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Identifiable characteristics and potentially malleable beliefs predict stigmatizing attributions toward persons with Alzheimer's disease dementia: results of a survey of the U.S. general public

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Abstract

The general public's views can influence whether people with Alzheimer's disease (AD) experience stigma. The purpose of this study was to understand what characteristics in the general public are associated with stigmatizing attributions. A random sample of adults from the general population read a vignette about a man with mild Alzheimer's disease dementia and completed a modified Family Stigma in Alzheimer's Disease Scale (FS-ADS). Multivariable ordered logistic regressions were used to examine relationships between personal characteristics and FS-ADS ratings. Older respondents expected that persons with AD would receive less support (OR=0.82, $p=.001$), have social interactions limited by others (OR=1.13, $p=.04$), and face institutional discrimination (OR=1.13, $p=.04$). Females reported stronger feelings of pity (OR=1.57, $p=.03$) and weaker reactions to negative aesthetic features (OR=0.67, $p=.05$). Those who believed strongly

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Contributors

S. Stites wrote the initial draft of the article. S. Stites, J. Karlawish and D. Xie conducted the analyses. All authors conceptualized the article, interpreted the findings, and edited the article.

Human Participant Protection

The Institutional Review Board of the University of Pennsylvania approved all procedures involving human subjects.

that AD was a mental illness rated symptoms more severely (OR=1.78, $p=.007$). Identifiable characteristics and beliefs in the general public are related to stigmatizing attributions toward AD. To reduce AD stigma, public health messaging campaigns can tailor information to subpopulations, recognizable by their age, gender, and beliefs.

Background

Alzheimer's disease presents the United States (U.S.) a unique challenge. It's a leading cause of disability but there are no therapies to slow its progression (U.S. Department of Health and Human Services (USDHHS), 2014). In response to this challenge, the U.S. has launched an ambitious national plan to discover an effective therapy by 2025. An essential strategy to achieve this plan is early detection and diagnosis, but stigmatization of Alzheimer's disease by the public presents an obstacle to achieving this strategy (Alzheimer's Association, 2011; USDHHS, 2014).

Stigma associated with Alzheimer's disease sometimes leads people to patronize, stereotype, isolate, or discriminate against those with this disease (Batsch & Mittleman, 2012; Corner & Bond, 2004; Werner & Giveon, 2008). Stigma can also discourage a person from seeking diagnosis, hinder a patient's quality of life, discourage participation in Alzheimer's disease research, and inhibit members of the public from adequately educating themselves (Alzheimer's Association, 2011; Alzheimer's Association and Centers for Disease Control and Prevention, 2013; Connell, Shaw, Holmes, & Foster, 2001; Link, Cullen, Mirotznik, & Struening, 1992). To address these obstacles, the Alzheimer's Association proposes a national messaging campaign to change the general public's views in order to reduce stigma (Behuniak, 2011; Robinson et al., 2014).

The success of such a messaging campaign faces several challenges. The media's typical treatment of Alzheimer's disease relies on stereotypes that promote ageism, gerontophobia, and negative emotions (Joyce, 1994; Kirkman, 2006; Van Gorp & Vercruysse 2012; Van Gorp, Vercruysse, & Van den Bulck, 2012). Patients are typically shown in the later stages of disease when they are incapable of making autonomous decisions, a burden to their family members and care-takers, and unable to speak for themselves (Van Gorp et al., 2012; Kirkman, 2006; Le Corre, Scodellaro, & Arwidson, 2009; Werner, Goldstein, & Buchbinder, 2010). These depictions evoke attention-grabbing negative emotions that can be effective for motivating certain behaviors— like making financial donations (Van Gorp & Vercruysse, 2012) – but they may also promote stigma by emphasizing negative aspects of the condition (Van Gorp & Vercruysse, 2012).

While negative messages about Alzheimer's disease may contribute to stigma (Van Gorp et al., 2012), positive emotional appeals— such as those about the capacity of individuals with Alzheimer's disease to enjoy happiness— are less attention-grabbing and not as easy to understand (Devlin, MacAskill, & Stead, 2007; Van Gorp et al.; 2012). Thus, public messaging campaigns may need to draw on more than emotional appeals to mitigate stigma. One promising solution is to focus on delivering strong messages about specific stigmatizing beliefs, attitudes, and behaviors (Vaala, Bleakley, Hennessy, & Jordan, 2016). Unfortunately, there is little research to inform the content of these messages.

Effective campaigns will also need to take into account that the impact of public health messages varies based on characteristics of the target audience (Flora & Maibach, 1990; Schmid, Rivers, Latimer, & Salovey, 2008; Witte & Allen, 2000). Studies of public stigma associated with Alzheimer's disease that have been conducted outside the U.S.— in Israel, Brazil, China, and Canada— suggest stigmatizing attributions differ among subgroups. They show that adults who are older, less educated, and less knowledgeable about Alzheimer's disease endorse stronger stigmatizing beliefs (Blay & Peluso, 2010; Cheng et al., 2011; Laforce & McLean, 2005; Werner 2005; 2008). Females generally reported stronger emotional responses, like pity and anger, and males reported stronger behavioral intentions, like wanting to isolate or restrain a person with Alzheimer's disease (Werner 2005; 2008; Werner & Davidson, 2004). In addition, people have been found to respond differently based on their judgments of Alzheimer's disease as having a mental or behavioral rather than physical etiology (Weiner, Perry, & Magnusson, 1988).

Thus, to reduce the stigma of Alzheimer's disease, messaging campaigns will need to deliver strong arguments that target specific beliefs, attitudes, and behaviors, and to deliver these messages to audiences defined by identifiable characteristics such as gender and age. However, little is known about stigmatizing attributions toward Alzheimer's disease by adults in the U.S. general population. This information is needed to inform our national efforts to develop and target public health messaging campaigns that will promote early detection and diagnosis of Alzheimer's disease (Schmid et al. 2008).

The purpose of our study is to investigate how stigmatizing attributions of Alzheimer's disease differ among identifiable subgroups of adults in the U.S. general population. Using data from a survey of adults randomly selected from the general population and based on results from prior studies, we hypothesized that older individuals, females, and persons who believed more strongly that Alzheimer's disease was a mental illness would endorse stronger stigmatizing attributions. Results from this research may help to understand differences in how distinct segments of the public react to Alzheimer's disease and to help better target public health messaging campaigns designed to reduce stigma.

Methods

Study Design

This is an analysis of self-reported stigmatizing attributions of Alzheimer's disease in a random sample of adults in the general U.S. public.

Data Source

Data were obtained from a study of public stigma that examined whether the cause and prognosis of mild dementia were related to stigmatizing attributions. The study asked respondents to read a vignette and then complete a survey. Respondents were recruited September 5th through 13th 2013 by an online panel provider. The demographic profiles of online panels have been shown to be representative of the U.S. general population (Heen, Lieberman, & Miethe, 2014).

The survey was distributed to a random sample likely to be adults in the U.S. who were able to provide informed consent and read English. The survey completion rate was 58%. Respondents were asked to provide standard demographic information, including age, race, ethnicity, and education. The collection of race and ethnicity information was informed by the Census Alternative Questionnaire Experiment (Rastogi & Jones, 2012). Respondents were asked to self-identify by race or ethnicity or by multiple races.

The study used a 3x3 factorial design in which 1,025 consenting adults were assigned to 1 of 9 conditions using unrestricted simple randomization (Schulz & Grimes, 2002). In the present study, we analyzed data from 317 respondents randomized to the study condition in which they were told the cause of the mild stage dementia was Alzheimer's disease (Figure 1). Because diagnostic labels may be an antecedent of stigmatizing attributions (Link & Phelan, 2013), we compared the results in the Alzheimer's disease condition to those (n=310) whose vignette did not have a diagnostic label.

Vignette

The original study used vignettes to examine the degree to which the diagnostic label and the prognosis of Alzheimer's disease contribute to endorsement of stigmatizing attitudes and emotions in the general public. The study was described to participants as being about "health beliefs" and did not mention Alzheimer's disease during recruitment or consent. The vignette described a man suffering from impairments typical of the mild stage of Alzheimer's disease dementia.

To personalize the vignette, the character was given a name, Mr. Andrews, and referred to as "he." Pilot versions of the survey included male and female versions of the vignette, but sample size restrictions required reducing the number of vignettes. Interest in being able to compare findings from the original study with a particular line of research, in which vignettes relied on male characters, favored retaining the male version of the vignette. Studies of Alzheimer's disease that have experimentally varied the gender of a non-familial vignette character have not found appreciable differences in reactions among the general public (Blay & Peluso, 2010; Low & Anstey, 2009).

No other demographic characteristics of the vignette character were given. The symptoms described in the vignette were consistent with observable impairments in six domains of the Clinical Dementia Rating (CDR) scale (Hughes, Berg, Danziger, Coben, & Martin, 1982): memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care.

After reading the vignette, participants were given a comprehension test to confirm that they accurately understood its salient details. Respondents were given two opportunities to answer correctly. Those who failed on the second attempt were excluded (n=30).

Questionnaire

Stigmatizing attributions were assessed using a modified version of the Family Stigma in Alzheimer's Disease Scale (FS-ADS; Werner, Goldstein, & Heinik, 2011). Some items on the original instrument were adapted for understandability and relevance in the context of

the current study (See Supplemental materials in Johnson, Harkins, Cary, Sankar, & Karlawish, 2015). The modified FS-ADS addressed seven domains specific to stigmatizing attributions: *Structural Discrimination*, worrying the person (described in the vignette) encountered discrimination by insurance companies or employers and was excluded from voting or medical decision-making; *Negative Severity Attributions*, expecting the person had certain symptoms like speaking repetitively or suffering incontinence; *Negative Aesthetic Attributions*, expecting the person had poor hygiene, neglected self-care, and appeared in other ways that provoked negative judgments; *Antipathy*, endorsing the person evoked feelings of disgust or repulsion; *Support*, expecting others would feel concern, compassion, or willingness to help the person; *Pity*, expecting others would feel sympathy, sadness, or pity toward the person; and *Social Distance*, feeling the person would be ignored or have his social contacts limited by others. The overall internal consistency of the adapted form appeared reliable (Cronbach's $\alpha = 0.91$). Responses were analyzed using the method established by Johnson et al. (2015). Higher scores indicated stronger endorsement.

General knowledge of Alzheimer's disease was assessed using a shortened Alzheimer's Disease Knowledge Scale (ADKS; Carpenter, Balsis, Otilingam, Hanson, Gatz, 2009). The abbreviated instrument omitted 8 items on the original assessment because they could have been answered using information in the vignette (Johnson et al., 2015). Respondents were also asked to rate the degree that they felt the condition described in the vignette (i.e., Alzheimer's disease) was a *mental illness* from "not at all" (1) to "a very great extent" (5). A full description of the study's methods has been published elsewhere (Johnson et al., 2015).

Statistical Analysis

Ordered logistic regression models were used to examine the effect of respondent characteristics on 7 measures of stigmatizing attributions toward Alzheimer's disease in a randomly selected sample of the general population. In separate analyses, we examined the effects of demographic characteristics, general knowledge about Alzheimer's disease, and strength of belief that this disease was a mental illness on each outcome. We report the adjusted odds ratios (AOR) from these analyses. We then performed forward step-wise selection to construct multivariable models that adjusted for interrelationships among respondent characteristics (Alpha-to-Keep 0.20). Ordered logistic regression was used because of the ranked nature of outcomes (Fullerton, 2009). All coefficients were exponentiated to derive odds ratios, which provide an average estimate of the probability of rankings in *higher* quintiles of the outcome as compared to those in lower-ranked categories.

In separate randomized between-group comparisons, we examined the difference (ratio) in the odds ratios (DOR) between when the cause of the mild stage dementia was stated as Alzheimer's disease as compared to when the cause was not given a disease label. In these multivariable analyses, we statistically controlled for all assessed characteristics of respondents as potentially confounding factors.

All analyses statistically adjusted for prognostic category as some respondents were told that the vignette character's condition would remain stable over time while others were told it would change. Respondents' caregiver status was excluded from analysis as small group size

prohibited comparisons (n=19) and its inclusion as a covariate did not substantively alter the main results (Hosmer & Lemeshow, 2004).

All models met the proportional odds assumption. All independent variables were screened for multicollinearity (correlation coefficient $r > 0.7$). In analyses that adjusted for multiple comparisons, all independent variables were screened for interactions with study prognostic category ($p > 5.0$). All statistical tests were two-sided. P values $\leq .05$ were considered statistically significant. All statistical analyses were performed using Stata 14 (College Station, TX).

Results

Respondents

In the group randomized to the Alzheimer's disease condition, respondents' median age was 49 years (IQR 29), about half (49%) were female, most (80%) self-identified as White (non-Latino), and over half (65%) had less than a 4-year college degree. They were similar on all assessed characteristics to those randomly assigned to the group that was not told a diagnostic label (all $p > .05$; Table 1).

Analyses Adjusted for Study Prognostic Condition

In separate ordered logistic regression analyses that adjusted for study prognostic condition category, we examined the effect of respondent characteristics on stigmatizing attributions in the group randomized to the Alzheimer's disease condition. With each successive decade of age, adult respondents were less likely to believe others would feel supportive of a person with Alzheimer's disease (*Support Scale*; AOR=0.82, $p=.001$). Older respondents were also more likely to be concerned that a person with Alzheimer's disease would be ignored or have his social interactions restricted by others (*Social Distance Scale*; AOR=1.15, $p=.02$; Table 2).

In an adjusted analysis, females were more likely to believe others would feel sympathy, sadness, and pity toward a person with Alzheimer's disease compared to males (*Pity Scale*; AOR=1.70, $p=.009$). They were also more likely than males to believe others would feel compassion and support for a person with Alzheimer's disease (*Support Scale*; AOR=1.52, $p=.04$).

Those who believed strongly that Alzheimer's disease was a mental illness rated symptoms in a person with mild dementia more severely as compared to those who reported weaker beliefs in adjusted analysis (*Negative Severity Attributions Scale*; AOR=1.80, $p=.006$). There were no discernible differences based on educational level, general knowledge of Alzheimer's disease, or place of residence as urban or rural (all $p \geq .07$).

Multivariable Analyses

We constructed multivariable statistical models based on the results of the adjusted analyses. The multivariable models statistically controlled for interrelationships among respondent characteristics. A separate full model was constructed for each of the 7 measures of stigmatizing attributions.

Mental illness belief, study prognostic category, and respondent age were included in the full model that examined *Structural Discrimination*. For each decade in age, respondents were more likely to expect a person with Alzheimer's disease to experience and encounter discrimination by insurance companies and other institutions (*Structural Discrimination*; OR=1.13, $p=.04$). In the same multivariable model, those who believed strongly that Alzheimer's Disease was a mental illness were more likely to expect a person with Alzheimer's disease to experience *Structural Discrimination* as compared to those who reported weaker beliefs (OR=1.50, $p=.05$).

In the full model that included respondent education and study prognostic category, older respondents were more likely than younger respondents to worry that a person with Alzheimer's would be ignored or have his social interactions restricted by others (*Social Distance Scale*; OR=1.13, $p=.04$). In addition, with each decade in age, respondents were much less likely to believe others would feel supportive toward a person with Alzheimer's disease statistically controlling for respondent gender and study prognostic category (*Support Scale*; OR=0.82, $p=.001$; Figure 2).

In the full model that included age, education and study prognostic category, females were more likely to believe others would feel sympathy, sadness, and pity toward a person with Alzheimer's disease compared to males (*Pity Scale*; OR=1.57, $p=.03$). They were generally less likely than males to expect that someone with mild dementia would appear in ways that would provoke negative judgments about hygiene and self-care statistically controlling for education, mental illness belief, and study prognostic category (*Negative Aesthetic Attributions Scale*; OR=0.67, $p=.05$).

Respondents who believed strongly Alzheimer's disease was a mental illness endorsed greater severity of symptoms in someone with mild stage dementia as compared to those who reported weaker beliefs statistically controlling for education and study prognostic category (*Negative Severity Attributions Scale*; OR=1.78, $p=.007$). There were no discernible differences based on respondents' level of education (all $p>.10$). No assessed characteristics were independent predictors of endorsement of feelings of disgust or repulsion toward a person with Alzheimer's disease (*Antipathy Scale*; $p>.08$).

Randomized group comparisons

In order to examine how the use of the label "Alzheimer's disease" could alter differences in endorsement of stigmatizing attributions, we compared the results from the Alzheimer's disease condition to those when respondents were not told a diagnostic label (Table 3). In a between-group comparison, older respondents worried more than younger respondents that others would socially distance a person with Alzheimer's disease when the Alzheimer's disease label was used as compared to when the symptoms were unlabeled (*Social Distance Scale*; DOR=1.27, $p=.007$).

In separate between-group comparisons, we found differences in endorsement of the severity of symptoms in the Alzheimer's disease condition compared to the unlabeled condition for both respondent age (*Negative Severity Attributions Scale*; DOR=1.30, $p=.002$) and education (*Negative Severity Attributions Scale*; DOR=2.49, $p=.01$). As reported earlier in

the results from multivariable analyses, age and education did not reach statistical significance in the Alzheimer's disease condition (both $p > .12$). This suggests the differences detected in the between-group comparisons were best attributed to differences in the unlabeled condition rather than the Alzheimer's disease condition.

Discussion

Analyses from a random sample of 627 adults in the U.S. general population showed that stigma differed among subpopulations, particularly those described by age, gender, and the belief that Alzheimer's disease is a mental illness. These results remained after multivariable adjustment for respondent characteristics.

Our results are consistent with the one other study of a general population, conducted in Israel, that found a similar relationship between age and stigmatizing attributions toward a person with Alzheimer's disease (Werner, 2005). We found that for each decade of age respondents were more likely to worry that persons with Alzheimer's face a lack of support and compassion (*Support Scale*; OR=0.82, $p=.001$), have their social relationships restricted (*Social Distance Scale*; OR=1.13, $p=.04$), and encounter discrimination by insurance companies and other institutions (*Structural Discrimination Scale*; OR=1.13, $p=.04$). To deliver personally relevant messages (Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008), public health campaigns designed to change stigma of Alzheimer's disease in older subpopulations will need to address concerns related to support, exclusion, and discrimination. Public policy changes may also be needed to address social determinants of lack of support, exclusion, and discrimination.

Understanding the determinants of these concerns about Alzheimer's disease in older subpopulations may help advance policies, practices, and change the social climate that affect persons with this disease. Older individuals may feel a greater worry about the impacts of Alzheimer's disease because – as the risk for disease increases with age (USDHHS, 2014) – they may be more likely to have personal experiences with affected friends or immediate family and may worry more about developing this disease (Alzheimer's Association, 2011; USDHHS, 2014). Their worries may reflect their knowledge of the challenges people with Alzheimer's disease can face. This interpretation is consistent with evidence that suggests the need for policy shifts to address shortfalls in support and to remove exclusionary practices that impact persons with Alzheimer's disease (Alzheimer's Association, 2011).

Our findings add to evidence from studies in convenience samples that have found differences in stigmatizing attributions based on gender (Werner, 2008; Werner & Davidson, 2004). We found females were generally more likely than males to believe others would feel sympathy, sadness, and pity for a person with Alzheimer's disease (*Pity Scale*; OR=1.57, $p=.03$). They were also less likely than males to make negative judgments about hygiene and self-care (*Negative Aesthetic Attributions Scale*; OR=0.67, $p=.05$). Effective public health communications to change stigma of Alzheimer's disease may need to tailor messages to the cultural context surrounding gender norms for emotional expression and social role responsibilities (Werner, 2008; Werner & Davidson, 2004). In addition, our findings raise the

question of whether differences in stigmatizing attributions — e.g., reactions more of pity versus reactions more of disgust about aesthetics — may mediate one's willingness to help in the care of a person with Alzheimer's disease. Understanding this relationship may help inform interventions to reduce disparities in caregiving, where females currently bear most of the responsibility (Bouldin & Andresen, 2010; Kasper, Freedman, & Spillman, 2011).

Although Alzheimer's disease shares many symptoms with mental illnesses like schizophrenia – agitation, depression, and delusions – it is not officially categorized as a mental illness (First, Reed, Hyman, & Saxena, 2015). We expected that respondents who more strongly believed Alzheimer's disease was a mental illness would endorse stronger stigmatizing attributions given the stigma known to surround mental illnesses (Angermeyer & Dietrich, 2006; Thornicroft, 2006; Weiner et al., 1988). Over a third of our respondents (35%) believed very strongly that Alzheimer's disease was a mental illness, and those who believed more strongly that Alzheimer's disease was a mental illness rated symptoms more severely than those with weaker beliefs (*Negative Severity Attributions Scale*; $OR=1.78$, $p=.007$). Those with stronger beliefs were also more likely to worry that persons with this disease would encounter institutional discrimination (*Structural Discrimination Scale*; $OR=1.50$, $p=.05$). Although prior studies of stigma have largely presumed the condition's classification as a mental illness based on its formal taxonomy (Angermeyer & Dietrich, 2006; Weiner et al., 1988; Werner, 2005; 2008; Werner & Davidson, 2004), our findings show stigmatizing attributions depend on the individual's belief about whether it is a mental illness. These results underscore the need for efforts that directly address the unique beliefs about an illness rather than rely on a disease-based model of stigma. Moreover, the relationships we found were independent of respondents' general knowledge about Alzheimer's disease, which suggests that intervention efforts focused primarily on education are unlikely to be sufficient to change stigma.

Our findings provide robust evidence to inform messaging campaigns designed to change stigmatizing attributions of Alzheimer's disease dementia. They show that specific subpopulations demarcated by age, gender, and personal beliefs vary in their endorsement of stigmatizing attributions. This information can be used to help deliver customized and culturally relevant messages. This approach is consistent with emerging evidence (Lang & Yegiyen, 2008; Vaala et al., 2016) that suggests effective campaign messages may need to be focused on delivering strong arguments about the target attitudes, beliefs, and behaviors as opposed to being grounded in emotionally laden appeals. In addition, the characteristics of subgroups that we identified (i.e., age, gender, and personal beliefs) are aspects of an individual's cultural identity (American Psychological Association, 2003). This information is fundamental to illuminating the insidious psychological aspects of stigma and its expression within specific cultural and subcultural contexts. Prior studies suggest that delivering messages within these and other cultural contexts may be helpful in mitigating public stigma (Geana, Kimminau, & Greiner, 2011; Pescosolido, Medina, Martin, & Long, 2013). Our findings may help public health messaging campaigns to use larger cultural climates to change individually held attitudes, beliefs, and behaviors.

Messaging campaigns face important questions about when and how to use the label "Alzheimer's disease." Our findings show that, with few exceptions, the use of the label

“Alzheimer’s disease” is likely not to alter stigmatizing attributions related to mild stage dementia. One exception is that older respondents were more likely to be concerned that a person would be ignored or have their social contacts limited by others when the cause of the person’s dementia was attributed to Alzheimer’s disease as compared to when the cause was unspecified (*Social Distance Scale*; DOR=1.27, $p=.007$). This finding suggests older adults may strongly associate Alzheimer’s disease with restrictions on one’s social interactions. Public health messaging campaigns may need to discuss directly the need and ability to have positive social relationships in the context of Alzheimer’s disease, where restrictions on social interactions are sometimes needed to ensure personal safety.

While Alzheimer’s disease messaging campaigns, especially those associated with charitable fund raising, have often relied on emotional appeals and particularly fear-based approaches, this method may actually work contrary to the objectives of campaigns aimed at mitigating stigma (Joyce, 1994; Kirkman, 2006; Van Gorp & Vercruysse 2012; Van Gorp et al., 2012). It may also undermine support and empathy for persons living with and caring for individuals with dementia (Devlin et al., 2007). Our results provide information that can inform novel media campaigns that may help shift the public climate surrounding Alzheimer’s disease to reduce stigma by delivering strong arguments with customized messages, avoiding dominant social media frames, and humanizing individuals with Alzheimer’s disease.

Because mass media messaging campaigns can have unintended consequences (Cho & Salmon, 2007; Hoyt, Burnette, & Auster-Gussman, 2014; Puhl, Luedicke, & Peterson, 2013), empirical studies, such as this one, are fundamental to the appropriateness and success of such efforts. In addition, pilot testing may help to ensure the effectiveness and appropriateness of campaign messages aimed at reducing stigma of Alzheimer’s disease. This disease—unlike other conditions that have been empirically studied in messaging campaigns (see Witte & Allen, 2000)—invokes both positive (compassion and warmth) and negative dimensions (inflated doubts about competence and paternalism) of stigmatizing attributions (Fiske, Cuddy, Glick, & Xu, 2002). Campaign messages might need to be adjusted to be effective in the context of the mixed-content stereotypes often associated with Alzheimer’s disease.

This study, the first to report characteristics that explain stigmatizing attributions toward Alzheimer’s disease in the U.S. general population, examined *seven* domains of stigmatizing attributions. Nonetheless, they may reflect only some of the ways Alzheimer’s disease is stigmatized in the general public. In addition, our vignette described a specific patient with symptoms of mild stage dementia. Stigmatizing attributions of the general public may differ based on a patient’s characteristics, such as gender, or being identified with specific races or ethnicities, or being viewed as having a certain type or severity of symptoms. Results of similar studies to date – particularly those that have experimentally varied the gender of the vignette character– seem to suggest that personal characteristics, like gender, may impact stigmatizing attributions toward Alzheimer’s disease because they affect judgments about social roles and interpersonal relationships (Blay & Peluso, 2010; Low & Anstey, 2009; Wadley & Haley, 2001). Investigation of how stigmatizing attributions are mitigated or

compounded by demographic characteristics of individuals with Alzheimer's disease is an area warranting further research.

Understanding how stigmatizing attributions translate into stigmatizing behaviors may help advance this area of research. This work would build on studies that measure stigma based on a person's behaviors and behavioral intentions toward another (Hutchinson & Mahlalela, 2006). Research that advances understanding of these behaviors and behavioral intentions toward persons with Alzheimer's disease may help inform behavioral and policy interventions to reduce stigma.

A strength of this study is that the sample was drawn randomly from a large national panel. This type of panel has been found to be representative of the general population (Heen et al., 2014). Our results offer important information about how stigmatizing attributions differ in subgroups. However, our sample of 627 prohibited investigation of some subpopulations and our findings reflect how many but likely not all members of a particular subgroup responded. Further research is needed to understand stigmatizing attributions of Alzheimer's disease in additional contexts, such as in divergent racial, ethnic, and socio-economic groups and in those with varying degrees of interactions with persons with Alzheimer's disease (Cheng et al., 2011; Laforce & McLean, 2005; Werner, 2005; Woo & Mehta, 2016).

Identifiable characteristics and potentially malleable beliefs predict stigmatizing attributions toward persons with Alzheimer's disease. Efforts to reduce Alzheimer's disease stigma through education and messaging may need to target population segments, particularly by age and gender, and beliefs about the disease.

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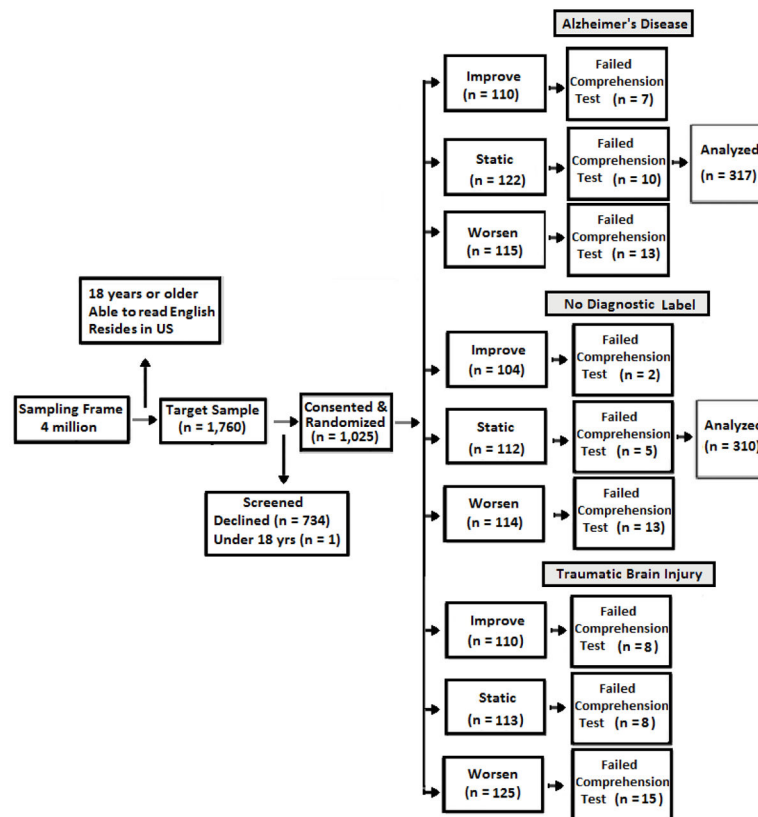


Figure 1.

Study Flow through analysis in experiment examining stigmatizing attributions of dementia, Random Sample United States Adult Population 2013

Note. The comprehension test confirmed respondents accurately understood the vignette by asking them to correctly indicate the given disease prognosis. Respondents were allowed two opportunities to select the correct choice. Those who failed on the second attempt were excluded.

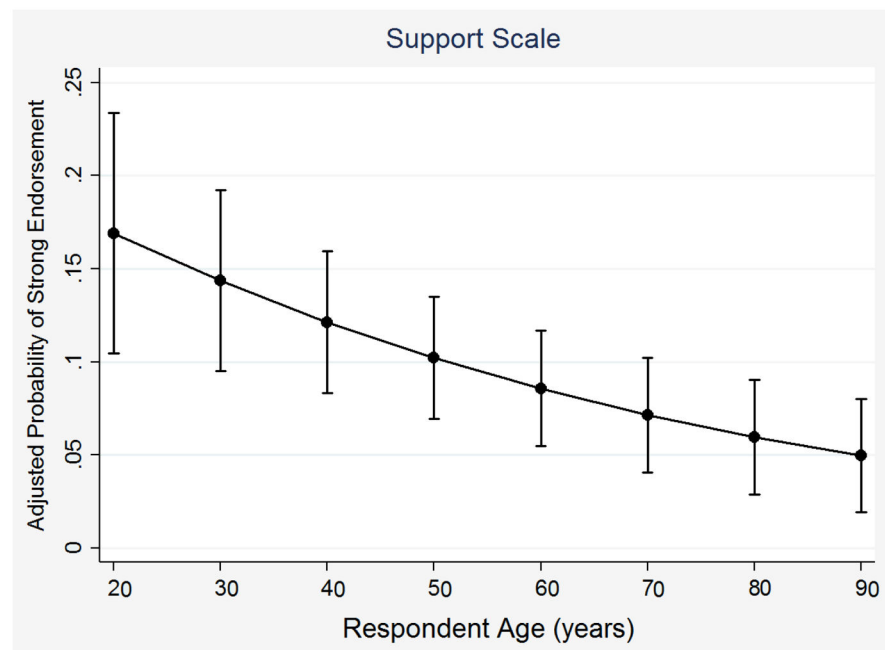


Figure 2.

Predicted odds respondents endorsed strongly that they believed others would feel supportive toward a person with Alzheimer's disease by respondent age in a random sample of the adult population (N=317)

Note. For purposes of presentation, probabilities predict respondent endorsement in the highest quintile. This statistical model met the assumption for proportional odds; results are similar in all response categories. Estimates were derived from ordered logistic regression model adjusted for respondent gender and study prognostic category. Error bars depict 95% confidence intervals.

Table 1

Characteristics of randomized participants by study diagnostic condition in a random sample of the adult population (N=627)

Respondent Characteristic	Alzheimer's Disease (N=317)	No Label (N=310)	P value
Age, median (IQR)	49 (29)	49 (29)	.64
65+ years old, % (n)	19.1 (61)	17.4 (51)	.61
Females, % (n)	49.0 (156)	50.9 (158)	.69
Race / Ethnicity, % (n)			.19
White, Non-Latino	80.4 (255)	74.5 (231)	
African American, Non-Latino	7.3 (23)	8.7 (27)	
Other ^a	12.3 (39)	16.8 (52)	
Education, % (n)			.61
High School/GED or Less	23.7 (75)	27.1 (84)	
Some College or 2-year Degree	41.6 (132)	39.7 (123)	
4-year College Degree or beyond	34.7 (100)	33.2 (103)	
Caregiver (past or present), % (n) ^b	6.0 (19)	9.4 (29)	.13
Urban/Metro Setting, ^c % (n)	78.5 (249)	82.3 (255)	.27
Mental Illness Rating, ^d median (IRQ)	3 (3)	3 (2)	.66
Alzheimer's Disease Knowledge Scale (ADKS), ^e median (IQR)	15 (5)	15 (4)	.29

Note. Column percentages may not total 100 due to rounding.

^aCategory includes those who identified as Asian, Native American, multiple races, Hispanic or Latino only, other or did not respond (n=4).

^b4-year college, master's, doctorate, or professional degrees.

^cRespondents considered themselves a past or current primary caregiver of a person with Alzheimer's disease.

^dResides in urban rather than rural area based on Rural Urban Commuting Area (RUCA) classifications. Urban areas included RUCA classes 1 to 3 and rural included classes 4 to 10.

^eRespondents were also asked to rate the degree the condition described in the vignette was a mental illness from "not at all" (1) to "a very great extent" (5).

^fAbbreviated version. Maximum possible score = 22.

Table 2

Adjusted odds ratios (AORs) of characteristics in random sample of adult general public explaining stronger stigmatizing attributions toward Alzheimer's disease (N=317)

Respondent Characteristic	Structural Discrimination AOR (P value)	Negative Severity Attributions AOR (P value)	Negative Aesthetic Attributions AOR (P value)	Antipathy AOR (P value)
Age (decades)	1.11 (.07)	1.01 (.91)	0.99 (.81)	0.93 (.23)
Female ^a	0.99 (.97)	1.18 (.41)	0.64 (.03)	1.03 (.90)
Alzheimer's Disease Knowledge Scale (ADKS) ^b	1.20 (.37)	1.09 (.85)	0.86 (.46)	0.70 (.09)
Mental illness rating ^b	1.41 (.10)	1.80 (.006)	1.34 (.15)	0.89 (.59)
Urbanicity ^c	0.89 (.63)	1.28 (.32)	0.77 (.28)	0.85 (.52)
Education ^d				
Some college/2-year degree	1.08 (.75)	1.51 (.12)	0.97 (.91)	0.96 (.88)
College or higher ^e	1.02 (.93)	1.05 (.85)	1.43 (.19)	0.81 (.43)

Respondent Characteristic	Support AOR (P value)	Pity AOR (P value)	Social Distance AOR (P value)
Age (decades)	0.82 (.001)	0.90 (.07)	1.15 (.02)
Female ^a	1.52 (.04)	1.70 (.009)	0.97 (.89)
Alzheimer's Disease Knowledge Scale (ADKS) ^b	1.09 (.66)	1.00 (.98)	0.79 (.26)
Mental illness rating ^b	0.96 (.83)	0.87 (.53)	1.02 (.57)
Urbanicity ^c	0.95 (.84)	1.18 (.49)	1.14 (.59)
Education ^d			
Some college/2-year degree	1.33 (.27)	1.49 (.13)	1.39 (.21)
College or higher ^e	0.99 (.96)	1.15 (.61)	1.63 (.07)

Note. AOR = adjusted odds ratio from ordered logistic regression analysis statistically controlling for study prognostic category.

^a Male is reference category (0).

^b Below median is reference category (0).

^c Rural area is reference category (0).

^d High school, GED, or less is reference category (0).

^e 4-year college, master's, doctorate, or professional degrees.

Table 3

Adjusted difference in odds ratios (DORs) of stronger stigmatizing attributions when mild dementia is attributed to Alzheimer's disease as compared to unlabeled in random sample of adult general public (N=627)

	Structural Discrimination	Negative Severity Attributions	Negative Aesthetic Attributions	Antipathy
Model Covariates	DOR (P value)	DOR (P value)	DOR (P value)	DOR (P value)
Age (decades)	1.08 (.38)	1.30 (.002)	0.97 (.65)	1.06 (.51)
Gender	0.77 (.38)	0.75 (.32)	0.62 (.09)	1.21 (.50)
Alzheimer's Disease Knowledge Scale (ADKS)	0.95 (.85)	1.00 (.99)	0.82 (.51)	0.80 (.44)
Mental illness rating	0.92 (.79)	1.04 (.89)	1.23 (.49)	0.65 (.17)
Urbanicity ^a	0.86 (.68)	1.20 (.62)	0.67 (.26)	0.95 (.90)
Education				
Some college/ 2-year degree	1.22 (.58)	2.49 (.01)	1.58 (.22)	1.39 (.37)
College or higher ^b	1.19 (.64)	1.75 (.14)	1.80 (.12)	0.83 (.62)
Model Covariates	Support	Pity	Social Distance	
	DOR (P value)	DOR (P value)	DOR (P value)	
Age (decades)	0.92 (.31)	0.94 (.48)	1.26 (.006)	
Gender	1.31 (.34)	1.37 (.28)	0.97 (.97)	
Alzheimer's Disease Knowledge Scale (ADKS)	0.98 (.95)	0.88 (.66)	0.91 (.75)	
Mental illness rating	0.78 (.42)	0.61 (.10)	0.90 (.74)	
Urbanicity ^a	1.00 (.99)	1.27 (.51)	1.14 (.72)	
Education				
Some college/ 2-year degree	1.19 (.63)	1.31 (.46)	1.48 (.29)	
College or higher ^b	0.90 (.77)	0.93 (.85)	1.28 (.51)	

Note. DOR = difference (ratio) in odds ratios of independent variable predicting stronger endorsement of the outcome when respondents were told the dementia was caused by Alzheimer's disease compared to when the cause was unspecified (reference category). All ordered logistic regression models were adjusted for other independent variables and prognostic category.

^aClassification of area of residence as urban or rural based on Rural Urban Commuting Area (RUCA). Urban areas included RUCA classes 1 to 3 and rural included classes 4 to 10.

^bCategory includes 4-year college, master's, doctorate, or professional degrees.