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Illusory Boundaries and Perceived Access to Rural Mental Health Care

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in the Department of Psychology.

By
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Under the mentorship of Dr. Karen Z. Naufel

ABSTRACT

This study examined the potential effects of illusory boundaries (in the form of county lines on a map) on distance judgments, specifically distance to mental health care (therapy) and perceived accessibility to said mental health care. 47 undergraduate psychology students completed our study through SONA on Qualtrics. Participants were presented with a series of 10 maps. Each map had two pins, one labelled “you are here” and the other labelled “therapy location” with a key on the bottom for reference (however, participants were instructed to not use their fingers as a measurement tool to keep the distance judgment a perceived estimate). Five of the maps contained boundaries between “your location” and the “therapy location” while the other five did not. For each map, participants answered three questions: one in the form of a sliding scale estimating distance from “your location” to the “therapy location” on the map, and two in the form of Likert-type scales rating participants’ perception of ease of access to therapy and accessibility to therapy. A paired-samples t-test was used to analyze the data. A statistically significant difference was found for perceived accessibility between conditions; when an illusory boundary was present between locations, participants perceived accessibility to be lower than when the two locations were within the same county. This research has implications for rural mental health care accessibility in the context of perceived illusory boundaries.

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Access to health care is an important predictor to determining if people are likely to pursue health care. Similarly, *perceived access to health care*, which is a person’s view of how able they are to pay for and physically get to health care, can also play a role in predicting the extent to which someone seeks health care (Health Resources and Services Administration [HRSA], 2005). Moreover, when health care is not perceived as accessible, then people are not likely to go (HRSA, 2005). Given that accessibility affects the implementation and execution of mental health services for rural populations, it is therefore important to identify the factors that hinder the perception of accessibility.

Illusory boundaries, such as state and county lines, may create artificial barriers in the extent that people seek health care options. As examples, people living in rural Stilson, Georgia are actually closer to major health care facilities in Jacksonville, Florida than they are to similar facilities in Atlanta, Georgia. However, it is questionable if Stilson residents would consider going to Jacksonville for treatment. Similarly, would a person living in County A only consider visiting mental health treatment within County A, even though a treatment center in County B is closer? The present study aims to answer this question.

**Barriers to Accessing Mental Health Care**

Rural access to mental health care is riddled with a wide array of physical and social barriers, including stigma (or acceptability) associated with care, accessibility to care, and availability of care (HRSA, 2005). Stigma associated with care pertains to the sociocultural perception that people are responsible for their own mental health and that any help sought for this is a flaw or fault in one’s character; this sense of pride is
compounded in rural communities due to a lack of privacy and the presence schemas of self-reliance (Health Resources and Services Administration, 2005). Availability of mental health services refers to the actual presence of services in rural communities (HRSA, 2005). Finally, accessibility to mental health care involves a recognition that one needs services, an understanding of what services one has available to them, an understanding of where such services are located, a means of physically reaching these services, and the financial means to acquire these services (HRSA, 2005).

Stigma regarding mental health care in rural populations stems from sociocultural schemas of how one should rightfully function, and needing help to function can be considered a weakness and a blow to one’s pride, leading to a lesser likelihood of seeking treatment (HRSA, 2005). In a thematic analysis of in-person interviews conducted with patients and providers at a women’s-only primary clinic in rural Appalachia, 61% of interviewed patients cited stigma as a barrier to mental health care. Stigma was further analyzed, as it was described by patients, into three distinct types. Internalized stigma referenced personal shame; immediate interpersonal stigma referenced perceived judgment by a friend, family member, or even health care provider; and public stigma (the most cited) referenced public shame or embarrassment (Hill, Cantrell, Edwards, & Dalton, 2016). Research has also collected anecdotal evidence for stigma affecting people’s acquisition of mental health care. For example, a small qualitative study on eight North-Central rural Appalachian mental health clients documented some clients whose family and friends reacted negatively to their use of psychotropic medication; one patient turned down a psychiatrist-recommended hospitalization in favor of outpatient care due to fears of upsetting his family (Pillay, Gibson, Lu, & Fulton, 2018). Despite the
perception of patients interviewed in rural South Dakota that mental illness exists as a relatively normal facet of rural life, lack of anonymity in a small community and a perceived loss of pride when receiving assistance were cited as main causes for stigma (Broffman, Spurlock, & Campbell et al., 2015). Lack of confidentiality and anonymity was also recorded in a 50-participant qualitative study in a rural African American community in the South (Haynes, Cheney, & Sullivan et al., 2017), and 25% of 101 women veterans in rural communities who completed inventories cited a barrier to mental health care as being the fact that “people in my life might treat me differently” by agreeing or strongly agreeing with that statement (Murray-Swank, Dausch, & Ehrnstrom, 2018, p 108). Whether in the form of perceived lack of pride, lack of anonymity, lack of information, or lack of adequate approval, rural mental health stigma is related to a person’s willingness to seek out health care.

Availability related to provider presence in rural communities, financial resources for clinics, and psychological specialization of providers affects the degree to which rural patients can adequately acquire mental health services (HRSA, 2005). Participants in one study noted the lack of mental health providers in North-Central rural Appalachia who accepted Medicaid. Participants in this study also described providers’ lack of availability; clients who could be treated in these areas were limited to those most at risk of suicide. Moreover, participants cited impersonal providers who, perhaps due to shortage-related burnout, were unable to adequately support their clients (Pillay, Gibson, Lu, & Fulton, 2018). A rural African American community who participated in focus groups described an increased complexity to the mental health care system as compared to the primary health care system; specifically, participants cited a need for improvement
in mental health screening in primary care, integration of mental health services in primary care, and quality of mental health specialty care (Haynes et al., 2017). Although many of these availability barriers are legitimate concerns for rural communities in need of mental health intervention, there remains a possibility that the perception of availability of services differs from actual availability of services.

Finally, accessibility to mental health care in rural areas is defined by the ability of patients to accurately identify a need for care, a description of available care, a location of available care, a physical means of arriving for care, and a financial means of paying for care (HRSA, 2005). In one study, 61% of 18 women participants discussed a lack of mental health literacy, specifically a lack of information regarding psychotropic medication and a lack of understanding of what services were available to them at their clinic (Hill, Cantrell, Edwards, & Dalton, 2016). Similarly, the rural African American community cited a lack of community awareness of mental health, specifically how to identify mental illness when it is present (Haynes et al., 2017). Additionally, 64% of those called and semi-structurally interviewed in rural South Dakota who screened positively for depression, anxiety, or post-traumatic stress disorder (PTSD) asserted that they did not require mental health care in the past year (Broffman et al., 2015), suggesting they did not have the previous knowledge of how to identify and/or address mental illness. These studies suggest some wariness in communities in attaining mental health services due to a societal lack of awareness regarding what mental health is and what services are available and where.

An already wary potential-patient may forgo treatment when pushed to travel too far. Physical distance, too, tends to be a predictor of the perceived accessibility of health
care. Both patients and providers at 15 Veterans Health Administration (VHA) primary health centers described distance as the most significant barrier to seeking health care as veterans; the average one-way distance of the 96 patients and 88 providers who completed surveys was 44.5 miles with distance to specialty services such as mental health services described as being even further away. Peripheral barriers compounded by distance for the veterans and providers included poor health, limited functioning, inadequate finances, emergencies, and requirement of specialty/diagnostic services (Buzza, Ono, & Turvey et al., 2011). Of the 101 rural women veterans who filled out inventories in one study, 28% described their medical center as being too far away, 24% described mental health care as costing too much money, and 22% cited concern for getting time off of work to attain services (Murray-Swank, Dausch, & Ehrnstrom, 2018).

The eight rural Appalachian participants in one study cited budget cuts, lack of public transportation, and lack of gas money as barriers to receiving mental health care (Pillay, Gibson, Lu, & Fulton, 2018).

With the rise of telehealth solutions as an attempt to combat some of these barriers to primary health care and mental health care services, rural communities have the potential to receive care where they had not before. However, telehealth therapy has its own barriers for the rural population, such as inadequate comfort with or ability to operate technology, lack of access to high-speed internet, lack of personability, and communication barriers (Levy, Spooner, & Lee et al., 2018). Therefore, it is crucial to study how access to brick-and-mortar health service locations is perceived and what can be done to expand upon that perceived access in order to enable higher rates of health
care service reception in rural populations. Research on the perception of illusory boundaries may provide insight.

**Illusory Boundaries**

Illusory boundaries are implicit and permeable spatial barriers that are not explicit continuous physical structures (Sturz & Bodily, 2016). For example, while the Great Wall of China is an explicit boundary that consists of a physical barrier, the border between Georgia and South Carolina is an illusory boundary that has no real physical structure in place that would prohibit travel.

Illusory boundaries such as borders on a map may create artificial and perceptual boundaries when none exist, and this could alter how people perceive distance. Psychologists in the field of gestalt psychology studied these anomalies and classified them according to different gestalt principles. One such gestalt principle is that of common region, the notion that humans tend to group elements together when they are physically located within one unit; one illustration of this is that humans will perceptually group pairs of dots encompassed in ovals, even when said ovals are lined up horizontally with each dot equidistant from one another (Wagemans, Elder, & Kubovy et al., 2012). Furthermore, when dots form one shape (such as a triangle composed of three dots- one for each corner), they are judged as being closer together than two dots whose relative distance is exactly the same but which are a part of their own separate shapes (Coren & Girgus, 1980).

Similarly, three-dimensional boundaries, whether represented virtually or physically, can create biases in distance judgments. Though some of these boundaries are not illusory due to the fact that they physically or virtually exist to separate two spaces,
they do not affect the distance between locations. Thus, the perceived increase in distance in the presence of boundaries is a bias. For example, one study found that children and adults perceived a physical distance between themselves and target objects to be greater when opaque boundaries (hanging blankets) were in place than when target objects at the same distance from them were not obstructed by opaque barriers. Children (and not adults) in this study approached transparent (low wooden fences) barriers with the same overestimation of distance (Kosslyn, Pick, & Fariello, 1974). Similarly, participants overestimated distance when physical campus drop-offs and gaps in the ground separated the participants from a target object as opposed to a control group who did not experience gaps or drop-offs (Sinai, Leng Ooi, & He, 1998). Additionally, one study found that participants moved slider bars more (to represent perceived distance between “themselves” and a wall on a screen) when wall extrusions indicated barriers between themselves and the wall than when they did not, even though the virtual distance was the same in all conditions (Sturz & Bodily, 2016). Together, these studies suggest that illusory boundaries can affect how people perceive distance by causing the distance to seem greater than if no boundary were there at all. It could therefore be hypothesized that two locations on a map may seem farther apart when a county line is present between them.

One possible reason for illusory and physical boundaries alike to influence distance judgments could be that neural networks utilize boundaries to assist in spatial orientation. For example, rats have been shown to rely on boundary geometry rather than features or landmarks when reorienting themselves in an environment (Cheng, 1986). This has been shown in multiple studies to apply to humans and other animals as well.
(Lee, 2017). In fact, this reliance on boundaries for spatial orientation appears to be innate. When participants in a virtual environment placed an object where they remembered its previous location to be (after a learning trial in which they oriented themselves with either landmarks, boundaries, or both), the presence of boundaries and landmarks in the learning trial affected their ability to orient themselves in a landmark-only testing environment but not in a boundary-only testing environment. In other words, landmarks and boundaries in the learning trial helped them remember an object’s location only when placing the object in an area with landmarks as opposed to an area with boundaries. Moreover, when landmark- and boundary-orientation was tested at the end of a series of trials, landmark-orientation was hindered by previous trials while boundary-orientation was not. This is argued to result from the innate nature of boundary-based learning and orientation and the reliance of landmark-based orientation and learning on associative reinforcement. In other words, boundary-based learning and orientation appears to be automatic, while landmark-based learning and orientation appears to be learned (Doeller & Burgess, 2008).

How people perceptually code visual information may have further implications for judgments across boundaries. One study suggested through a series of trials exhibiting directional judgment errors that humans do not code specific locations in one superordinate unit (such as cities in an American state) in relation to specific locations in different superordinate units (Stevens & Coupe, 1978). Instead, the authors argue, humans code the superordinate units themselves and only the location of the specific point in relation to its location within the superordinate unit. Thus, humans rely on inference to judge relative direction between specific locations that lie within different
superordinate units. For example, participants judged the direction of Reno, Nevada relative to San Diego, California to be further east than it actually is (it is northwest of San Diego). This is arguably because the state of Nevada is to the east of the state of California (Stevens & Coupe, 1978). That people appear to code entities such as states as superordinate units may serve to further illustrate our perceived significance of illusory boundaries.

Furthermore, a link may exist which ties biological representations of boundaries in the brain to perceived distance. Perceptual coding of boundaries and space on a cellular level is represented by grid cells, a biological component most recognized in animals but for which evidence is emerging in humans (Doeller, Barry, & Burgess, 2010). Grid cells are a cellular representation in the brain of an animal’s environment and current location. Boundary-coding cells in rats form not only in the presence of wall-like structures but also in response to ridges, crevices, and drop-offs (Stewart, Jeewajee, Wills, Burgess, & Lever, 2014). As one study noted the overestimation in distance when ridges and drop-offs were present (Sinai, Leng Ooi, & He, 1998), it can be inferred that these were coded in the human brain as barriers in a similar manner to rats. Research suggesting that merely imagining navigation and spatial orientation in humans can be represented by grid cells (Horner, Bisby, Zotow, Bush, & Burgess, 2016) creates a world of implications for map-reading and distance judging. If people’s perception of two-dimensional maps are anything like the “maps” in our grid cells of physical barriers in our environment, it can be hypothesized that crossing county lines on a map may be coded similarly to crossing a physical boundary in the real world.
In sum, illusory boundaries have been shown to affect perception of distance. This could perhaps be due to the brain’s coding of potential barriers and how they affect travel. Though distance remains the same, perhaps the brain is already calculating ease of travel when it perceives distances across illusory boundaries such as drop-offs. This could explain why distance appears to increase across illusory boundaries. Thus, seeing as illusory boundaries appear to cause an increase in perceived distance, locations across county lines on a map should appear farther away than those within county lines. And, in the realm of people searching for rural mental health services, it is important to know how these judgments affect people’s decision-making when it comes to attending mental health services.

The Present Study

Previous research suggests that perceived accessibility is an integral part of a person’s decision to attend therapy or other health-related appointments (HRSA, 2005). Additionally, a person’s perception of accessibility may be affected by the perceived distance to a location (Buzza, Ono, & Turvey et al., 2011; Murray-Swank, Dausch, & Ehrnstrom, 2018). Illusory boundaries, such as wall extrusions, can affect how people perceive distance (Sturz & Bodily, 2016). However, it is unclear if illusory boundaries affect perceived distance and accessibility to treatment specifically. The present study aims to fill this gap in research. It is important to study this because rural populations already face multiple unique barriers (accessibility, availability, and acceptability) when it comes to accessing mental health care (HRSA, 2005); any nuances such as perception of distance on a map could be the difference between attaining health care and forgoing it. In the present study, participants viewed maps in which they saw their location and the
location of a therapy center. Half of the time, the two locations were separated by a county line. The rest of the time, the two locations were located within the same county. After each map, participants estimated the distance, ease, and accessibility of the therapy clinic. If illusory boundaries increased, then there should be an increase in perceived distance and a decrease in perceived ease and accessibility of travelling to a therapy location.

**Method**

*Participants*

Forty-seven undergraduate psychology students enrolled in an Introduction to Psychology course participated in this study. Students were between the ages of 18 and 56. Thirteen male students and 34 female students participated. Participants received course credit towards their research participation requirement for completing the study.

*Design and Materials*

The study was administered online via Qualtrics survey software. Participants could take the study at their convenience on their phone, tablet, or computer. The study utilized a repeated measures design in which participants viewed two versions of five maps (10 maps total). Each map had two location drop pins. One drop pin read “you are here” while the other read “therapy location”. For one version of the map, a county line divided the two drop pins. For the other, no county line divided the two drop pins (see Appendix A and Appendix B for the two versions of the map).

The maps consisted of county lines with each county delineated on the maps. The actual county names were blurred to discourage participant suspicion of the purpose of
the study. A map key was included for reference at the bottom of the maps, though the participants were prompted to not use it with their fingers, as all distance judgments were to be perceived. The conditions consisted of a boundary condition and a no boundary condition (see Appendix A for boundary condition and Appendix B for no boundary condition). Each condition consisted of five maps for a total of 10 maps. The corresponding boundary and no boundary map pairs consisted of pins labelled “you are here” and “therapy location” in exactly the same positions. The only difference was the presence or absence of a dividing county line separating the two pins. Furthermore, all pins in the conditions, though angled and placed in different locations on the map, were the same distance apart.

**Measures**

Measures were adapted from Health Resources and Services Administration’s definition of accessibility (HRSA, 2005) as well as from the wall extrusion study (Sturz & Bodily, 2016). The measures first consisted of a distance measure in the form of a sliding scale ranging from 0 (on the far left of the scale) to 500 miles (on the far right of the scale), which was adapted from the 2016 Sturz & Bodily study. There were no numbers to indicate increments between the 0 and the 500 mile marks. However, as a participant slid the scale, the number on which their slider rested was indicated above their cursor. The slider was set at a default location of 0 miles with no gridlines (see Appendix C for sliding scale). A second measure assessed ease of travelling to the therapy location in the form of a Likert-type scale. Following this measure was another Likert-type scale that measured accessibility of the therapy location (see Appendix D for all measures).
Measures at the end of the study consisted of a question asking “Should we use your data?” followed by another asking “Did you use your fingers to measure distance on the screen?”. These measures were used to discern which data should be included in our final analysis (Appendix H).

Procedure

The study was conducted via Qualtrics as an online survey. The participants first viewed an informed consent (see Appendix E for informed consent). After the informed consent, participants were shown a series of five images displaying an overview of the study and directions for its completion (see Appendix F for overview). Participants then proceeded through the 10 maps via random assignment. For each condition they rated their perceived distance between themselves and the therapy location. They then rated how accessible the therapy location appeared to be in relation to their location. Finally, they rated how easy they perceived it would be to travel from their location on the map to the designated therapy location on the map (see Appendix D for measures). Upon rating all 10 maps, the participants answered demographic questions (see Appendix G for demographic questions). Lastly, they were asked if their data should be used and if they used their fingers to measure distance on the screen using the included map keys (see Appendix H for follow-up questions). The final screen thanked the participants for their participation and provided them with the contact information of the study authors (see Appendix I for final screen).

Results

Data Cleaning and Descriptive Data
I made a priori decisions on who to exclude from the data. I cleaned data to discard participants who did not complete the survey, participants who answered that their data should not be included due to a lack of trying on their part, and participants who answered that they utilized their fingers or other measurement tools to judge distance on the maps. This led to the cleaning of six participants who did not finish, zero participants who did not think their data warranted inclusion in the analysis, and three participants who used their fingers or other measurement aids. I narrowed down the total number of participants before the data cleaning, 56, to 47 participants after the data cleaning.

I created a composite score for distance, ease, and accessibility by averaging each participants’ responses for each of these measures. The grand means are reported in Table 1.

In order compare the boundary conditions and no boundary conditions, I averaged composite means for distance, ease, and accessibility for the five boundary conditions and the five no boundary conditions.

Table 1

*Descriptive Statistics for Grand Means for Each Dependent Variable (N = 47)*

<table>
<thead>
<tr>
<th>Grand Means</th>
<th>Response Total</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance Judgment</td>
<td>47</td>
<td>36.00</td>
<td>261.70</td>
<td>134.96</td>
<td>46.49</td>
</tr>
<tr>
<td>Ease of Access</td>
<td>47</td>
<td>1.00</td>
<td>4.90</td>
<td>2.90</td>
<td>.89</td>
</tr>
<tr>
<td>Accessibility</td>
<td>47</td>
<td>1.00</td>
<td>4.00</td>
<td>2.39</td>
<td>.63</td>
</tr>
</tbody>
</table>
Main Analyses

To test the hypothesis that the appearance of a county line as an illusory boundary would lead participants to view equal distances as being of greater distance, less easy to reach, and less accessible, I ran three paired samples t-test comparing boundary vs. no boundary conditions on distance, ease, and accessibility. Against hypotheses, when participants had a map with a boundary, they did not perceive distance to be significantly greater than when they had a map without a boundary, \( t(46) = 1.70, p = .10 \), Cohen’s \( d = .18 \). Also against hypotheses, when participants were given a map with a boundary, they did not judge ease of travelling to the therapy location as being significantly greater than when they were given a map without a boundary, \( t(46) = .93, p = .36 \), Cohen’s \( d = .09 \). As predicted, however, when participants were given a map with a boundary between their location and the therapy location, they perceived it as being less accessible than when they were given a map without a boundary, \( t(46) = -2.60, p = .01 \), Cohen’s \( d = .24 \).
Figure 1. Boxplot for accessibility ratings according to the mean of all boundary or no boundary scores. (A boxplot displays a data set’s minimum, first quartile, median, third quartile, and maximum values. The mean of the data set is represented by an X, and any outliers are represented as points.)

Discussion

This study set out to identify possible influences of illusory boundaries, in the form of county lines on a map, on participants’ perceived access to mental health services and these potential influences’ possible implications for rural mental health treatment applications.
I predicted that distance judgments (represented on a sliding scale) would be significantly higher for maps in which a county line separated the “you are here” location from the “therapy location” than for maps in which these two locations were positioned inside the same county and thereby were not separated by county lines. I also predicted that participants would rate both the ease of getting to and the accessibility of the therapy location to be significantly higher for maps in which the two locations were not separated by a county line than for maps in which a county line separated the “you are here” location from the “therapy location”.

Our predictions were partially supported by our findings. The measure ranking accessibility of the therapy location was significantly higher when there was no county line between the two locations than when there was a county line. This is supported by research in which hanging blankets, low wooden fences, drop-offs and gaps in the ground, and wall extrusions representing boundaries correlated with higher distance judgments compared to lower judgments in the absence of said boundaries (Kosslyn, Pick, & Fariello, 1974; Sinai, Leng Ooi, & He, 1998; Sturz & Bodily, 2016). These findings have implications for perceived accessibility to locations on maps. This research suggests that map reading may serve as an extension of already existing illusory boundary biases. Not only does this have implications for mental health care and how accessible therapy seems, but it could possibly extend to other locations as well, such as schools, dentist offices, and libraries. Future studies could examine the possible implications for other locations and its effects on populations which the location is intended to serve.
However, the data did not support the prediction that a boundary would affect distance judgments. Although distance was rated as being generally higher for locations separated by county lines than for locations without county line boundaries, this difference was not significant. The study in which distance judgments were shown to rise in response to the presence of illusory boundaries (wall extrusions) was not replicated (Sturz & Bodily, 2016). One possible explanation for the lack of significance could be due to the response format on this study’s survey question. In the original study, Sturz and Bodily (2016) implemented increments of 10 feet (from 0 to 200) on the sliding scale. However, the present study did not include such increments. The presence of increments may help the participant conceptualize the overall distance on the sliding scale. Moreover, the wall extrusion study placed the word YOU (in all capitalized letters) at the far left end of the scale to indicate that the distance that the participant slid the scale was in relation to their own perceived location in the virtual room. This could help orient the participant. Finally, that study asked the participant to estimate the distance in feet while the current study sought an estimation in miles. While a foot is a measurement unit that people encounter on a daily basis, miles may be harder to conceptualize. This could be one reason why participants in the wall extrusion study presented significant distance judgment differences.

Additionally, the sliding scale for the distance measure could also have been problematic if participants used a cell phone to complete the study. One study found that participants responded significantly less accurately on a sliding scale on a smartphone than on a personal computer (PC), despite having a longer response time on the smartphone than the PC (Antoun, Couper, & Conrad, 2017). For example, the
aforementioned research which found significant distance judgment differences on a sliding scale in the presence of wall extrusions was conducted primarily on laptop and desktop computers with only 2% of participants using a smartphone and another 2% using a tablet (Sturz & Bodily, 2016). The current study did not measure the extent that participants used their phones to take the study. However, it could be the case that more students were taking it from a cell phone than in years past. A suggestion for further studies would be to require that the study be taken on a computer by holding an in-person, supervised study. This would also eliminate the possible use of fingers and measuring tools to deduce distance on the screen.

Additionally, the prediction that the ease of getting to the therapy location would be rated as higher for maps in which county lines did not separate locations than for maps in which county lines separated locations was not supported by our findings. One possible explanation for the lack of significance is the difference in measures between this ease ranking and the accessibility ranking. The Likert-type scale for the ease measure consisted of five response options while the Likert-type scale for the accessibility measure only consisted of four response options. It can be speculated that participants felt compelled to choose the middle option of the five for the ease measure but were forced to choose a more subjective response for the accessibility response options. This is supported by research that suggests the absence of a midpoint on a Likert scale reduces social desirability bias and potentially reduces the presence of distorted results (Garland, 1991). It would be advised that future studies maintain the same number of response options for Likert-type scales to equalize measurement sensitivity.
It could also be advised that future studies define the qualitative words that they are asking participants to use in their judgments. For example, participants in the present study may have not known the difference between ease and accessibility. Moreover, possible nuances in the wording of “How easy would it be for you to get to the therapy location from your location?” and “How accessible does this therapy location seem?” could potentially have influenced results. For one, participants could be subjectively applying themselves in the ease response by judging their own personal ability to reach a therapy location due to the presence of the word “you” in the question. This could potentially cause participants to examine their own personal modes of transportation and state of finances that would impact their ability to reach the therapy location. On the other hand, participants could see the accessibility question as being more objective seeing as it does not contain the word “you”. In this case, participants could perhaps have applied their understanding of the general population’s mobility when estimating how one would get to the therapy location. It would also be advised that future studies remain consistent in their use or lack of use of the word “you” when measuring judgments. Moreover, if a study did utilize the word “you”, it would be advised that the researcher also collect data (perhaps veiled as “demographic data”) indicating the participant’s financial and physical means of travel that could then be compared to their responses.

While the present study’s significant finding reveals implications for maps in distance bias and reveals possible implications for this bias regarding rural mental health care, it leaves a lot left to be discovered. Future studies are encouraged to delve in to the possible nuances in wording questions, formatting measures, and manipulating maps. As presented earlier, future studies are encouraged to examine possible extensions of this
study’s application to rural mental health care clients. For example, future research could ask if the presence of a university inside or outside of one’s county of residence affects their perception of distance from and accessibility to the university should they choose to commute to school. This could have implications for how likely a person is to attend a university or even attend college at all. As stated earlier regarding Likert scales, future studies are advised to maintain consistency in the number of options given on a scale in order to reduce the possibility that participants choose a middle value by default. Also stated earlier, future studies are encouraged to maintain consistency in presenting or not presenting the word “you” when asking for judgments in order to control for the participant applying their own means of transportation to the judgment. Overall, this extends to the advice that researchers clearly define the terms they are using in their prompts to participants. In addition, future studies could investigate whether the visual effect of county lines on accessibility ratings translates to a lexical effect of the word “county” alone. For example, a researcher could ask if the knowledge that a therapy location is positioned inside or outside of one’s county of residence, regardless of exact distance between the two, would affect one’s perception of the accessibility of that therapy location. This could potentially create more questions regarding how the visual system judges distance and accessibility compared to the schematic system connected to language.

Conclusion

The findings of this study can be generalized to populations who utilize mental health services, particularly in rural settings. Accessibility is an important component in the decision of whether to attend mental health treatment (Broffman et al., 2015; Haynes
et al., 2017; HRSA, 2005; Hill, Cantrell, Edwards, & Dalton, 2005). The finding that accessibility correlates significantly with the presence or absence of an illusory boundary (in this case, a county line) has implications for decision-making in which maps are utilized. For example, people who use such services as MapQuest, Google Maps, or Apple Maps could be susceptible to this phenomenon when searching for potential therapy locations.

Implications also exist when it comes to health insurance barriers. For instance, some health insurance providers confine their coverage to a person’s state of residence. This coverage “barrier” coupled with the illusory boundary of a state line may prevent rural populations from seeking treatment where it is available. This serves to reinforce the accessibility bias in the presence of illusory state lines. Further research could investigate how removing such artificial barriers affects people’s efficacy in seeking therapy.

In sum, these findings present the first step towards understanding how illusory boundaries affect accessibility to health care. This research has potential implications for barriers to social services that are perhaps already underutilized in our society, not only for rural populations but also for marginalized communities as a whole.


Appendix A

Boundary Condition
Appendix B

No Boundary Condition
Appendix C

Sliding Scale

How far (in miles) do you estimate the distance to be between your location and the therapy location?
(Please indicate using this sliding scale.)

0 500

miles
Appendix D

Measures

Please use the following map to answer the next three questions.

How far (in miles) do you estimate the distance to be between your location and the therapy location? (Please indicate using the sliding scale.)

How easy would it be for you to get to the therapy location from your location? (Please select the answer from choices below.)
- very difficult
- difficult
- neither difficult nor easy
- easy
- very easy

How accessible does this therapy location seem? (Please answer using the scale below.)
- not at all accessible
- slightly accessible
- moderately accessible
- extremely accessible
Appendix E

Informed Consent

INFORMED CONSENT
Location of Mental Healthcare

Dear Participant,

We are Caitlin Shelby, an undergraduate psychology student, and Dr. Karen Naufel, Professor of Psychology, and we are conducting this research to gain information about perceived access to mental health care.

During this study, you will view a series of maps and then answer some questions. We expect it to take approximately 10–15 minutes, and you will receive SONA credit for participating. This experiment does not pose any risks to you beyond those you experience in daily life. If you feel uncomfortable answering any question, you are welcome to skip it without penalty, and you may stop taking the survey at anytime for full credit.

This research will benefit you by increasing your understanding and knowledge about the psychological research process. This research will benefit society by helping society understand how people perceive access to mental health care based on maps they see.

Your responses in this experiment will be anonymous. Only a code number will be used to identify your responses, not your name. Your data will be stored in a public repository and will be accessible to other researchers. Your identity will be protected to the fullest extent of the law. Your data may be placed in a public repository to allow other researchers to validate statistical analyses. However, your name or IP address is not associated with your responses. Additionally, the researchers will work with an institutional compliance officer or associate to verify that the data are deidentified prior to posting.

You have the right to ask questions and have those questions answered. If you have questions about this study, please contact the researcher at cs11162@georgiasouthern.edu. For questions concerning your rights as a research participant, contact Georgia Southern University Office of Research Services and Sponsored Programs at (912) 478-5460. Please refer to protocol number H19487 in your response. If you experience any adverse effects as a result of participation, please contact Dr. Naufel at knaufel@georgiasouthern.edu. You may also call Georgia Southern’s Counseling and Psychological Center at 912-478-5541.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please indicate so by selecting the radial button below.

By completing this survey, you consent that you are at least 18 years of age, and that you understand your rights.

Principal Investigator: Caitlin Shelby
Georgia Southern University
Statesboro, GA 30460

Faculty Advisor: Dr. Naufel
(912) 478-5460
knaufel@georgiasouthern.edu

"I have read this informed consent sheet. I understand my rights as a participant. By participating in this study, I am also confirming that I am at least 18 years of age."

Yes

No
Appendix F

Overview of the Study
Appendix G

Demographic Questions

What gender do you identify as?
- Female
- Male
- Not Listed
- I prefer not to respond

How old are you? (in years)

Please specify your race/ethnicity.
(Check all that apply.)
- African American or Black
- Native Hawaiians and other Pacific Islanders
- Asian or Asian American
- White or European American
- Latino/Latina
- Not Listed
- Native American or Alaska Native
- Prefer not respond
Appendix H

Follow-up Questions

Should we use your data? Decisions about public health can be made from research findings. Therefore, in order to protect the validity of the study, we would only like to include responses in which participants tried. If you just clicked through the study without paying attention, please let us know so we can exclude you from the analyses. You will still receive credit.

(Please select the option that best reflects your participation.)

☐ Do not use my data— I clicked through without looking at the graphs.
☐ Use my data— I answered to the best of my ability.
☐ Use my data— I tried, but I am not sure how well I did.

Did you use any measurement tool (fingers, ruler, etc.) to answer these questions?

☐ Yes
☐ No
Appendix I

Final Screen

Thank you for participating in the study.

If you have any questions please contact the primary investigator via email at cs11162@georgiasouthern.edu. If you have any concerns about the study you can also contact the IRB via phone at 912-478-8843. The protocol number for this study is ___H19447____.