a plant where 1=strongly decrease; 4=neither increase nor decrease; 7=strongly increase.

\*\*\*\*\*, and \* indicate significance from the base variables at the 1%, 5%, and 10% levels.

from Millennials' having different values than previous generations including work/life balance, leisure time, well-being, and social relationships (Lyall, 2020; Ng and Johnson 2015). Heightened interest and awareness of these topics (in general) likely results in the benefits resonating better with Millennial consumers.

Compared to the oldest age cohort, Gen Z had a greater LTB for plants with physical and emotional and mental health benefit messages but not social benefit messages. Similarly, Behe et al. (2022) found that Gen Z responded well to educational and physiological plant benefits compared to Baby Boomers. Some of the Gen Z's lack of interest in social benefits may stem from their being digital natives which has been dominated by online social connectedness via social media (Van den Bergh et al. 2023). Conversely, Gen Zers are often concerned with physical and mental well-being due to low confidence and self-esteem (Ameen et al. 2022). As a result, touting benefits that boost self-confidence and esteem could help attract this generation to making purchases.

Gen Xers responded positively only to the emotional and mental health benefit message. Studies have identified Gen X as individuals who are self-reliant and self-sufficient while valuing belonging (Jurkiewicz 2000). As a result, benefits that aid them in their ability to be self-reliant (such as emotional and mental health) may have a greater impact on plant sales. Retailers who have a good understanding of the age of their customer base should adapt plant benefit messaging to engage and attract their target age group. If the retailer is seeking market expansion and understands the age range of potential customers, plant benefit messaging can be expanded.

Results from this study indicate that for women (who comprised the majority of the non-male group), all three benefit messages evoked higher LTB ratings. However,

the participant's ethnic heritage influenced messaging differently. Retailers who understand the ethnic composition of their market can connect more effectively by selecting benefit messages that evoke a greater LTB rating among their clientele. The primary retail outlet where plants were most frequently purchased also influenced LTB ratings for plants displaying the different benefit messages. Compared to farm-direct sellers, independent garden retailers, home improvement stores, and online sellers will likely benefit from employing all three benefit messages. However, compared to farm-direct sellers, mass-merchandisers who sell plants may not be as likely to benefit from these messages.

Despite the interesting results of the study, several limitations need to be acknowledged. First, to reduce participant fatigue, only a small number of plant benefit types were included in the survey instrument. This study was designed to assess the potential marketing implications of using broad statements relative to the benefits of plants. Future work could delve into specific benefit categories or statements to assess their individual impact and how that varies across demographics, regions, etc. A second limitation was the hypothetical nature of the online survey instrument. Future research should broaden the types of benefits and investigate them in auctions, actual retail settings, or other non-hypothetical situations to determine actual purchasing behavior.

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