Summer 8-22-2021

Community Factors Contributing to COVID-19 Positivity Rate: Using Illinois as a Case Study

Helena Lucia Swanson
DePaul University, hswanso2@depaul.edu

Community Factors Contributing to COVID-19 Positivity Rate:

Using Illinois as a Case Study

A Thesis

Presented in

Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

By

Helena Lucia Swanson

August 9th, 2021

Department of Psychology

College of Science and Health

DePaul University

Chicago, Illinois

Thesis Committee

Dn. Joseph R. Ferrari, PhD, Chairperson

Jerry Cleland, PhD, Reader

Acknowledgements

The development to completion of this thesis project would not have been possible without my wonderful network of support. I would first like to thank my incredibly patient and loving fiancé, Brandon Spino, who offered unwavering support throughout this entire process. From bringing me snacks and water to make sure I was taken care of while writing to stealing me away from writing and studies when I needed a break, I am so thankful to have a partner that understands me so deeply. Also, the kindness of my parents, Lisa and Jim Swanson, was crucial during this process. My parents supported me through all the changes graduate school and the pandemic inflicted on me and I could never say thank you enough for their support. This acknowledgement section would be incomplete without me thanking the wonderful friends I made in graduate school so far that have supported and encouraged me along the way. An extra special thank you to Rebecca McGarity-Palmer for being an amazing supporter and my virtual writing buddy. Finally, I'd like to give a huge thank you to my thesis committee, Dr. Joseph R. Ferrari and Dr. Jerry Cleland. Thank to my reader, Jerry Cleland, for his mentorship on this project as it made for a better product. Lastly, thank you to my thesis chair and advisor, Dr. Joseph R. Ferrari, for supporting me through this project, providing quick feedback, and encouraging me in all aspects of professional development, including this project.

Biography

Helena Lucia Swanson (she/her) was born in Wolcott, CT, July 23, 1997. Helena graduated from Central Connecticut State University in New Britain, CT where she received her Bachelor of Arts degree in Psychology with a minor in Gerontology. After completing her Bachelor of Arts degree, she started the Community Psychology MA/PhD program at DePaul University in Fall of 2019. Helena's research and community interests include community livability, aging in communities, aging in place, age-friendliness, and food and housing insecurity across the lifespan.

Table of Contents

List of Tables

List of Appendices

Abstract

Community level factors influence many aspects of residents' lives (Flournoy & Yen, 2004), including health (Ellen et al., 200). An instance in which community level factors greatly influence individual health is in the case of a disaster (Couch & Coles, 2010; Steinglass & Gerrity, 1990). A recent and ongoing global disaster that communities are experiencing is the COVID-19 pandemic. In times of disaster, similar to the COVID-19 pandemic, disaster management and response are crucial for communities. A community-level factor that influences individual and community health in times of disaster is social vulnerability. Another community level factor that has yet to be explored in literature examining disaster impact but may contribute to a community's disaster impact is community livability. The present study aimed to examine the relationship between social vulnerability, community livability, and COVID-19 disaster impacts using the state of Illinois as a case study. Furthermore, the present study sought to examine the difference of results at two community-level structures: county-level and region-level data. Data utilized for the present study were all archival including the Center for Disease Control and Prevention's Social Vulnerability Index, AARP's Community Livability Index, and Illinois COVID-19 public health statistics for COVID-19 infection rates. The present study found that social vulnerability positively predicts COVID-19 infection rates at the county-level, but not at the region-level. Additionally, the present study adds novel contribution to disaster literature by finding significant relationships between social vulnerability themes and community livability dimensions. Community livability was tested as a moderator for the relationship between social vulnerability and COVID-19 positivity infection rates and the model was found to be nonsignificant. The present study results build on current disaster literature and has implications for community psychology, research, and disaster management practice.

Introduction

Community-level factors influence many aspects of residents' lives (Flournoy & Yen, 2004). Resident, or individual, level variables that are influenced by community-level factors include health and well-being, health beliefs, socialization and social networks, community norms, lifespan development, and socioeconomic status (Ellen et al., 2001; Ellen & Turner, 1997; Fitzpatrick & LaGory, 2000; Halfon & Hochstein, 2002; Yen & Syme, 1999). Individual health and well-being might be the most influenced by community-level factors. Various health factors that are influenced by community factors include infant mortality, physical health of children and adults, risk of disease, and mental health (Ellen et al., 2001). An instance in which community-level factors greatly influence individual health is in the case of a disaster (Couch & Coles, 2010; Steinglass & Gerrity, 1990). The term *disaster* in this case may allude to many different types of catastrophes (e.g., hurricanes, tornados, forest fires, earthquakes, terrorist attacks, and epidemics/pandemics). A recent and ongoing disaster in the United States is the COVID-19 pandemic (American Journal of Managed Care, 2020). This paper explores community level factors in the context of COVID-19. Throughout the paper, community-level factors will be detailed in a general context to provide background information and in COVID-19 context to provide relevant information to the relationship between community-level factors and COVID-19.

COVID-19 Pandemic, 2020-2021

The COVID-19 (originally named severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2) pandemic impacted communities globally. As of August 5th 2021, the COVID-19 pandemic took the lives of over half a million United States residents and 35 million have been infected (Center for Disease Control and Prevention, 2020a). The COVID-19 was detected in the

United States in January 2020; and the first known local transmission of the virus occurred in Chicago, IL (Nature, 2020). Since the first local transmission in Chicago, as of November 29th, 2020, there have been 159,747 confirmed COVID-19 cases in Chicago (City of Chicago, n.d.). In March 2020, many United States state and local officials strongly advised residents to stay home and practice social distancing with little transition time in efforts to protect community residents from infection (Mervosh, 2020). Social distancing included limiting close contact with those whom you do not live (Center for Disease Control and Prevention, 2020b). The quick transition to staying home and social distancing were government leaders' attempts to reduce the virus' infection rate. These recommendations are an example of leaders' disaster management plans in effort to control the spread of COVID-19. In addition to virus infection and death, many individuals experienced negative secondary impacts of the virus as well.

Negative secondary impacts of the virus include experiencing unemployment, housing insecurity, food insecurity, disruption to public and religious services, drug and alcohol abuse, increased mental health symptomology, disruption and loss of business, inequitable education delivery, and reduced health-seeking behaviors as described by Family Health International (FHI 360, n.d.). Negative secondary impacts of COVID-19 are exacerbated by the politicization and misinformation spread in relation to the virus, existing structural inequalities, systemic racism, bias, and discrimination, and widespread lack of healthcare coverage among United States residents (FHI 360, n.d.).

Populations that experienced structural disadvantages before the pandemic have suffered disproportionately more than others during the COVID-19 pandemic (Harris et al., 2020). Community psychologists are concerned with COVID-19 because marginalized populations they serve are experiencing increased social inequalities as a result of the pandemic (e.g., housing

instability, food insecurity, lack of access to adequate healthcare; Jason et al., n.d.). Community psychologists can offer a unique and valuable perspective to COVID-19 disaster management because they emphasize system-level analyses to systemic problems (Jason et al., n.d.).

Disaster Management and Community Psychology

Disaster management and preparedness includes many sectors of community involvement to build a culture of preparedness. Community sectors that are typically involved in disaster management and preparedness include federal, state, local, tribal and territorial governments, non-governmental partners (e.g., community organizations), neighborhood-based community groups, faith-based organizations, and youth, children, and daycare centers (Federal Emergency Management Agency, 2020a). Community psychologists are concerned with disaster management because of the common interest in community resilience, health and wellness, and collective action (Norris et al., 2008).

To organize disaster management and plan for emergencies a disaster cycle was defined. The disaster cycle is a continuous flow of action including preparedness, response, mitigation, and recovery (Flanagan et al., 2011). Each of the four disaster cycle stages are explained below. Additionally, community psychologists' role and previous work in disaster research and COVID-19 context is provided for each disaster cycle stage.

Stage 1: Preparedness Stage

During the preparedness stage disaster management leaders develop emergency preparedness plans to minimize damage from future disasters (Noji, 2000). Additionally, during the preparedness stage, disaster management leaders seek to understand the following: '*Which groups are less likely to prepare for a disaster?*' '*Which groups will lack essential emergency response items [during a disaster]?*' (Keim, 2008). Some actions local leaders may take during

this stage include create an evacuation and contingency plan, conduct community outreach and engagement, determine resource needs and allocation, and prepare shelter, supplies, transportation, and evacuation plans (Center for Disease Control and Prevention, 2015). For example, if a community is at increased risk of flooding, leaders may create dams or channels divert water away from their community to prevent flooding impact when there are heavy rain falls. Chawla and colleagues (2009) provide suggestions for disaster management leaders to use during the preparedness stage in the event of a pandemic. Suggestions include involving various stakeholders to contribute to disaster planning; namely, federal government, healthcare professionals, researchers, and community members. Other suggestions include testing the validity of previously developed disaster management models for a community, operationalize responsibilities of health and non-health administrators, strengthen local capacity for effective preparedness implementation, and develop strategic communication (Chawla et al., 2009).

The United States is typically well-prepared and equipped when responding to disease (Lewis, 2020). However, COVID-19 is different than other diseases in the United States' virus history because of the transmission rate and its differences compared to recent nationwide influenza outbreaks (e.g., the 2009 H1N1 pandemic). COVID-19 is much more contagious and has an increased transmission rate compared to other recent disease outbreaks (e.g., Ebola virus, H1N1; Lewis, 2020).

Additionally, the United States presidential administration at the time (e.g., D. Trump administration, 2016-2020) chose to deny the danger of the COVID-19 virus and largely misled the general public about the virus, policies surrounding the virus, and the politics necessary to address the virus (Hatcher, 2020). In the initial months of the pandemic, February 2020, the Trump administration did not encourage national action as a way to mitigate the virus' impacts

and downplayed the virus' threat. Furthermore, the Trump administration did not provide a consistent message in addressing COVID-19 as a public health matter. Lastly, the presidential administration failed to provide consistent nationwide guidance and communication. The Trump administration did not properly prepare the United States for the horrific impact of the COVID-19 virus and instead denied and misled the general public about the virus (Sauer et al., 2021).

In the preparedness stage, disaster management teams seek to sustain healthy communities and minimize disaster by allocating resources to communities. Community psychologists are concerned with disaster preparedness because they seek to encourage and sustain community health (Campbell & Murray, 2004). Two key tenets of community psychology are promoting collective wellness and an ecological understanding of individuals within communities (Jason et al., n.d.). Collective wellness means encouraging and understanding characteristics of a healthy community. Developing an ecological understanding involves critically analyzing how individuals and their social environments (i.e., ecological levels) interact and influence each other. Community psychologists are engaged in resource distribution and access; specifically, resource access and distribution to vulnerable populations (Sarason & Lorentz, 1979). Trickett (1984) described four principles using an ecological framework for resource allocation. The four principles are as follows: (1) cycling and exchanges of resources throughout ecological levels, (2) adapting community conditions for survival, partially through resource acquisition, (3) interdependence, indicating that resources at various ecological levels influence one another, (4) succession, indicating that as time passes ecological needs change and resources need to be fairly distributed based on need changes.

Stage 2: Response Stage

During the response stage disaster management leaders prevent disaster damage and attempt to save lives from a current disaster (Noji, 2000). Additionally, during the response stage, disaster management leaders seek to understand the following: *'Which groups are least likely to hear, understand, and respond to warnings?'*, *'Which groups will have difficulty following emergency directives?'*, *'Which groups will need emergency medical care or continuation of medical care?'*, and *'Which groups are least likely to have access to emergency services?*' (Hutton, 2010). Some actions local leaders may take during this stage include: determine resource allocation, provide targeted data to decision-makers and first responders, prioritize response efforts, and tailor communication efforts (Center for Disease Control and Prevention, 2015). In response to the 2009 H1N1 influenza pandemic, USAID (n.d.) suggested the following for disaster management leaders during the response stage: "(1) establish an emergency operations center, (2) continually assess needs, identify resources, and plan for response, (3) implement the response, (4) prepare for community recovery" (p. 3).

In the context of the COVID-19 pandemic, the Federal Emergency Management Agency (FEMA) of the United States allocated more than $12 billion in COVID-19 response. FEMA, a United States Department of Homeland Security agency, provided funding to State, Local, Tribal, and Territorial (SLTT) partners for a Disaster Relief Fund, supported the National Guard in deployment of more than 5,000 medical professionals. This funding provided additional hospital support, provided support to temporary medical facilities, supported emergency food and shelter programs, and supported crisis counseling services (Federal Emergency Management Agency, 2020b). Additionally, FEMA, the U.S. Department of Health and Human Services, and

the Unified Coordination Group strategically managed and distributed Personal Protective Equipment (PPE) and other medical supplies to hospitals.

Community psychologists are frequently called upon to provide services to communities impacted by disasters (Goodman et al., 2014). Community psychologists may work with disaster response teams or organizations to assist with community outreach, community collaboration, and indirect services (Lewis et al, 2011). However, for community outreach, community collaboration, and indirect services to be successful they must include social justice and cultural competence (Goodman et al., 2014). Community psychologists are skilled in and value social justice perspectives and cultural competence (Jason et al., n.d.). Community outreach with social justice and cultural competence frameworks include recognizing and incorporating cultural values and sociopolitical context in disaster response strategies (Goodman et al., 2009).

Stage 3: Mitigation Stage

During the development and implementation of the mitigation stage, disaster management leaders develop policies to reduce risk to a disaster (Noji, 2000). Additionally, during the mitigation stage, disaster management leaders seek to understand the following*: 'Which groups are most at risk during an emergency?'* and *'What resources are needed by at-risk groups during an emergency?'* (Hutton, 2010). Some actions local leaders may take during this stage include develop hazard mitigation plans, set up community shelters, and develop structural planning and policy (Center for Disease Control and Prevention, 2015). In response to the H1N1 influenza pandemic in 2009, Chawla and colleagues (2009) suggested mitigation strategies to decrease infection and mortality. Some suggestions included increased capacity for employees to work from home, social distancing and closure of meeting places, deep cleaning

common areas, providing PPE to critical workers, and mechanisms to identify necessary resources and ways to ensure availability of those resources (Chawla et al., 2009).

The mitigation strategy for the COVID-19 pandemic is an ongoing effort given the pandemic's continuation. The United States followed a similar mitigation strategy for COVID-19 as suggested for H1N1. In an effort to control the spread of COVID-19, a phased opening strategy created by the United States White House details the closure and reopening of public spaces and employers to protect residents from COVID-19 (White House, 2020). While the application of the phased opening strategy was done differently in different states, cities, or counties, most followed a similar path as suggested by the White House. Additionally, not all states, cities, or counties may have transitioned to the most advanced phases of reopening because they did not meet the guidelines associated with that phase. Furthermore, phase transitions are not always linear. Many communities had to retreat to more restricted phases because virus infections increased again. There are three phase opening stages provided by the White House; mitigation efforts are prevalent in all phases; however, it is most evident in phase one. Phase two and three will be presented in the recovery stage section.

Phase one details that individuals considered vulnerable should continue to shelter in place and that those living with vulnerable people should not return to work because they can bring the virus home to the vulnerable person. Individuals should also maximize social distancing when in public spaces (e.g., shopping areas, parks, outdoor recreation areas) and social events of more than 10 people should be avoided. Additionally, individuals should minimize non-essential travel and isolate according to Center for Disease Control and Prevention (CDC) guidelines. Employers should encourage remote working for employees, make special accommodations for vulnerable workers, and also minimize non-essential travel. Lastly, places

such as schools and bars should remain closed, visitations to senior living facilities and hospital should be prohibited, and large venues (e.g., places of worship, sporting venues, movie theaters) should operate under strict protocols and follow CDC guidelines.

Additionally, public health experts provided four main recommendations to mitigate the pandemic's impact. The major public health recommendations to reduce transmission of COVID-19 include washing hands often, avoiding close contact (e.g., social distancing), wearing a facial covering/ mask, covering coughs and sneezes, clean and disinfecting frequently touched surfaces, and monitoring health daily (Center for Disease Control and Prevention, 2020c). Despite these recommendations, many communities across the nation experienced grave, disproportionate effects of the virus, partially because of community-level factors. Furthermore, public health recommendations and phase openings are supported inconsistently by government leaders which may provide contradictory information and make messaging and community practice different in certain locations (Weber & Houghton, 2020).

Community psychologists may be helpful during the disaster mitigation stage because they seek to identify, serve, and advocate for vulnerable, disadvantaged populations (García-Ramírez et al., 2014). By identifying vulnerable populations that may be at increased risk of disaster affects, community psychologists work may inform disaster management leaders' strategies to protect at-risk community members. Actions some community psychologists are doing to mitigate pandemic affects include using disaster mitigation approaches that involve community groups, collecting stories to demonstrate the strength and power that occurs when communities come together to assist one another, showcasing psychologists' efforts to address community-level determinants of the pandemic, and collating resources to build community cohesiveness between community groups and organizations (Harris et al., 2020).

Stage 4: Recovery Stage

During the recovery stage disaster management leaders repair, replace, and/or rebuild the community to restore back to the original state after a disaster (Noji, 2000). Additionally, during the recovery stage, disaster management leaders seek to understand the following: *'Which groups are most likely to have suffered the most from impact?'* and *'Which groups are most likely to have experienced the most economic or emotional stress or altered social factors?'* (Hutton, 2010). Some actions local leaders may take during this stage include: determine resource allocation again, identify subpopulations that are the least resilient, and track recovery and identify ongoing problems (Center for Disease Control and Prevention, 2015). In response to the H1N1 influenza pandemic, USAID (n.d.) suggested the following for disaster management leaders during the recovery stage: (1) reestablish a sense of security by reducing public fear, supporting the community's grieving process, reopening public places, and reintroducing joy and (2) linking relief and recovery by reassessing vulnerability, strengthening and sustaining relief activities, and getting life and commerce back to normal.

The COVID-19 pandemic is an ongoing issue in the United States; however, the United States has started the recovery stage. As of June 4th, 2021, 38 out of 50 states and 3 out of 5 territories in the nation have 70% or more of their residents that have received their first dose of the COVID-19 vaccine (Center for Disease Control and Prevention, 2021). Additionally, phase two and three of the phase opening strategy as defined by the White House incorporate pieces of the recovery stage (White House, 2020).

Phase two explains that vulnerable individuals should continue to shelter in place and that those living with vulnerable people should not return to work because they can bring the virus home to the vulnerable person. Similar to phase one, individuals should maximize social

distancing when in public spaces (e.g., shopping areas, parks, outdoor recreation areas). However, social setting guidelines increase to 50 people at a given social event. Additionally, non-essential travel may resume. In phase two, employers should still encourage working remotely and should still provide accommodations to vulnerable workers. Lastly, places such as schools and bars may reopen with contingencies, visitations to senior living facilities and hospital are still prohibited, and large venues (e.g., places of worship, sporting venues, movie theaters) still should operate under strict protocols and follow CDC guidelines.

Finally, phase three includes allowing vulnerable populations to return to public interactions, while still practicing social distancing and avoiding crowded environments. Employers can return to normal unrestricted staffing of worksites. Lastly, businesses (senior care facilities, hospitals, large venues, gyms, and bars) can operate while practicing sanitation and social distancing protocols.

Community psychologists are typically engaged in the recovery stage of disaster management to encourage, facilitate, and measure community resilience. Community resilience is a community's ability to recover from a disaster by utilizing community resources (Paton & Johnson, 2001). Community resilience occurs at various, interdependent ecological levels and involves ensuring community members have the capacity and resources to facilitate growth and rehabilitation of physical environment (e.g., buildings), the economy, businesses, and social institutions (Paton & Johnson, 2001). Strong sense of community and social networks/support are crucial elements for successful community resilience (Paton & Johnson, 2001). Additionally, Millar and colleagues (1999) reported community resilience was related to level of involvement community functions and activities (e.g., social action groups, social clubs). Millar and

colleagues (1999) findings indicate that the more community members that engage in community activities the greater the community's disaster resilience will be.

The COVID-19 pandemic continues to sweep through the United States and researchers are continuously working on disaster management plans and attempting to understand which community members are at increased risk of the virus and the secondary negative impacts that the virus has created. Williams et al. (2020) found that as of May 6th, 2020 in England the following were risk factors associated with COVID-19 related death: being male, being an older adult, having diabetes, severe asthma, or various other medical conditions, and being Black or South Asian. Researchers and local leaders attempt to stay up to date on risk factors, community factors influencing health and infection, and identify populations of community members that may be most at risk to the virus in effort to protect and mitigate the pandemic effects for vulnerable populations. One way to conceptualize risk factors and community vulnerability to COVID-19 is to examine social vulnerability.

Social Vulnerability

A community-level factor that influences individual and community health is *social vulnerability*. Social vulnerability defines characteristics of a person or group of people as those that affect "their capacity to anticipate, cope with, resist, and recover from the impact" of a disaster (Kei, 2008, para. 1). As mentioned previously, community psychologists seek to identify and engage with vulnerable populations (García-Ramírez et al., 2014). Social vulnerability may be considered in all phases of disaster management (Flanagan et al., 2011). To understand and react to a community's vulnerability to a disaster, social vulnerability characteristics should be examined.

Social Vulnerability Characteristics

To assess social vulnerability, characteristics that contribute to social vulnerability are evaluated. There are six characteristics most commonly attributed to contributing to social vulnerability; namely, *age, gender, race and ethnicity, socioeconomic status, English language proficiency, and disability and medical issues* (Center for Disease Control and Prevention, 2015). Community leaders should seek to identify vulnerable people or groups of people to effectively prepare to protect their community and subgroups of the community from the impact of a disaster. Researchers have related social vulnerability characteristics to the COVID-19 pandemic; namely, virus case counts, infection rates, deaths, and negative secondary impacts (e.g., economic hardships, discrimination, increased mental health symptomology, etc.; Dasgupta, S., 2020; Nayak, et al., 2020).

Some researchers began assessing the association between social vulnerability variables and COVID-19 relatively early in the pandemic's history. Karaye and Horney (2020) examined the association between the Center for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) and COVID-19 case count data as of May 12, 2020. They concluded that overall SVI scores were associated with a 65% increase in COVID-19 case counts. Additionally, race and ethnicity and English language proficiency were associated with a 669% increase in virus case counts. However, the relationship between social vulnerability and COVID-19 varied among counties in the United States. Karaye et al. (2020) also found a negative relationship between COVID-19 infections and disability. The negative relationship between virus infection and disability is inconsistent to previous literature examining COVID-19 and persons with disabilities (Andrews et al., 2020). Andrews and colleagues (2020) explain that persons with disabilities are more likely to be living in institutional settings (e.g., group homes,

nursing homes, assisted living facilities) and are at increased risk of contracting the virus. Lastly, SVI variables explained only roughly 38% of the variance in COVID-19 case counts. The varying relationship among counties, the counterintuitive relationship found, and the low variance explained in COVID-19 case counts require further investigation into the relationship between social vulnerability and COVID-19.

The negative impact the COVID-19 pandemic had on vulnerable populations elucidated many inequalities within United States systems and resulted in many negative secondary impacts (Pappas, 2020). Researchers sought to study the relationship between social vulnerability, COVID-19, and vulnerable populations to understand how these populations were impacted and to create/suggest interventions to help (Brodhead, 2020; Karaye et al., 2020; Kerkhoff et al., 2020). Moreover, results may help researchers and federal and local leaders identify the vulnerable populations disproportionately impacted by COVID-19 (Kiaghadi & Rifai, 2020). In this section, social vulnerability characteristics are detailed and reasons for characteristics contributing to vulnerability are provided. It is important to recognize that individuals may hold multiple identities that compound their social vulnerability; therefore, making them increasingly vulnerable to disasters (Mikolai et al., 2020; Myers, 2020). Additionally, previous research using each social vulnerability characteristic in the field of community psychology and in COVID-19 context are explained.

Age. Age contributes to social vulnerability because older adults and children may be particularly vulnerable during disasters (Flanagan et al., 2011; Ngo, 2001). Children (e.g., persons younger than 18) are at increased risk of negative impacts from a disaster because they have not developed the resources, knowledge, or understanding to cope with disasters (Flanagan et al., 2011). While many may assume children might be protected through parental

responsibility, this concept is rarely accounted for in disaster policy, procedures, or strategies (Martin et al., 2006). Additionally, Martin et al. (2006) found that less than half of emergency medicine programs report providing training to professionals to provide care to children and that most programs do not regularly incorporate child victims into practice emergency scenarios. Older adults may experience an increased likelihood of medical conditions, decreased access to mass media, and/or chronic health conditions putting them at increased risk of disaster effects. Ngo (2001) emphasized that to minimize disaster vulnerability for older adults, leaders need to understand the specific needs and traits of the population that lead to risk factors to vulnerability. To mitigate older adults' vulnerability, disaster policies and programs target the needs of the older adult population by creating strong connections between available resources and older adult community members.

Community psychologists engage in research and advocacy for and with older adults to encourage community supports for successful aging, resiliency throughout the lifespan, civic engagement, and intergenerational justice (Hostetler & Paterson, 2017). Previous community psychologists examined older adults' experience during disasters (Li et al., 2011; Norris & Murrell, 1998). Li and colleagues (2011) found that older adults' sense of community served as a protective factor against earthquake-associated distress. Norris and colleagues (1998) found that older adults' experience to a previous disaster served as a protective factor to future disaster stress and anxiety.

In the context of COVID-19, older adults are at the highest risk of COVID-19 infection and death (Center for Disease Control and Prevention, 2020d). Older adults (age 65+) accounted for 31% of COVID-19 cases, 45% of hospitalizations, 53% of ICU admissions, and 80% of COVID-19 deaths (Le Couteur et al., 2020). While all older adults are at increased risk of dying

from COVID-19, the oldest-old (age 85+) have the greatest case-fatality rate, 10-27% (Center for Disease Control and Prevention, 2020e). Comparatively, the young-old (age 65-74) have a case-fatality rate of 3-5% and the old-old (age 75-84) at 4-11%. Older adults are also experiencing many negative secondary effects of the virus such as age discrimination and loneliness (Krendl & Perry, 2020). In effort to prevent virus infection, many older adults are following public health recommendations (e.g., staying home and resisting seeing friends and family). As a result, older adults are experiencing increased ageism, loneliness and other mental health concerns, and loss of social connectedness (Monahan et al., 2020; Tyrrell & Williams, 2020).

Gender & Sex. Gender independently does not contribute to social vulnerability. However, the ways in which gender identity intersects with many other characteristics of social vulnerability and social patterns may generate vulnerability or a disadvantage to disaster coping (Phillips et al., 2010). Gender social inequalities such as wage differences, employment, and gender roles in family responsibility may result in women being more socially vulnerable to disasters (Yeletaysi, 2009). However, in contrast, men typically tend to be more likely to be risk takers which may contribute to vulnerability (Phillips et al., 2010). The mixed results lend researchers to believe that the impact that one's gender has on their vulnerability may be context specific to the disaster.

Community psychologists sought to understand gender and sex differences during previous disasters (Li et al., 2012; Norris et al., 2008). Li and colleagues (2012) found that women report significantly lower resilience compared to men in a Chinese sample one year after an earthquake. Norris and collaborators (2008) found that women indicated higher reports of direct disaster injuries, severity of the disaster, and perceived disaster danger than men after a flood in Mexico.

Research examining sex differences for COVID-19 are contradictory to one another. Some studies indicate males experience increased infection and fatality rate from COVID-19 (Chen et al., 2020; Li et al., 2020; Mo et al., 2020), while some studies show females experience increased infection and fatality rates (Korean Society of Infectious Diseases et al., 2020), and some show no sex differences (Wan et al., 2020; Wu et al., 2020). Further research is needed to establish the existence of gender differences (or not) for COVID-19.

Race and Ethnicity. Race and ethnicity also intersect with other characteristics of social vulnerability (Flanagan et al., 2011). More specifically, race and ethnicity strongly intersect with the social vulnerability component, socioeconomic status. The relationship between race and ethnicity and socioeconomic status is driven by systemic racism and ethnocentrism further marginalizing populations and increasing their vulnerability to disaster (Cutter et al., 2003; Morrow, 1999). As for race, Black people were identified as having the highest indicators of social vulnerability among all the races (Cutter et al., 2003). For ethnicity, Hispanic/Latinx people and Native American/Indigenous people rank the highest for social vulnerability (Cutter et al., 2003). During the H1N1 Influenza pandemic, Spanish-speaking Hispanics were at the greatest risk of exposure and experienced disparities in access to healthcare (Quinn et al., 2010).

Community psychologists sought to identify, report, and seek justice for racial inequalities present during previous disasters (Krzysztof & Fran, 1995; Kung et al., 2018; Voorhees et al., 2007). Voorhees and colleagues (2007) found that media source disproportionately portrayed racial minorities as victims of disaster, and rarely in positions of expertise (e.g., officials, experts, police, politicians, doctors) following the impact of hurricane Katrina compared to White people. Kung and collaborators (2018) found that Asian Americans reported lower resilience to developing posttraumatic stress disorder following the World Trade

Center attack compared to White counterparts. Following the hurricane Hugo disaster of 1989, Krzystof and colleague (1995) reported Black individuals received less community support than similar affected White disaster victims. Furthermore, Davidson and colleagues (2013) reported that following the 2008 hurricane Ike disaster there were no differences among racial/ethnic groups in level of property damage; however, Black individuals reported greater disaster exposure, concern for safety of their family, and greater likelihood of posttraumatic stress disorder symptomology.

As previously mentioned, the COVID-19 pandemic exacerbated systemic racism in United States systems that place race minority populations at increased risk of the virus (Center for Disease Control and Prevention, 2020f). Systemic inequality factors increased COVID-19 risk among race/ethnicity minority groups; namely, discrimination, lack of healthcare access and utilization, occupations that are labeled essential during the pandemic, education, income, and wealth gaps, immigrant status, language barriers, and increased likelihood of crowded housing conditions (Gil et al., 2020). American Indian and Alaskan Native people are at high risk of COVID-19 infection because of lower socioeconomic status resulting in poverty and crowded housing (Hathaway, 2020). Additionally, Black and Asian Americans in the U.S. died from COVID-19 at almost four times higher rates than the national average (Louis-Jean et al., 2020; Yan et al., 2020). On top of facing disproportionate case fatality rates, Asian Americans experienced increased discrimination and xenophobic attacks due to anti-Asian sentiments that are being widely shared as a result of the virus allegedly originating in Wuhan, China (Kandil, 2020). President Donald Trump used phrases such as ‘Chinese virus’, ‘Chinese flu’, ‘Kung flu’ to describe the COVID-19 pandemic, which aggravated anti-Asian sentiments occurring in the United States (Berman, 2020; Kandil, 2020). In California, as July 1st, 2020 over 800

discrimination and harassment incidents occurred against Asian Americans in a three-month period, including 64 potential civil rights violations and 81 assaults (as cited in Berman, 2020). The Hispanic/Latinx population, the largest ethnic minority group in the U.S., constitutes only 18% of the population, but accounts for 28.4% of COVID-19 cases (Gil et al., 2020). Lastly, in Chicago, IL specifically, Black individuals are at increased levels of risk to COVID-19 and social vulnerability (Kim & Bostwick, 2020). It is evident that racial and ethnic minority groups are disproportionately impacted by the COVID-19 pandemic, which is influenced by their social vulnerability.

Socioeconomic Status. Individuals that were low-income or economically disadvantaged were disproportionately affected by previous disasters (Flanagan et al., 2011; Brodie et al., 2006). People that were economically disadvantaged were less likely to have the ability to purchase the needed resources or capabilities to protect against disaster (Center for Disease Control and Prevention, 2015). Resources to protect against a disaster may include stockpiling food and medicine and seeking shelter. If the disaster is an illness, the ability for low socioeconomic individuals to stay home from work if they are sick is essential to stop the spread of the illnesses; however, those that were low-income have less capability to miss a day of work with no pay. Furthermore, if an individual was unemployed or uninsured, they were at increased risk of negative effects of a disaster because they did not have the means to recover from loss or injury (Flanagan et al., 2011). Brodie et al. (2006) measured the characteristics of evacuees who were staying at a shelter in Houston, TX after Hurricane Katrina. Brodie and colleagues (2006) concluded that 12% were unemployed and 54% were uninsured. Additionally, the economic impact that disasters create historically result in a poverty trap that may result in long-term health and economic difficulties for society; while disproportionately impacting lower socioeconomic

status families and individuals (Bond et al., 2020; Barret & Carter, 2013; Kraay & McKenzie, 2014).

Community psychologists also sought to identify experiences of individuals of lower socioeconomic status during previous disasters (Ginexi et al., 2000; Krzysztof et al., 1995; Li et al., 2012). Ginexi and colleagues (2000) reported that lower household income was significantly related to increased depressive symptoms following the 1993 Midwestern floods. Krzysztof and Fran (1995) reported that disaster victims that were less educated received reduced community support from disaster effects compared to more educated individuals. Li et al. (2012) reported that of those impacted by the 2008 Wenchuan Earthquake, the most devastating earthquake that has ever struck the People's Republic of China, individuals that were low-income and had lower education levels experienced reduced resilience to disaster impacts.

In the context of COVID-19, families or individuals that are of lower socioeconomic status, experience reduction in income and financial savings (Dang et al., 2020). As part of COVID-19 disaster management, many local leaders have enlisted essential workers to work onsite, rather than remotely. Essential workers conduct a wide range of operations and services that leaders have labeled as critical to societal infrastructure; and therefore, cannot be halted or done remotely (National Conference of State Legislatures, 2020). Individuals holding essential positions commonly have lower-paying jobs (e.g., grocery store clerks, pharmacy techs, public transportation operators) (Shadmi et al., 2020). Furthermore, individuals that are of lower socioeconomic status are less likely to have access to healthcare, which may result in decreased likelihood of visiting a healthcare professional when experiencing COVID-19 symptoms, therefore, possibly spreading the virus to their families and community (Shadmi et al., 2020).

English Language Proficiency. In this country, English literacy is especially important for disaster communication. If United States residents are not proficient in English, they may not understand the necessary steps to protect themselves from a disaster; and therefore, be at increased risk of disaster effects (Flanagan et al., 2011). For instance, in 2019 it was noted that 21% of United States adults had low English literacy (United States Department of Education: National Center for Education Statistics, 2019); Spanish is the second most spoken language in the United States (Gonzalez-Barrera & Lopez, 2013). Previous research has identified that Spanish-speaking Hispanic/Latinx homeowners were more likely to seek disaster mitigation information from friends and family, compared to state and local government resources (Peguero, 2006).

Equity in disaster impacts and communication is important to community psychologists, regardless of English language proficiency (Kung et al., 2018). Kung and colleagues (2018) reported that non-English-speaking Chinese participants reported significantly lower disaster resilience levels compared to English-speaking Asian-American participants following the World Trade Center attack of 2001. The authors suggest that community outreach programs be provided in multiple languages.

In the context of COVID-19, individuals that do not speak English may have difficulty receiving disaster information. As stated, Spanish-speaking Hispanic/Latinx homeowners are more likely to receive disaster information from family and friends; however, with social distancing being enforced they may be communicating with their family and friends significantly less. Furthermore, lack of English language proficiency present in the hospital may create language barriers between non-English speaking patients and healthcare professionals (Kaplan, 2020). Communication issues between healthcare professionals and patients is difficult and can

result in clinical errors (Karliner, 2018). Typically, those that are not proficient in English may be accompanied by a friend or family member to assist in translation. However, during the COVID-19 pandemic, hospitals restricted the ability for friends and family members to visit or accompany ill patients in effort to decrease virus transmission (Center for Disease Control and Prevention, 2020g). Restricted visitations created increased communication difficulty between non-English speaking patients and healthcare professionals, which may have resulted in increased clinical error. COVID-19 patients that do not speak English are frequently alone, confused, and without proper preventative care in hospitals due to communication issues (Kaplan, 2020).

Disability and Medical Issues. Roughly, one in four adults in the United States have some type of disability (Center for Disease Control and Prevention, 2020h). Individuals with a disability (e.g., sensory, physical, cognitive) or medical complications may have difficulty understanding or reacting to disaster preparation or mitigation steps (Center for Disease Control and Prevention, 2015). People that require assistance from medical equipment for sight, hearing, or mobility may be at an intense disadvantage if electrical power or resources are interrupted by a disaster. Additionally, it is important to recognize that without disaster mitigation, many people may acquire a disability from the disaster itself. For instance, after the 1963 Macedonia earthquake, 34% of residents that reported an injury had acquired a permanent disability as a result of the disaster (Alexander, 2011).

Community psychologists may research individuals with disabilities and seek to advocate for them at various ecological levels (Balcazar & Suarez-Balcazar, 2016). However, little research has been done in the field of community psychology to understand the experiences of individuals with disabilities during disasters.

In the context of COVID-19, a disability does not inherently increase risk of infection (Center for Disease Control and Prevention, 2020i). However, those with disabilities may experience negative secondary impacts from the pandemic. Prior to the COVID-19 pandemic, those with intellectual and developmental disabilities experienced isolation from society because of stigmatization (Gilmore & Cuskelly, 2014). During the pandemic, the isolation those with intellectual and developmental disabilities experience intensified as they attempt to maintain social distancing from loved ones and caregivers (Constantino & Sahin, 2020). Moreover, education inequity experiences among those with intellectual and developmental disabilities is exaggerated by the pandemic and remote learning (Constantino et al., 2020). Also, individuals with intellectual disabilities may not fully understand or fully partake in preventative health actions (e.g., hand washing, social distancing, etc.) increasing their risk of infection (Center for Disease Control and Prevention, 2020i). While individuals with disabilities are not inherently at increased risk of COVID-19, many of them also experience underlying medical conditions (Center for Disease Control and Prevention, 2020i). Those with prior medical conditions are among those at highest risk for COVID-19 due to having a compromised immune system (Srinivasa Rao, et al., 2020). Medical conditions that increase COVID-19 risk include cancer, chronic kidney disease, COPD, heart conditions, obesity, pregnancy, sickle cell disease, and type 2 diabetes (Center for Disease Control and Prevention, 2020j).

Community Livability, from a Community Psychology Perspective

Another community-level factor that may contribute to community health during a disaster is community livability. The American Association of Retired Persons (AARP) describes “A livable community is one that is safe and secure, has affordable and appropriate housing and transportation options, and offers supportive community features and services. Once

in place, those resources enhance personal independence; allow residents to age in place; and foster residents' engagement in the community's civic, economic, and social life" (Harrell et al., 2014, p. 3). As of 2018, the top three United States cities (population > 500,000) for community livability were San Francisco, California; Boston, Massachusetts; and Seattle, Washington (Lynott et al., 2019).

The movement to make communities more livable was birthed from the rapid global aging demographic changes occurring and the lack of community readiness for the change (Lynott et al., 2019). United States aging demographic changes will be evident by 2030, such that older adults (65 years or older) will represent 20% of the population, showing a 200+% increase from 35 million to over 72 million (Jordana et al., 2008). Even though community livability is not solely for older adults, it was created by an organization that prioritizes older adults' needs (Harrell et al., 2014). While many community psychologists have researched elements of community livability (Goodman et al., 2017; Hoffman, 2020; Toolis, 2017; Wolfe, 2014), they rarely label their work as contributing to community livability.

Lynott and colleagues (2019) detail AARP's seven categories for assessing livability; namely, housing, transportation, environment, neighborhood characteristics, opportunity, health, and engagement. Community livability is an important topic for community leaders and community residents to acknowledge to support efforts to enhance livability for all community residents, regardless of income, age, and address (Lynott et al., 2019). Additionally, community psychologists are concerns with community livability factors, even if they do not label it as such, because the factors impact social justice and equity, which are two principles of community psychology (García-Ramírez et al., 2014; Jason et al., n.d.). The next section will detail the seven categories of community livability and research community psychologists have contributed to

each element. Additionally, research for each community livability element in the context of the COVID-19 pandemic is detailed.

Housing

Housing affordability and access is a social justice issue (Goodfellow, 2015). The AARP Policy Book (2019-2020) details the importance of housing availability, suitability, and affordability and the influence housing has on older adults' ability to live independently and actively engage in the community. Additionally, the authors stress the significance of housing meeting the needs of all individuals regardless of ability level or age.

Many community psychologists previously researched housing equity and the influence housing has on one's life (Aubry et al., 2016; Ecker & Aubry, 2016; Singelenberg et al., 2014). Aubry and collaborators (2016) found that access to quality interpersonal and community resources contributed to individuals' ability to achieve housing stability after experiencing homelessness. Ecker and Aubry (2016) evaluated housing characteristics contributing to individuals' psychological perception of community integration. The authors concluded that respondents that reported higher housing quality also reported higher psychological community integration. This finding suggests that how a community member feels about their home may influence their sense of community. For older adults specifically, Singelenberg and colleagues (2014) reported that older adults benefit in various ways from participating in Integrated Service Areas (ISAs). ISAs provide services from housing providers, social workers, architects, researchers, and local officials to older adults while upholding their dignity and independence. The ways in which older adults benefit from participating in ISAs includes higher housing satisfaction and increased longevity of independent living.

The COVID-19 pandemic has exacerbated and presented new housing issues (Ahmad et al., 2020; Benfer et al., 2020; Nafilyan, et al., 2020). For those that rent their home, United States federal organizations enforced a temporary halt to residential evictions to prevent the spread of COVID-19 (Center for Disease Control and Prevention, 2020k). According to Benfer and colleagues (2020) many individuals who rent their home during the COVID-19 pandemic experienced financial hardship, exhausted all resources, had limited or no funds remaining, and were at risk of eviction given the eviction protection expiration. Ahmed and collaborators (2020) reported that United States counties with higher incidences of housing with either overcrowding, high housing costs, incomplete kitchen facilities, or incomplete plumbing facilities experienced higher COVID-19 mortality rates. Nafilyan and colleagues (2020) found that living in an intergenerational household increased COVID-19 mortality rates for ethnic minority groups. Previous research has displayed the benefits of intergenerational living (DeLaski-Smith, 1984); however, in the context of COVID-19 intergenerational living may be detrimental, specifically for older adults.

Transportation

Transportation is a vital link that connects community members of all ages to job opportunities, social activities, and community services (AARP Policy Book, 2019-2020). Equitable transportation options must be affordable, accessible, safe, dependable, and user-friendly.

Community psychologists research the value of equitable transportation and the consequences when transportation is inequitable (Graham et al., 2014; Novaco et al., 1979). Graham and colleagues (2014) found that complications in transportation to school resulted in less sense of school belonging, more school stressors, anxiety and depression in high school

youth with disabilities. Novaco and collaborators (1979) found that negative transportation conditions were related to negative physiological and psychological effects. Additionally, the authors argue that since community psychology is concerned with environmental factors contributing to individuals and communities, then they must investigate factors like transportation and others that contribute to health and behavior.

"The economic and social effects of the COVID-19 outbreak in public transportation extend beyond service performance and health risks to financial viability, social equity, and sustainable mobility" (Tirachini & Cats, 2020, para. 1). Urban travel has declined globally; however, public transportation has declined significantly more than other forms of transportation (Astroza et al., 2020; Molloy et al., 2020). This is because public transportation is risky for COVID-19 transmission from being in close contact to other travelers (UITP, 2020). Many public transportation companies are struggling financially during the pandemic because travel decreased, and some local governments have restricted or placed regulations on public transportation (Tirachini & Cats, 2020). However, public transportation restrictions or regulations disproportionately impact low-income populations; therefore, providing safe public transportation during the pandemic is a matter of social equity (Tirachini & Cats, 2020.

Environment

Natural resources and a clean environment should be a priority of local government in the 21st century (AARP, n.d.a). Actions to protect environments can positively impact communities for generations to come, including creating jobs. Some environmental factors leaders seek to impact include air quality, water management, land use, materials management, energy efficiency, community education, and business development (AARP, n.d.).

Some community psychologists are concerned with climate change, pro-environmental behaviors, and environmental organizations (Dean & Bush, 2007; Mahmoud-Elhai et al., 2020; Quimby & Angelique, 2011). Dean and Bush (2007) found that psychosocial processes (e.g., problem analysis, decision-making, inter-organizational relationships, community participation, and community knowledge transfer) are key in promoting ecologically and socially sustainable communities for environmental organizations. The authors argue that in order to care for the 'ecologies' (e.g., different ecological levels) that support community members, community psychologists must bridge the separation between the environment and daily life to embrace the larger picture of ecological frameworks. Mahmoud-Elhaj and collaborators (2020) examined pro-environmental behaviors, specifically in relation to use of recycled water. The authors findings suggest that community engagement in educational pro-environmental interventions may increase use of recycled water. Quimby and Angelique (2011) found that barriers to participating in pro-environmental behavior include lack of time, money, efficiency, and feelings of defeat and disappointment. Additionally, participants reported that catalysts to pro-environmental behaviors included increased community mobilization (e.g., government leaders influencing widespread change), education, increased institutional support, and actions to address barriers.

During the COVID-19 pandemic, there were positive and negative effects on the environment (Zambrano-Monserrate et al., 2020). Zambrano-Monserrate and colleagues (2020) found that as of April 2020, positive effects of the pandemic on the environment included improvements in air quality, cleaner beaches, and environmental noise reduction. However, the authors also reported negative effects of the pandemic on the environment including increased

waste production, decreased recycling behaviors, contamination of physical spaces (e.g., water and land) and air.

Neighborhood Characteristics

Neighborhood characteristics, such as access to life, work, and play are crucial aspects contributing to community health (Lynott et al., 2019). A livable community with positive neighborhood characteristics is one that is compact and has low crime rates. Compact neighborhoods are beneficial for community members because it is easy to access services (e.g., hospitals, doctor offices), amenities (e.g., grocery stores, parks, libraries), and jobs.

Community psychologists previously researched the relationship between neighborhood factors and crime rates (Heinze et al., 2018; Hoffman, 2020). Hoffman (2020) describes a term, created by E.O. Wilson, labeled "biophilia" as the innate human preference to green space environments (e.g., outdoor or natural spaces) and how interactions with green spaces promote health and sustainability. Additionally, Hoffman (2020) identifies interactions with green spaces as an opportunity to promote cultural diversity and understanding, including reduction in violence. Heinze and colleagues (2018) examined consequences of community members engaging in a program designed to revitalize vacant lots within city neighborhoods. The authors found that after community members engaged in the program there was a 40% decrease in assaults and violent crimes in revitalized lots.

The urgency for more green spaces is evident during the COVID-19 pandemic (Kleinschroth & Kowarik, 2020). Kleinschroth and colleague (2020) examined Google search requests after March 15th, 2020 for phrases such as "go for a walk". The authors found that there was an increased search for activities like "go for a walk" that they associate with the desire of people to go outdoors as an activity because of the stay-at-home and social distancing

recommendations and the concern that such activities may not be permitted. Additionally, the closure of green spaces during the pandemic limits options for physical activity; which negatively impacts physical and mental health and disproportionately impacts vulnerable populations (Slater et al., 2020). When closures and restrictions during the pandemic are lifted, researchers have observed increased use of green spaces (Freeman & Eykelbosh, 2020).

Opportunity

Education and job opportunities are factors contributing to a community's livability. Moreover, equity in opportunities regardless of race, background, age, and income is a strong contributor to livability (Lynott et al., 2019). The diversity of community members that are able to contribute to the community by working, paying taxes, volunteering, and supporting local businesses enriches community life.

Many community psychologists are concerned with equity in opportunities to work and education (Keys et al., 2014; Weinstein, 2002). Keys and colleagues (2014) describe an urban school's effort to empower students of color with disabilities from low-income neighborhoods by providing inclusive, socially just educational opportunities. Weinstein (2002) detailed reasons community psychology must be involved in education reform to include the goals of the civil rights movement, including equity in educational opportunities. The author wrote the most important shift community psychologists may advocate for in education systems is a shift from talent selection to talent development in the classroom.

During the COVID-19 pandemic, United States rates of unemployment skyrocketed, partially as a result of the disaster management phase strategy including categorizing employment as essential and nonessential workers (Bernstein et al., 2020). The categorizing of employment as essential and nonessential work had its consequences, including essential

workers unionizing to demand hazard pay because of their increased risk to COVID-19 (Smith, 2020); however, 79.5% of a United States residents sample agreed with nonessential business closures (Czeisler et al., 2020). Additionally, in efforts to control the spread of the virus many schools transitioned to remote student learning altering family, students', and teachers' lives (Garbe et al., 2020). Garbe and colleagues (2020) recommend ways to increase education accessibility during remote learning; including, increasing parents' content knowledge, providing district-assigned learning coaches, and reallocating teachers to focus on different aspects of learning (e.g., creating online teaching context, supporting students in navigating content, responding to technology difficulties). Furthermore, researchers predict education learning loss to occur as a result of the pandemic; learning loss will likely occur more to students of vulnerable populations (e.g., low-income, Black students, and Hispanic students; Dorn et al., 2020). For low-income communities, access to educational technology (e.g., Wi-Fi, computers, tutoring, technologically trained teachers) is less abundant and will likely in learning loss.

Health

Community factors that promote healthy community living, such as access to quality healthcare, contribute to livability (Lynott et al., 2019). A livable community that promotes community health may include smoke-free air laws, have high-quality healthcare options available, and have easy access to exercise opportunities. Many other community livability factors contribute to community health; namely, education and job opportunities, social engagement, and a clean environment.

Community psychologists have been concerned with community health since the birth of the field (Jason et al., n.d.). Many different facets of health and health disparities have been researched by community psychologists (Douglas et al., 2016; Wolff, 2014). Douglas and

colleagues (2016) present two strategies of community empowerment to redress systemic health inequalities for people of color; namely, identifying determinants of public health disparities and empowering communities to directly redress health inequities. Wolff (2014) details various settings and ways in which community psychology may contribute to community health; including, college campus mental health services, community mental health centers, community coalition-building, and participating in organizational or governmental task forces to address health disparities.

As detailed previously, the COVID-19 pandemic impacted the health and well-being of individuals of low socioeconomic status, those with disabilities and/or of older age, and people of color disproportionately compared to their counterparts. In addition to that, COVID-19 impacted health of various other groups. For example, researchers identified that individuals with obesity were at increased risk of COVID-19 infection, hospitalization, ICU admission, and mortality (Popkin et al., 2020). Rozenfeld and colleagues (2020) emphasize that health promotion and COVID-19 disease prevention strategies must prioritize vulnerable groups and address structural inequalities through social and economic policy.

Engagement

AARP details two types of community engagement; namely, social and civic engagement (Lynott et al., 2019). Social engagement is the extent community members eat dinner with members of their household, hear or see family and friends, and talk with and do favors for neighbors. Civic engagement is the extent community members participate in political matters and social, religious, and business organizations. A livable community with social and civic engagement fosters positive interaction among community members to connect, reduce social isolation, and strengthen sense of community (AARP Policy Book, 2019-2020).

Lerner (2004) describes civic engagement as prosocial behavior expressed as a commitment to improving, connecting to, and help one's community. Community psychologists previously researched the impact engagement has on individuals and communities (Matthew, 2017; Rossi et al., 2016). Matthew (2017) detailed behaviors that graduate student researchers, community members, and service providers identified as equitable, high-quality, community-based partnerships to encourage behaviors contributing to community engagement. Some behaviors detailed include trusting and equitable relationship-building prior to entering a community or beginning a project, increasing community member comfort and willingness to participate, and ensuring the community does not feel "used or researched" (Matthew, 2017). Rossi and colleagues (2016) examined a sample of youth and found that various social domains were associated with civic engagement including neighborhood, school, family, and peers.

Community engagement played a crucial role during previous disease outbreaks, such as Ebola (Questa et al., 2020). Community engagement was critical because of its contributions to community communication, social mobilization, participation, action, and empowerment. Gilmore and colleagues (2020) reported community engagement structures and approaches as appropriate COVID-19 prevention and control measures. The authors detail possible main contributors to increase community engagement; namely, community leaders (e.g., traditional, religious, and/or governing), faith-based organizations, community organizations or groups, individual community members, and other key stakeholders (e.g., students, women, elderly, youth, and survivors).

Study Rationale

Community-level factors influence many facets of individual community members' lives. Two community-level factors that influence community health and life are social vulnerability

and community livability. Previous researchers linked social vulnerability and COVID-19 impacts (Karaye et al., 2020); however, no research has examined the relationship between community livability, social vulnerability, and COVID-19 disaster affects. The present study will examine both community-level factors, social vulnerability and community livability, and their relationship to COVID-19 infection rates. Additionally, the present study will examine possible commonalities between social vulnerability and community livability. Findings from this study may inform community leaders and community psychologists of community characteristics that may influence future disaster impacts.

Method

Data Sources

The present study will use archival data collected from several sources, posted from 2018 to 2020. Using archival data is advantageous because of the breadth of information provided by government agency databases. The AARP *Livability Index* (AARP, 2018) and the *Social Vulnerability Index* (Centers for Disease Control and Prevention, 2018) data were collected in 2018. The Illinois Department of Public Health (2020) data spanned March 2020 and continued with daily updates in a dataset called *COVID-19 Statistics*. *COVID-19 Statistics* data that included March 2020 to November 5th, 2020 were included in the present study. November 5th, 2020 was chosen as the cutoff because this excluded potential COVID-19 infection spikes as a result of major holidays (e.g., Thanksgiving, Kwanzaa, Hanukkah, Christmas, etc.) and the initial stages of the COVID-19 vaccine rollout, which started at the beginning of December, 2020.

The present study author gathered archival data from three sources; namely, the Center for Disease Control and Prevention (CDC) *Social Vulnerability Index* dataset (Centers for Disease Control and Prevention, 2018), Illinois Department of Public Health *COVID-19*

Statistics dataset (Illinois Department of Public Health, 2020), and AARP *Livability Index* dataset (AARP, 2018). All datasets were organized by county-level data using the Federal Information Processing Standards (FIPS). FIPS codes are assigned to states and counties within the United States to organize location specific attribute data by areas within the United States (National Institute of Standards and Technology, 2019). Federal agencies developed FIPS to serve as a standard for collecting and analyzing data for areas within the United States.

All data for this study focused on a single state, Illinois. Focus on a single Midwest state was chosen because of data restrictions provided by AARP which restricts a single researcher to 1,000 data points for a dataset. The AARP *Livability Index* for Illinois independently consists of 816 data points. However, while a single state was chosen based on AARP imposed data restrictions, there are theoretical reasons for choosing Illinois specifically.

First, researchers examined the relationship between social vulnerability and COVID-19 infection rates in Illinois in April 2020 (Lara-Garcia et al., 2020). These researchers identified social vulnerability themes that were risk and protective factors for contracting COVID-19 that yielded some questionable results. Social vulnerability themes identified as risk factors included belonging to a minority group, living in a multi-unit structure, being age 17 or younger, and having limited English proficiency. The themes categorized as protective factors included being 65 or older, being older than age 5 with a disability, being low-income, and living in a mobile home. Some of these study results seem to be contradictory to what we know about COVID-19 and infection rates; specifically, risk factors including being less than 17 years old and protective factors including being 65 or older and being low-income. The present study is novel and will build upon these findings by examining more recent COVID-19 data and another community-level factor that may contribute to risk and/or protective factors associated with the virus.

Second, Chicago, IL is the largest city within the state of IL with a population of 2,705,988 (Census Reporter, 2018) and the third largest city in the United States. Additionally, Chicago is identified as an area that has high levels of social vulnerability, but high levels of community resilience (Bergstrand et al., 2015). Since Chicago has high levels of social vulnerability and high levels of community resilience, it is important to analyze the impact the virus has had on the city.

Third, Illinois' population demographics indicate the state is home to some of the most vulnerable populations at risk of COVID-19 (Illinois Department of Public Health, 2017). Some risk factors associated with dying from COVID-19 include individuals that are 60+ years old or those that have preexisting health conditions (World Health Organization, 2020). Roughly 20% of Illinois population is 60+ years old, meaning that one in five Illinoisans are older adults that are at high risk for dying from COVID-19 (The Illinois Department on Aging, 2019). Additionally, systemic racism has placed Black people in positions that have resulted in them dying at a disproportionate rate of COVID-19 compared to other ethnicity groups (Weller, 2020). Illinois is ranked 7 among the top 10 states in the nation as home to the largest African American/ Black population according to the Census Bureau (United States Department of Health and Human Services Office of Minority Health, 2019). Illinois Black residents account for 42% of COVID-19 deaths, but Black people only make up 15% of the Illinois population (Issa, 2020). In Chicago specifically, 70% of those that have died from COVID-19 are Black, and they make up 29% of the city's population (Michaels, 2020). Furthermore, Karaye et al. (2020) conducted a geographically weighted regression model that depicted Illinois having varied social vulnerability characteristics (e.g., minority status and language, housing and transportation, and household composition and disability) that may contribute to or protect

against COVID-19. Taken together, these reasons suggest a need for further evaluation of how social vulnerability is related to COVID-19 infection positivity rates in Illinois specifically, in relation to social factors like livability of spaces.

Illinois State's Regional Divisions to the COVID-19 Pandemic

In response to COVID-19, Illinois' governor Jay Robert Pritzker divided Illinois into 11 regions to "allow health officials to apply a more focused approach to each area's COVID-19 response as the pandemic continues" (NBC Chicago, 2020, para. 1; Restore Illinois, n.d.). There are 102 counties in Illinois, each with their own unique FIPS code. The 102 counties will be organized into the 11 regions defined by Governor Pritzker (Table 1) for comparative analyses. The 11 region names and the number of counties that make up the region are as follows: North (9 counties), North-Central (20 counties), West-Central (18 counties), Metro East (7 counties), Southern (20 counties), East-Central (21 counties), South Suburban (2 counties), West Suburban (2 counties), North Suburban (2 counties), Suburban Cook (1 county), and the city of Chicago. (Restore Illinois, n.d.). Appendix A displays the 11 regions on a map.

Table 1. Illinois' 11 Regions for COVID-19 Response

Region Name	Counties
North	Winnebago, Whiteside, Stephenson, Ogle, Lee, Jo Daviess, DeKalb, Carroll, Boone
North-Central	Woodford, Warren, Tazewell, Stark, Rock Island, Putnam, Peoria, Mercer, McLean, McDonough, Marshall, Livingston, La Salle, Knox, Kendall, Henry, Henderson, Grundy, Fulton, Bureau
West-Central	Scott, Schuyler, Sangamon, Pike, Morgan, Montgomery, Menard, Mason, Macoupin, Login, Jersey, Hancock, Greene, Christian, Cass, Calhoun, Brown, Adams
Metro East	Washington, St. Clair, Randolph, Monroe, Madison, Clinton, Bond
Southern	Williamson, White, Wayne, Wabash, Union, Saline, Pulaski, Pope, Perry, Massac, Marion, Johnson, Jefferson, Jackson, Hardin, Hamilton, Gallatin, Franklin, Edwards, Alexander
East-Central	Vermillion, Shelby, Richland, Piatt, Moultrie, Macon, Lawrence, Jasper, Iroquois, Ford, Fayette, Effingham, Edgar, Douglas, De Witt, Cumberland, Crawford, Coles, Clay, Clark, Champaign

South Suburban	Will, Kankakee
West Suburban	Kane, DuPage
North Suburban	McHenry, Lake
Suburban Cook	Suburban Cook
Chicago	Chicago

Examining the livability, social vulnerability, and COVID-19 infection positivity rates of these Illinois 11 regions designed for COVID-19 response is advantageous because it may inform the state government of regions that need more resources to combat COVID-19. Additionally, the 11 regions for COVID-19 response will be utilized for comparative analysis to examine which community-level analysis (county-level or region-level) will yield stronger results for hypotheses and research questions.

The purpose of comparing the 11 regions designed for COVID-19 response to the 102 counties of Illinois was to examine if combining counties into regions may result in inappropriate COVID-19 response. A reason combining counties into regions may be inappropriate for COVID-19 response is if there is a significant variability between counties that may not be reflected after combining into regions. For example, if there is one county within a large region that is experiencing negative COVID-19 impacts (e.g., increased infection, death, and hospitalization rates), but all other counties within the region are not experiencing the same impacts, disaster management leaders only examining region-level statistics may not properly respond to the county experiencing negative impacts.

Data Utilized

The datasets chosen for this study were picked because of the breadth of information and the reliability of federal and local government databases. To assess social vulnerability, CDC's *Social Vulnerability Index* dataset (Centers for Disease Control and Prevention, 2018) was chosen. To examine COVID-19 infection positivity rates in Illinois, Illinois Department of

Public Health (2020) *COVID-19 Statistics* dataset was chosen. Lastly, to investigate livability of spaces, AARP's *Livability Index* was chosen (AARP, 2018).

Social vulnerability

"Social vulnerability refers to the resilience of communities when confronted by external stresses on human health, stresses such as natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability may decrease both human suffering and economic loss" (Agency for Toxic Substances and Disease Registry, September 12, 2018, para. 1)**.** It is crucial for many different stakeholders (e.g., researchers, government officials, and local leaders) to understand their areas' social vulnerability so they can respond and prepare properly for disaster.

The *Social Vulnerability Index* (SVI) was developed at CDC by the Agency for Toxic Substances and Disease Registry's Geospatial Research, Analysis, and Services Program (GRASP; Center for Disease Control and Prevention, 2015). The SVI is a free, web-based tool that assists emergency/disaster managers to map and identify communities that may need more support before, during, and after a disaster (Agency for Toxic Substances and Disease Registry, n.d.a).

The CDC's *Social Vulnerability Index* (SVI) dataset (Centers for Disease Control and Prevention, 2018) provides census data for each county within the United States and assesses the level of preparedness for a disaster as of 2018. The data for the SVI is based on the Census Bureau's American Community Survey 2018. The purpose of the SVI is "to help public health officials and emergency response planners identify and map the communities that will most likely need support before, during, and after a hazardous event" (para. 2). Examples of hazardous events include floods, chemical exposure, severe weather, and disease outbreaks. Measuring the

impact and level of preparedness of disease outbreak is particularly important for the context of this study because of the prevalence of the COVID-19 virus.

Previous researchers have examined themes of the SVI and the overall SVI score to test the relationship between social vulnerability and social problems. SVI themes and overall SVI are linked with social problems: namely, teen birth rates, obesity, Lyme disease, and physical inactivity (An, & Xiang, 2015; Gay et al., 2016; Ratnapradipa et al., 2017; Yee et al., 2019).

The SVI ranks U.S. census tracts on 14 social factors aggregated into four themes (Appendix B). The four themes of the SVI are *socioeconomic status, household composition and disability, minority status and language, and housing type and transportation*. These four themes each have several variables measuring the concepts, creating multidimensional scales. Each theme is recorded as a percentile ranking value ranging from 0-1; higher values indicate greater social vulnerability. The current study will utilize all four themes in analyses. The SVI provides scores for each of the four themes as well as an overall score. The overall score is calculated by summing each of the four themes, ordering the tracts based on an established CDC ranking system, and calculating overall percentile rankings (Centers for Disease Control and Prevention, 2018).

Socioeconomic status is calculated based four items; namely, on the percentile rank of individuals below the poverty level, the percentile rank of civilians (age 16+) unemployed, the percentile rank per capita income, and the percentile rank of individuals with no high school diploma (age 25+). Higher values indicate greater socioeconomic status vulnerability.

Household composition and disability is calculated based on four items; namely, the percentile rank of persons aged 65 and older, the percentile rank of persons aged 17 and younger, the percentile rank of civilian noninstitutionalized population with a disability, and the percentile

rank of single parent households with children under 18. Higher values indicate greater household composition and disability vulnerability.

Minority status and language is calculated based on two items; namely, the percentile rank of minority (all persons except White, non-Hispanic) and the percentile rank of persons (age 5+) who speak English "less than well". Higher values indicate greater minority status and language vulnerability.

Housing type and transportation is calculated based on five items; namely, the percentile rank housing in structures with 10 or more units, the percentile rank of mobile homes, the percentile rank households with more people than rooms, the percentile rank of households with no vehicle available, and the percentile rank of persons in institutionalized group quarters. Higher values indicate greater housing type and transportation vulnerability.

When combining counties to create the 11 regions as defined by Governor Pritzker for comparative analyses, SVI component scores and overall scores for each county within a given region will be averaged to represent the region as a whole. However, since SVI scores are calculated by county, Chicago scores cannot be abstracted independent of Cook County scores. For the sake of analyses, when dividing the 11 regions for COVID-19 response, Chicago will share the same SVI component scores and overall score as Cook County.

Illinois COVID-19 statistics

The Illinois Department of Public Health (2020) measures COVID-19 infection positive cases, deaths, total tests performed, and recovery rate in the *COVID-19 Statistics dataset* as of November 5th, 2020. The *COVID-19 Statistics dataset* is aggregate data for each county within Illinois since the onset of the pandemic until November 5th, 2020. Data was cutoff at November

5th, 2020 in order to avoid spikes because of major holidays and prior to the COVID-19 vaccine rollout begun.

COVID-19 infection positivity rate was calculated by the Illinois Department of Public Health (2020) by dividing total tests performed by positive infection cases. COVID-19 infection positivity rate will provide an aggregate infection positivity rate for each county since the pandemic impacted the United States. Infection positivity rate will be recorded for each county in Illinois.

When combining counties to create the 11 regions as defined by Illinois' Governor Pritzker for comparative analyses, the infection positivity rate for each county within a given region will be averaged to represent the region as a whole. The Illinois Department of Public Health (2020) reports Chicago data independent of Cook County data. Therefore, when examining county-level data, Chicago data will be aggregated to Cook County data.

Livability Index

The AARP *Livability Index* is an initiative of the Public Policy Institute measuring the quality of life in U.S. communities (AARP, 2018). The goal of the livability index is to compare communities and help those in leadership in those communities to take measures to make their communities more livable.

One previous study used the AARP *Livability Index* in which the authors found a difference in community health for urban and rural spaces (Zhang, Warner, Wethington, 2020).

This AARP index consists of seven dimensions including: *housing, transportation, environment, neighborhood characteristics, opportunity, health, and engagement* (Public Policy Institute, 2018; Appendix C). The index provides a score for every county, city, and state in the United States ranging from 0 to 100; higher scores indicate greater livability. The overall score is

calculated by averaging seven dimensions of a given location. The current study will utilize all seven dimensions and overall scores in analyses.

Housing includes both affordability and access to housing in any given place. The metrics used to create the housing dimension are calculated based on given items; namely, the number of homes/units with zero-step entrances (e.g., accessible for those with physical disabilities), the number of units that are multi-family homes, housing costs per month, housing affordability (percentage of income spent on housing), and the number of subsidized housing units per 10,000 people.

Transportation includes both safe and convenient transportation options available in a certain location. The metrics used to create the transportation dimension are calculated based on seven items; namely, the total number of buses and trains per hour in both directors for all stops within a quarter-mile, percentage of transit stations and vehicles that are ADA-accessible, the estimated walk trips per household per day, the estimated total hours the average commuter spends in traffic each year, the estimated household transportation costs, the average speed limit on streets and highways, and the annual average number of fatal crashes per 100,000 people.

Environment includes both clean air and water in a given place. The metrics used to create the environment dimension are calculated based on four items; namely, the percentage of the population getting water from public water systems with at least one health-based violation in the last year, the number of days per year when regional air quality is unhealthy for sensitive populations, the percentage of the population living within 200 meters of a high traffic road with more than 25,000 vehicles per day, and the toxicity of airborne chemicals released from nearby industrial facilities.

Neighborhood characteristics include access to life, work, and play in a location. The metrics used to create the neighborhood characteristics dimension are calculated based on nine items; namely, the number of grocery stores and farmer's markets within a half-mile, the number of parks within a half-mile, the number of libraries located within a half-mile, the number of jobs accessible within a 45-minute transit commute, the number of jobs accessible within a 45-minute automobile commute, the variety of jobs within a mile, the combined number of jobs and people per square mile, the combined violent and property crimes per 10,000 people, and the percentage of vacant housing units.

Opportunity includes inclusion and possibilities in a location. The metrics used to create the opportunity dimension are calculated based on four items; namely, the Gini coefficient (the gap between rich and poor), the number of jobs per person in the workforce, the adjusted four-year high school cohort graduation rate, and age-group diversity of the local population compared to the national population.

Health includes prevention, access, and quality in a location. The metrics used to create the health dimension are calculated based on six items; namely, estimated smoking rate, estimated obesity rate, percentage of people who live within a half-mile of parks and within 1 mile of recreational facilities (3 miles for rural areas), the severity of clinician shortage, the number of hospital admissions for conditions that could be effectively treated through outpatient care per 1,000 patients, and the percentage of patients who give area hospitals a rating of 9 or 10 on level of satisfaction.

Engagement includes civic and social involvement in a given place. The metrics used to create the engagement dimension are calculated based on six items; namely, the percentage of residents who have access to three or more wireline internet service providers, the number of

civic, social, religious, political, business organizations per 10,000 people, the percentage of people ages 18 years or older who voted in the last presidential election, the extent to which residents eat dinner with household members, see or hear from friends and family, talk with neighbors, or do favors for neighbors, and the number of performing arts companies, museums, concert venues, sports stadiums, and movie theaters per 10,000 people.

When combining counties to create the 11 regions as defined by Governor Pritzker for comparative analyses, Livability Index dimension scores and overall scores for each county within a given region will be averaged to represent the region as a whole. Livability Index dimension scores and overall score for Chicago were independently collected from Cook County scores.

Statement of Hypotheses and Research Questions

Hypothesis I: Overall, social vulnerability scores predict COVID-19 infection positivity rates.

Hypothesis II: Overall, social vulnerability scores positively predict overall livability scores.

Hypothesis III: Community livability moderates the relationship between overall social vulnerability predicting COVID-19 infection positivity rate, such that social vulnerability is related to COVID-19 infection rates partially because of community livability index themes.

Research Question I: What themes of the SVI will have a relationship with the dimensions of the Livability Index?

Research Question III: Which of the Livability Index dimensions moderates the relationship between overall SVI and COVID-19 infection positivity rates?

Research Question III: Which of the Livability Index dimensions moderates the relationship between overall SVI and COVID-19 infection positivity rates?

Results

For the current study, there are three hypotheses and three research questions. For each hypothesis and research question, two different community-level structures were examined (i.e., county-level and region-level) testing which community-level structure yielded more robust results. The purpose of examining both community-level structures for each hypothesis and research question was to evaluate which structure best represents the data. All analyses were conducted using Statistical Package for the Social Sciences (SPSS) (Version 26.0; IBM Corp, 2019).

Preliminary Analyses

The mean and standard deviation for each of the 11 regions are presented for the three study variables: Social Vulnerability Index, Livability Index, and COVID-19 positive case rate. The Social Vulnerability Index overall and the four themes means and standard deviations for region-level are presented in Table 2 (see below) and the raw scores by county are displayed in Appendix D. Social Vulnerability Index scores range from 0-1, the higher the value that greater a community's social vulnerability. The Livability Index overall and seven dimensions means and standard deviations for region-level are presented in Table 3 and the raw scores by county are displayed in Appendix E. Livability Index scores range from 0-100, the higher the value the greater a community's livability. Lastly, the COVID-19 positive case rate means and standard deviations for region-level are presented in Table 4 and the raw scores by county are displayed in Appendix F. COVID-19 positive case rate ranges from 0-100%, the higher the case rate the more cases of COVID-19 infection in a community.

Table 2.
Means Score on Region-level Social Vulnerability Index across Illinois Counties

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
North		.437 (.27)	.366 (.22)	.490 (.28)	.669 (.21)	.367 (.21)
North-Central		.400 (.34)	.401 (.30)	.481 (.21)	.527 (.31)	.369 (.34)
West-Central		.450 (.28)	.473 (.27)	.476 (.30)	.426 (.29)	.499 (.22)
Metro East		.249 (.21)	.262 (.25)	.127 (.10)	.390 (.26)	.512 (.33)
Southern		.723 (.21)	.746 (.23)	.715 (.24)	.423 (.23)	.625 (.23)
East-Central		.533 (.25)	.547 (.26)	.511 (.31)	.455 (.28	.553 (.23)
South Suburban		.574 (.48)	.431 (.43)	.421 (32)	.921 (.06)	.574 (.45)
West Suburban		.337 (.21)	.183 (.22)	.188 (.21)	.980 (.01)	.406 (.01)
North Suburban		.441 (.01)	.475 (.43)	.525 (.48)	.495 (.69)	.376 (.31)
Suburban Cook		.802	.683	.119	1.00	.871
Chicago		.802	.683	.119	1.00	.871

Note: Values outside the parentheses are means and in parentheses are standard deviation. Chicago scores cannot be abstracted independent of Cook County because Social Vulnerability Index scores are calculated by county. For the overall score and each theme, higher scores indicate greater social vulnerability in that category.

Table 3.
Mean Score on Region-level Livability Index across Illinois Counties

	Livability Index							
		Dimensions						
Region	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
North	49.79 (2.23)	54.89 (2.23)	44.00 (2.92)	49.00 (4.64)	56.44 (8.34)	43.00 (4.39)	53.44 (11.95)	47.89 (7.17)
North-Central	50.78 (2.69)	55.15 (6.34)	43.05 (3.61)	50.10 (4.97)	52.75 (8.16)	42.55 (6.29)	56.30 (13.78)	55.55 (13.45)
West-Central	50.04 (3.45)	57.22 (6.73)	41.39 (4.54)	47.28 (4.10)	58.11 (9.60)	36.67 (8.70)	55.61 (8.17)	54.11 (13.84)
Metro East	49.91 (2.91)	54.71 (4.61)	43.00 (4.44)	43.00 (6.11)	53.86 (8.21)	39.29 (10.61)	56.43 (17.16)	59.00 (10.91)
Southern	47.97 (2.82)	61.10 (4.33)	37.40 (4.82)	47.05 (7.27)	58.85 (8.24)	32.85 (7.46)	59.70 (7.06)	38.95 (11.79)
East-Central	49.11 (3.63)	57.86 (4.54)	40.90 (4.94)	46.67 (7.17)	57.00 (10.72)	36.95 (8.77)	56.33 (9.24)	48.10 (12.02)
South Suburban	51.21 (0.97)	42.00 (12.73)	51.00 (7.07)	50.50 (2.12)	59.50 (0.71)	49.00 (7.07)	45.00 (2.83)	62.00 (7.07)
West Suburban	53.50 (3.71)	35.00 (1.41)	63.00 (5.66)	57.50 (2.12)	52.50 (4.95)	62.00 (11.31)	45.00 (9.90)	59.50 (3.54)
North Suburban	49.88 (2.47)	45.50 (17.68)	48.50 (13.44)	55.50 (4.95)	57.00 (5.66)	42.50 (17.68)	52.00 (8.49)	45.00 (12.73)
Suburban Cook	51.88	46	68	75	45	53	34	42
Chicago	54.00	53	73	87	46	35	35	36

Note: Values outside the parentheses are means and in parentheses are standard deviation. Suburban Cook and Chicago scores are the raw scores because they are the only counties that make up their region. For the overall score and each dimension, higher scores indicate greater livability in that category.

Table 4.
Mean Percent on Region-level Positive Case Rate of COVID-19 across Illinois Counties

Region	COVID-19 Positive Case Rate
North	3.58 (0.66)
North-Central	2.65 (0.56)
West-Central	2.70 (0.68)
Metro East	3.73 (0.94)
Southern	2.83 (1.00)
East-Central	3.09 (0.96)
South Suburban	3.57 (0.48)
West Suburban	3.38 (0.56)
North Suburban	3.03 (0.61)
Suburban Cook	3.84
Chicago	4.11

Note: Values outside the parentheses are means and in parentheses are standard deviation. COVID-19 infection positivity rate was calculated by dividing total tests performed by positive infection cases. Suburban Cook and Chicago scores are raw scores because they are the only locations in the region. Higher scores indicate greater COVID-19 infection rates.

Primary Analyses

Hypothesis I: Overall, social vulnerability scores predict COVID-19 infection positivity rates.

To evaluate the first hypothesis, two *linear regression analyses* were conducted using overall SVI scores as the predictor variables and COVID-19 infection positivity rate as the outcome variable at the county-level and the region-level. The results show that the regression is significant when examining the variables at the county-level, $\beta = 0.006$, $p = 0.027$, but was not significant when examining the variables at the region-level, $\beta = 0.008$, $p = 0.352$. Furthermore, when examining the variables at the county-level, overall SVI scores account for 4.8% of the variance in COVID-19 infection positivity rate, $R^2 = 0.048$.

Hypothesis II: Overall, social vulnerability scores positively predict overall livability scores.

To evaluate the second hypothesis, two *bivariate correlation analyses* examined the relationship between overall SVI scores and overall Livability Index scores at the county-level and region-level. The results show that when examining the variables at the county-level the correlation between overall SVI scores and overall Livability Index scores was significant in a moderately negative direction, $r = -0.355$, $p = 0.000$. However, the results for the region-level analysis were not significant, $r = 0.176$, $p = 0.604$.

Hypothesis III: Community livability moderates the relationship between overall social vulnerability predicting COVID-19 infection positivity rate, such that social vulnerability is related to COVID-19 infection rates partially because of community livability index themes.

To evaluate the third hypothesis, two *moderation analyses* using PROCESS Macro for SPSS (Version 3.0; Hayes, 2012) examined the moderation at both the county-level and region-level. Overall SVI score was the predictor variable, COVID-19 infection positivity rate was the outcome variable, and overall Livability Index scores was the moderator. The moderation results both the county-level analysis, $F(3,99) = 2.04$, $p = 0.113$, and the region-level analysis, $F(3,7) = 2.55$, $p = 0.139$ were not significant.

Research Question I: What themes of the SVI will have a relationship with the dimensions of the Livability Index?

To evaluate the first research question, two *bivariate correlation analyses* explored all four SVI themes (*socioeconomic status, household composition and disability, minority status and language, and housing type and transportation*) and all seven Livability Index dimensions (*housing, transportation, environment, neighborhood characteristics, opportunity, health, and*

engagement) at both the county-level and region-level. Table 5 displays the results for the county-level and Table 6 displays the results for the region-level.

Research Question II: Which themes of the SVI are stronger predictors of COVID-19 infection positivity rate?

To evaluate the second research question, two *stepwise regression analyses* used the four SVI themes (*socioeconomic status, household composition and disability, minority status and language, and housing type and transportation*) as independent variables and COVID-19 infection positivity rate as the dependent variable at both the county-level and region-level. The stepwise regression analysis using county-level data shows that two SVI themes, minority status and language, $\beta = 0.241$, $p = 0.018$, and housing type and transportation, $\beta = 0.226$, $p = 0.026$, are the best predictors of COVID-19 infection positivity rate for a county, $F(2,100) = 9.04$, $p = 0.000$. The stepwise regression using region-level data concluded that only one SVI theme, household composition and disability, $\beta = -0.777$, $p = 0.005$, was the best predictor of COVID-19 positivity infection rate for a region, $F(1, 9) = 13.71$, $p = 0.005$.

Research Question III: Which of the Livability Index dimensions moderates the relationship between overall SVI and COVID-19 infection positivity rates?

To evaluate the third research question, fourteen *moderation analyses* using PROCESS Macro for SPSS (Version 3.0; Hayes, 2012) were explored. For each moderation analysis, the inputs were one of the seven Livability Index themes as the moderator (*housing, transportation, environment, neighborhood characteristics, opportunity, health, and engagement*), overall SVI scores as the predictor variable, and COVID-19 infection positivity rate as the outcome variable. None of the fourteen moderation analyses conducted yielded a significant interaction, at both the county-level and the region-level.

Table 5.

Mean Score and County-level Bivariate Correlation Coefficients for SVI Themes and Livability Dimensions

	Variable	*M* (SD)	1	2	3	4	5	6	7	8	9	10	11
SVI Themes													
	1. Socioeconomic status	.50 (.29)	--										
	2. Household composition	.50 (.29)	.51**	--									
	3. Minority status and language	.50 (.30)	.08	-.20*	--								
	4. Housing type and transportation	.50 (.29)	.61**	.06	.40**	--							
Livability Dimensions													
	5. Housing	56.22 (7.26)	.53**	.46**	-.46**	.26**	--						
	6. Engagement	55.66 (10.96)	-.23*	.18	-.65**	-.50**	.29**	--					
	7. Transportation	48.59 (7.72)	.02	-.13	.46**	.24*	-.27**	-.43**	--				
	8. Environment	56.20 (8.98)	.03	.26**	-.10	.06	.22*	.07	-.10	--			
	9. Neighborhood characteristics	42.49 (7.17)	-.36**	-.48**	.55**	.04	-.71**	-.42**	.59**	-.24*	--		
	10. Health	39.00 (9.32)	-.40**	-.47**	.49**	-.03	-.65**	-.34**	.39**	-.20*	.69**	--	
	11. Opportunity	49.80 (13.43)	-.57**	-.33**	.18	-.16	-.47**	-.11	.05	-.02	.33**	.37**	--

Note: Values outside the paratheses are means and in parentheses are standard deviation. * $p < .05$ ** $p < .01$

Table 6.

Mean Score and Region-level Bivariate Correlation Coefficients for SVI Themes and Livability Dimensions

	Variable	*M* (SD)	1	2	3	4	5	6	7	8	9	10	11
SVI Themes													
	1. Socioeconomic status	.48 (.18)	--										
	2. Household composition	.38 (.21)	.22	--									
	3. Minority status and language	.66 (.26)	.05	-.61*	--								
	4. Housing type and transportation	.55 (.18)	.73*	-.46	.49	--							
Livability Dimensions													
	5. Housing	51.13 (7.94)	.44	.46	-.70*	.07	--						
	6. Engagement	49.89 (8.91)	-.25	.72*	-.92**	-.69*	.57	--					
	7. Transportation	55.33 (13.59)	.46	-.60*	.75**	.74**	-.29	-.90**	--				
	8. Environment	54.27 (4.93)	-.23	.79**	-.61*	-.63*	.22	.77**	- .85**	--			
	9. Neighborhood characteristics	50.29 (12.14)	.15	-.77**	.90**	.62*	-.60	-.97**	.92**	-.83**	--		
	10. Health	44.16 (8.28)	-.39	-.59	.81**	.04	-.94**	-.69*	.45	-.47	.73*	--	
	11. Opportunity	49.83 (8.82)	-.84	-.10	-.07	-.58	-.39	.27	-.58	.38	-.27	.27	--

Note: Values outside the paratheses are means and in parentheses are standard deviation. * $p < .05$ ** $p < .01$

Discussion

The current study examined the relationship between social vulnerability, community livability, and COVID-19 infection positivity rates at two community-level structures, county-level and region-level. More specifically, the present study explored if community livability moderated the relationship between social vulnerability and COVID-19 infection positivity rates.

The first hypothesis expected social vulnerability would predict COVID-19 infection positivity rates. This hypothesis was significant at the county-level, but not at the region-level. Consistent with previous research (e.g., Karaye et al., 2020), the current study found evidence for social vulnerability acting as a positive predictor for COVID-19 infection positivity rates. However, results were significant only at the county-level, not the region-level. The results indicating significance only at the county-level and non-significance at the region-level is evidence of variability in social vulnerability within counties being unidentifiable when counties are collapsed into regions for COVID-19 response. Social vulnerability within counties being unidentifiable when collapsed into regions for COVID-19 response is potentially problematic because if disaster management leaders in Illinois use aggregated social vulnerability statistics to create a strategic response based on COVID-19 infection positivity rates, the leaders may not be properly addressing counties that are vulnerable, yet invisible, when examining statistics at a region-level.

The second research question explored which themes of social vulnerability predicted COVID-19 infection positivity rates and yielded different significant results based on the community-level structure examined. Previous research by Lara-Garcia and colleagues (2020) found that various factors related to the household composition and disability theme, minority status and language theme, and the housing type and transportation theme served as risk factors against COVID-19 positivity rates in Illinois; while other factors within the household

composition and disability theme, socioeconomic status, and housing type and transportation themes were protective factors. For the present study, when analyzing social vulnerability themes at the county-level, there were two social vulnerability themes that positivity predicted COVID-19 positivity infection rates: minority status and language and housing type and transportation. Minority status and language positively predicting COVID-19 positivity infection rates is consistent with previous literature that identified various race/ethnicity minority groups to be at greater risk of COVID-19 infection because of systemic inequity (Gil et al., 2020; Hathaway, 2020; Louis-Jean et al., 2020; Yan et al., 2020; Kim & Bostwick, 2020). Results indicating housing type and transportation as a positive predictor of COVID-19 disaster impacts is consistent with previous research that identified overcrowded homes significantly predicted COVID-19 mortality rates (Ahmed et al., 2020). Additionally, Dasgupta and colleagues (2020) found that U.S. counties that are socially vulnerable in terms of housing type and transportation were more likely to be identified as a COVID-19 hotspot.

When analyzing social vulnerability themes at the region-level, there was only one social vulnerability theme that negatively predicted COVID-19 positivity infection rates: household composition and disability. The present study's result that found household composition and disability to be a negative predictor of COVID-19 positivity infection rates is inconsistent with previous research that identified older adults and those with disability or medical conditions to be the population at greatest risk of dying from COVID-19 (Center for Disease Control and Prevention, 2020i; Le Couteur et al., 2020; Srinivasa Rao, et al., 2020). Potentially, older adults and those with disability or medical conditions understand the risk of infection and mortality related to COVID-19 and participate in rigid social distancing and masking practices. Results from the second research question are partially consistent with Lara-Garcia and colleagues

(2020) findings because results from the present study indicate that a protective factor for COVID-19 infection positivity rates may be factors related to the household composition and disability theme when viewing results at the region-level; while a risk factor may be other factors associated with the minority status and language theme and the housing type and transportation theme. Lastly, the different significant predictors of COVID-19 positivity infection rates based on community-level structures poses an additional question as to what potential factors contribute to a community's vulnerability may be contingent on what community-level structure leaders or researchers are examining. Disaster management leaders may take these protective and risk factor results into consideration when creating strategic COVID-19 response for communities, while taking into consideration the community-level structure the response is created for.

The second hypothesis expected social vulnerability to have a relationship with community livability. This hypothesis was significant at the county-level, but not the region-level. The result for the second hypothesis indicated social vulnerability has a negative relationship with community livability at the county-level, but not at the region-level. While the relationship between community livability and social vulnerability has yet to be explored previously, previous research has identified community factors that may buffer a community's social vulnerability; including, resident relationships, cooperation, and collective action (Lixin et al., 2017). The present study adds novel empirical findings to the literature because previous research has yet to link social vulnerability to community livability.

To further explore the relationship between social vulnerability and community livability, the first research question examined the relationship between social vulnerability themes and livability dimensions at the two community-level structures. Examining the relationship between

social vulnerability themes and community livability dimensions yielded different results based on community-level structure; however, there were some relationship commonalities between the two community-level structure results. In both community-level structure analyses (county-level and region-level) the social vulnerability theme household composition and disability was positivity related to the community livability dimension, environment, while the theme was negatively related to neighborhood characteristics. Consistent with the present study results which found social vulnerability to be positively related to the community livability dimension environment, previous research found that areas with high levels of social vulnerability are typically also at risk of climate hazards (e.g., hurricane, flooding, tornado, etc.; Adger et al., 2004; Rygel et al., 2006; Wu et al., 2002). A community with positive neighborhood characteristics (e.g., low crime rate and compact neighborhoods) is associated with lower social vulnerability for a community in the present study. Compact neighborhoods are communities that provide residents with easy access to necessary services (e.g., hospitals, doctors officers, grocery stores, jobs, etc.). Previous research identified that in time of disaster access to important resource, such as medical care, is crucial for disaster management and response, especially for vulnerable populations (Mace & Doyle, 2017).

Additionally, at both community-level structures (county-level and region-level) the social vulnerability theme minority status and language was negatively related to the community livability dimensions housing and engagement, and was positively related to transportation, neighborhood characteristics, and health. The United States' history and ongoing issue of systemic racism creates housing barriers for many racial and ethnic minority residents (Denton, 2006). The present study result that found that the greater percentage of minority residents and residents that speak English "less than well" within a community is related to unaffordability of

housing within communities; this result is likely a result of systemic racism and oppression of minority groups and discrimination against residents that do not speak English well. Previous research identified that ethnic minority and migrant groups are no less active in their communities than majority groups; however, the type of activity that minority groups participate in to be active may be different (Pachi & Barrett, 2012). Zani and Barrett (2012) detail some potential reasons that may systemically prevent minority groups from participating in political life and institutions, including election rules either making voting for minorities more difficult or denying them the right completely. The present study results also found that the greater percentage of minority residents and residents that speak English "less than well" was associated with more forms of public transportation, a more compact neighborhood with accessible resources and opportunities, quality and accessible resources for health prevention and promotion. Minority residents in the United States are more likely to live in urban areas (United States Department of Agriculture, 2020) and urban communities more likely have various forms of public transportation. However, while the present study results may imply that the more minority residents in a community the greater forms of public transportation, it is important to recognize that research has identified inequity of public transportation for minority residents in urban areas (Stacey et al., 2020). Similarly, as previously stated, minorities living in the United States are more likely to live in urban areas, which provides reasoning as to why there is a positive relationship between minority status and language and neighborhood characteristics; because urban areas are naturally more compact and have greater accessibility to resources and opportunity than rural areas (Burton, 2000). Finally, urban areas, where many minority residents reside, are also more likely to have better health promotion and prevention community-wide given the access to resources (World Health Organization, n.d.).

Lastly, at both community-level structures, the social vulnerability theme housing type and transportation was negatively related to the community livability dimension engagement, but positively related to transportation. The present study found that the more vulnerable a community is in terms of housing and transportation, the less likely residents are engaged socially and civically in their community. These results are consistent with previous research by Richard and colleagues (2009) who identified the importance of user-friendly transportation services, and the influence inaccessible transportation has on lower rates of social participation within communities. Interestingly, the present study identified inconsistency between the social vulnerability theme housing type and transportation and the community livability dimension transportation; such that the more vulnerable a community is in terms of housing type and transportation the more livable that community for transportation. A potential reason for this inconsistent result may be because of the different forms of measurement for the two indices used, the Social Vulnerability Index and the Community Livability Index. For example, a factor that contributes to a community's social vulnerability for housing type and transportation is the percentile rank of households with no vehicle available and the percentile rank of housing in structures with 10 or more units. However, the Community Livability index identified a livable community in terms of transportation to be one that includes accessible and affordable transportation. As previously mentioned, urban areas are more likely to have public transportation and be more compact (Burton, 2000; United States Department of Agriculture, 2020); which provides reasoning as to why there are inconsistency between the two indices in terms of housing and transportation measures.

There were no common community-level structure relationships found for the social vulnerability theme socioeconomic status and community livability dimensions. These results

indicate that certain policy action or community change, regardless of at which community-level structure, may impact a community's social vulnerability to disasters. The present study adds novel empirical findings to the literature because previous research has yet to link social vulnerability themes to community livability dimensions.

Previous research identified potential disaster impact buffers in communities including community resilience, informal community socializing, and community social capital (Hikichi et al., 2020; Masson et al., 2019). To date, previous research has yet to identify a community variable that may buffer the impact of social vulnerability on COVID-19 disaster impacts. The present study is the first to examine if community livability moderates the relationship between social vulnerability and disaster impact. Hypothesis III examined community livability as a moderator for social vulnerability and COVID-19 infection positivity rate. Results for the third hypothesis were non-significant at both community-level structures. To further explore community livability as a moderator for social vulnerability and COVID-19 infection positivity rates, the third research question examined all community livability dimensions as potential moderators for social vulnerability and COVID-19 infection positivity rates. All analyses examining community livability dimensions as a moderator for social vulnerability and COVID-19 infection rates at both community-level structures were non-significant. Regardless of which community-level structure you examine for Illinois, community livability does not buffer the impact of a community's social vulnerability for COVID-19 positivity infection rates.

A potential reason community livability does not moderate the relationship between social vulnerability and the disaster impact of the COVID-19 pandemic, as measured as positivity infection rate, may be because community livability and social vulnerability are so closely related. As observed in the results for the second hypothesis and the first research

question, there are various factors for both variables (social vulnerability and community livability) that are closely related. Changes associated with social vulnerability are associated with changes in community livability scores, so the two variables are potentially too closely related for community livability to buffer the relationship between social vulnerability and disaster impacts.

While the present study did not identify community livability as a moderator for social vulnerability and COVID-19 infection rates, the study results provide further validation for previous research and contribute to the literature on disaster vulnerability in a variety of ways. The results from the present study contribute to the literature on community disaster vulnerability and factors associated with social vulnerability in the context of COVID-19. Consistent with previous research (e.g., Karaye et al., 2020), the present study found social vulnerability positively predicts COVID-19 infection rates; however, there are different findings when examining data at different community-level structures, county-level and region-level. As previous stated, previous research has yet to link community livability to disaster vulnerability. Results from the present study provide empirical findings relating community livability to social vulnerability, overall and when comparing community livability dimensions and social vulnerability themes.

Limitations of the Present Study

The current study is not without limitations. The study focused on a single state, Illinois; therefore, results may not be consistent if the same study was conducted for other states. Additionally, Chicago is the largest city in Illinois and for two of the variables examined, social vulnerability and COVID-19 positivity infection rates, the data for Chicago could not be independently extracted from Cook County data. This provides a limitation because relationships

between variables may be different if independent Chicago data was available given the unique context of the city. Furthermore, all variables were collected from archival datasets online and two of the datasets, the Social Vulnerability Index and Community Livability Index, were data collected from 2018. While these indices are intended to be measures that do not change rapidly overtime, any community-level changes that were made to improve social vulnerability and/or community livability before the onset of the COVID-19 pandemic were not evident in the results of the study. Additionally, given the nature of the Social Vulnerability Index and measures of COVID-19 infection positivity rates, certain populations may be less represented in the data. Tate (2011) found that indices for social vulnerability may frequently exclude undocumented immigrants and homeless people. Moreover, research identified that undocumented migrants are less likely to report COVID-19 symptoms or seek medical care for fear of retaliation and/or deportation (Page et al., 2020).

This study also had theoretical limitations. First, the current study did not include other community-level variables that may have impacted COVID-19 positivity infection rate in addition to social vulnerability and community livability. There are likely other variables that impact a community's COVID-19 disaster impact that were not included in either the Social Vulnerability Index or the Community Livability Index.

Secondly, the present study analyzes data at two community-level structures, county-level and region-level. Given the nature of the regions created for Illinois' COVID-19 response, county-level data is nested within region-level data. Nested data may be a limitation because statistical dependency may occur (O'Dwyer & Parker, 2014). Statistical dependency is problematic because it may result in incorrect statistical conclusions.

Additionally, the present study does not account for community differences in terms of rural/urban community categorization. In Illinois, 19 counties are classified as urban, with the remaining 83 counties classified as rural (Illinois Primary Health Care Association, 2020). Not accounting for rural/urban community differences in this study is a limitation because previous research identified that rural and urban communities' disaster management needs are different (Kapucu et al., 2013). Furthermore, Javadinejad and colleagues (2019) identified that factors contributing to community resilience after a disaster are different for rural and urban communities.

Lastly, the COVID-19 pandemic is an ongoing issue globally. The study results related to COVID-19 infection rates are limited because they only include data from March 2020 to November 5th, 2020. While there was reasoning as to why November 5th, 2020 was chosen as a cutoff for data utilization (e.g., major holidays and vaccination rollout), the data still does not offer a full picture of the pandemic and its impact on communities.

Implications for Community Psychology

Community psychologists are frequently concerned with community disaster impacts (Campbell & Murray, 2004; Goodman et al., 2014; Lewis et al., 2011; Paton & Johnson, 2001; Sarason & Lorentz, 1979). The current study assessed how community-level variables, social vulnerability and community livability, on a disaster (i.e., COVID-19 pandemic) and its impact on communities (i.e., infection positivity rates). Findings showed that community livability is related to social vulnerability and that social vulnerability is related to disaster impacts, as measured as COVID-19 infection positivity rates at the county-level. Therefore, potential community changes that aim to increase a community's livability may positively impact a community's social vulnerability and decrease the potential for disaster impact. The best way to

effectively protect communities from future disaster is to focus on preventative, second-order change. Community psychologists interested in creating second-order change to protect the communities they serve from disasters may choose to focus on community research and change to increase community livability.

Many community psychologists are interested in creating communities that are equitable, sustainable, and promote wellness for all residents (Goodman et al., 2017; Hoffman, 2020; Toolis, 2017; Wolfe, 2014). Community livability is intended to create community structures and spaces that are livable for residents of all ages and abilities. The present study supports the notion that when government officials and local leaders create change that positively impacts community livability, they are simultaneously supporting residents that are typically vulnerable to disasters (e.g., children, older adults, and residents with disabilities) in a variety of ways. Therefore, policy action and community change that is intended to increase a community's livability will also decrease the community's social vulnerability to disaster. However, this finding is only supported at the county-level. Local community action to change community livability will likely not change a regions social vulnerability, which may be why the analysis was not supported at the region-level. Community psychologists frequently work with various stakeholders, including government officials to create change (Nelson, 2013). Community psychologists may work with local government officials and disaster leaders to encourage and implement local policy or community changes that may decrease a community's social vulnerability, and in turn, increase community livability.

Future Directions

The results from the present study have implications for research and disaster management. Some implications for research include the potential to examine more community-

level characteristics in terms of disaster vulnerability, management, and resilience. Study findings may also inform disaster management leaders about the consequences of aggregating counties for disaster response and the potential need for different strategic action to help vulnerable communities in times of disasters.

Research. Future research on disaster impacts and community characteristics related to disaster impact is necessary and beneficial. The current study assessed COVID-19 positivity infection rates; however, future researchers should investigate both retrospective disaster impacts and community impacts directly following a disaster to learn community characteristics that may have contributed to negative impacts and be prepared to analyze future disaster impacts for communities. Previous researchers examined disaster impacts for communities directly following the impact of disaster (Brodie et al., 2006; Ginexi et al., 2000; Martin et al., 2006) and retrospectively (Phillips et al., 2010); however, more research is necessary fully understand what community characteristics influence negative disaster impacts. A potential future direction for research to understand what impacts a community's disaster vulnerability may be to examine characteristics of communities greatly impacted by previous disasters to record common community characteristics. Additionally, research should consider examining the different types of community characteristics that are related to certain types of disasters (e.g., pandemics, tornados, earthquakes, etc.) and the impact the disaster had on different communities. In addition to exploring community characteristics related to social vulnerability, researchers should also consider exploring disaster management and resilience to determine best practices for addressing disasters within vulnerable communities. Researchers may be key in helping leaders understand the vulnerability of communities to certain disasters so the proper, equitable response may be created and implemented in times of disaster.

Disaster Management and Government Officials. Disaster management leaders and government officials may consider the findings from this study and make informed change to future disaster responses. When disaster strikes, disaster response and resource allocation is important; however, equity in resource allocation and disaster response is arguably the most important role of disaster managers (YourABA, 2020). The current study provides empirical findings indicating the different relationships examined between social vulnerability and disaster impact, as measured by COVID-19 positivity infection rates, that are present depending on the community-level structure examined. In the state that the data was analyzed, Illinois, disaster management leaders created regions for response (Restore Illinois, n.d.). The results from this study show that it may not be beneficial to create regions for disaster response based on geographic regions, as Illinois did for the COVID-19 pandemic, because aggregating counties into geographic-based regions makes venerable counties potentially unidentifiable and therefore left without equitable disaster response. A better strategy for disaster management leaders to follow may be to create regions or groups of counties for response based on need, rather than geographic placement. Disaster management leaders and government officials should evaluate the social vulnerability of communities they serve to understand vulnerable communities; therefore, resource allocation and disaster response is equitable to communities most in need. Additionally, after disaster strikes if disaster management leaders and government officials seek to create regions for response, they should consider implementing a tier-based approach based on communities needs when creating regions for disaster response.

Conclusion

The COVID-19 pandemic continues to impact communities globally despite the development of vaccinations. The present study details that importance of considering a

community's social vulnerability and livability as factors related to a community's COVID-19 positivity rates. Additionally, the present study offers empirical data that represents limitations to create geographic-based regions for disaster response. It is crucial that researchers, community leaders, government officials, and disaster management leaders identify which community-level factors contribute to COVID-19 positivity infection rate to create equitable disaster response.

References

AARP. (n.d.a). Environment: Protecting our natural resources. https://www.aarp.org/livable-communities/livable-in-action/info-2016/where-we-live-environment.html

AARP. (n.d.b). AARP Livability Index: Livability defined. https://livabilityindex.aarp.org/livability-defined

AARP. (2018). AARP *Livability Index.* https://www.aarp.org/ppi/issues/livable-communities/info-2015/livability-index.html

AARP Policy Book. (2019-2020). https://policybook.aarp.org

Adger, W. N., Brooks, N. G., Bentham, M. A., & Eriksen, S. (2004). New indicators of vulnerability and adaptive capacity. Tyndall Centre for Climate Change Research. http://www.tyndall.ac.uk/theme3/final_reports/it1_11.pdf

Agency for Toxic Substances and Disease Registry. (n.d.a). CDC'S social vulnerability index (SVI). https://svi.cdc.gov/Documents/FactSheet/SVIFactSheet.pdf

Agency for Toxic Substances and Disease Registry. (n.d.b). CDC SVI Documentation 2018. https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/SVI_documentation_2018.html

Agency for Toxic Substances and Disease Registry. (September 12, 2018). CDC'S social vulnerability index (SVI). https://svi.cdc.gov

Ahmad, K., Erquo, S., Shah, N., Nazir, U., Morrison, A. R., Choudhary, G., & Wen-Chih, W. (2020). Associations of poor housing conditions with COVID-19 incidence and mortality across US counties. *PLoS ONE, 15*(11): e0241327. https://doi.org/10.1371/journal.pone.0241327

Alexander, D. (2011). Disability and disaster. https://www.researchgate.net/profile/Ben_Wisner/publication/285004501_Disability_and_disaster/links/57031ef708ae646a9da87ecc/Disability-and-disaster.pdf

American Journal of Managed Care. (last visited November 25, 2020). A timeline of COVID-19 developments in 2020. *American Journal of Managed Care*. https://www.ajmc.com/view/a-timeline-of-covid19-developments-in-2020

Andrews, E. E., Ayers, K. E., Brown, K. S., Dunn, D. S., & Pilarski, C. D. (2020). No body is expendable: Medical rationing and disability justice during the COVID-19 pandemic. *American Psychologist.* http://dx.doi.org/10.1037/amp0000709

Astroza, S., Tirachini, A., Hurtubia, R., Carrasco, J. A., Guevara, A., Munizaga, M., Figueroa, M., & Torres, V. (2020). Mobility changes, teleworking, and remote communication during the COVID-19 pandemic in Chile. *Transport Findings*. https://findingspress.org/article/13489-mobility-changes-teleworking-and-remote-communication-during-the-covid-19-pandemic-in-chile

Aubry, T., Duhoux, A., Klodawsky, F., Ecker, J., & Hay, E. (2016). A longitudinal study of predictors of housing stability, housing quality, and mental health functioning among single homeless individuals staying in emergency shelters. *American Journal of Community Psychology, 58*(1-2), 123-135. http://dx.doi.org.ezproxy.depaul.edu/10.1002/ajcp.12067

Barret, C. B. & Carter, M. R. (2013). The economics of poverty traps and persistent poverty: Empirical and policy implications. *Journal of Development Studies, 49*(7), 976-990.

Balcazar, F. E., & Suarez-Balcazar, Y. (2016). On becoming scholars and activists for disability rights. *American Journal of Community Psychology, 58*, 251-258. doi: 10.1002/ajcp.12064

Benfer, E., Robinson, D. B., Butler, S., Edmonds, L., Gilman, S., McKay, K. L., Neumann, Z., Ownes, L., Steinkamp, N., & Yentel, D. (2020). The COVID-19 eviction crisis: An estimated 30-40 million people in America are at risk. https://www.aspeninstitute.org/blog-posts/the-covid-19-eviction-crisis-an-estimated-30-40-million-people-in-america-are-at-risk/

Bergstrand, K., Mayer, B., Brumback, B., & Zhang, Y. (2015). Assessing the relationship between social vulnerability and community resilience to hazards. *Social Indicators Research, 122*, 391-409. doi: 10.1007/s11205-014-0698-3

Berman, R. (August 2, 2020). COVID-19 and the surge in anti-Asian hate crimes. *Medical News Today*. https://www.medicalnewstoday.com/articles/covid-19-and-the-surge-in-anti-asian-hate-crimes

Berstein, J., Richter, A. W., & Throckmorton, N. A. (April 16, 2020). COVID-19: A view from the labor market. *Federal Reserve Bank of Dallas*. https://doi.org/10.24149/wp2010

Bonds, M. H., Donald, C. K., Pejman, R., & Jeffrey, D. S. (2010). Poverty trap formed by the ecology of infectious diseases. *Proceedings of the Royal Society B: Biological Sciences, 277*(1685), 1185-1192.

Brodhead, A. (April 14, 2020). Meet the Stanford researchers mobilizing to understand, fight COVID-19. https://news.stanford.edu/2020/04/14/covid-19-research-roundup/

Brodie, M., Weltzian, E., Altman, D., Blendon, R. J., & Benson, J. M. (2006). Experiences of Hurricane Katrina evacuees in Houston shelters: Implications for future planning. *American Journal of Public Health, 96*(8), 1402-1408.

Burton, E. (2000). The compact city: Just or just compact? A preliminary analysis. *Urban Studies, 37*(11), 1969-2001.

Campbell, C., & Murray, M. (2004). Community health psychology: Promoting analysis and action for social change. *Journal of Health Psychology, 9*(2), 187-195. doi: 10.1177/1359105304040886

Census Reporter. (2018). Chicago, IL. https://censusreporter.org/profiles/16000US1714000-chicago-il/

Centers for Disease Control and Prevention. (2015). Planning for an emergency: Strategies for identifying and engaging at-risk groups. https://www.cdc.gov/nceh/hsb/disaster/atriskguidance.pdf

Centers for Disease Control and Prevention. (2018). Agency for Toxic Substances and Disease Registry/ Geospatial Research, Analysis, and Services Program. *Social Vulnerability Index Database US*. https://data-and-tools-download.html

Center for Disease Control and Prevention. (2021). Percent of delivered first vaccine doses administered by U.S. states and territories. Website visited on June 15, 2021. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/distributing/first-doses.html

Center for Disease Control and Prevention. (2020a). United States COVID-19 cases and deaths by state. https://covid.cdc.gov/covid-data-tracker/?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fcases-updates%2Fcases-in-us.html#cases_casesper100klast7days

Centers for Disease Control and Prevention. (November 17, 2020b). Social Distancing. Retrieved from https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html

Center for Disease Control and Prevention. (November 27, 2020c). How to protect yourself & others. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html

Center for Disease Control and Prevention. (September 11, 2020d). Older adults. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html

Center for Disease Control and Prevention. (February 12-March 16, 2020e). Severe outcomes among patients with coronavirus disease 2019 (COVID-19) – United States. https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e2.htm?s_cid=mm6912e2_w#suggestedcitation

Center for Disease Control and Prevention. (July 24, 2020f). Health equity considerations & racial & ethnic minority groups. https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html

Center for Disease Control and Prevention. (September 15, 2020g). Healthcare workers managing visitors. https://www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/hcf-visitors.html

Center for Disease Control and Prevention. (September 16, 2020h). Disability impacts all of us. https://www.cdc.gov/ncbddd/disabilityandhealth/infographic-disability-impacts-all.html

Center for Disease Control and Prevention. (September 11, 2020i). People with disabilities. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-disabilities.html

Center for Disease Control and Prevention. (November 2, 2020j). Scientific evidence for conditions that increase risk of severe illness. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/evidence-table.html

Center for Disease Control and Prevention. (September 4, 2020k). Temporary halt in residential evictions to prevent further spread of COVID-19. https://www.federalregister.gov/documents/2020/09/04/2020-19654/temporary-halt-in-residential-evictions-to-prevent-the-further-spread-of-covid-19

Chawla, R., Sharma, R. K., Madaan, D., Dubey, N., Arora, R., Goel, R., Singh, S., Kaushik, V., Singh, P. K., Chabbra, V., & Bhardwai, J. R. (2009). Mitigation approaches to combat the flu pandemic. *Journal of Global Infectious Diseases, 1*(2), 117-130. https://doi.org/10.4103/0974-777X.56258

Chen, T., Wu, D., Chen, H., Yan, W., Yang, D., Chen, G., Ma, K., Xu, D., Yu, H., Wang, H., Wang, T., Guo, W., Chen, J., Ding, C., Zhang, X., Huang, J., Han, M., Li, S., Luo, X., Zhao, J., & Ning, Q. (2020). Clinical characteristics of 113 deceased patients with coronavirus disease 2019: Retrospective study. *British Medical Association, 368*, https://doi.org/10.1136/bmj.m1091

City of Chicago. (n.d.). COVID Dashboard. Accessed November 30th, 2020. https://www.chicago.gov/city/en/sites/covid-19/home/covid-dashboard.html

Couch, S. R., Coles, C. D. (2010). Community stress, psychosocial hazards, and EPA decision-making in communities impacted by chronic technological disasters. *Environmental Justice, 101*(1), 140-150.

Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social Science Quarterly, 84*(2), 242-261.

Czeisler, M. E., Tynan, M. A., Howard, M. E., Honeycutt, S., Fulmer, E. B., Kidder, D. P., Robbins, R., Barger, L. K., Facer-Childs, E. R., Baldwin, G., Rajaratnam, S. M. W., & Czeisler, C. A. (2020). Public attitudes, behaviors, and beliefs related to COVID-19, stay-at-home orders, nonessential business closures, and public health guidance – United States, New York, and Los Angeles, May 5-12, 2020. *MMWR. Morbidity and mortality weekly report, 69*(24), 751–758. https://doi.org/10.15585/mmwr.mm6924e1

Dang, H. H., Huynh, T. D., & Nguyen, M. (2020). Does the COVID-19 pandemic disproportionate affect the poor? Evidence from a six-country survey. *Institute of Labor Economics.* http://ftp.iza.org/dp13352.pdf

Dasgupta, S., Bowen, V. B., Leidner, A., Fletcher, K., Musial, T., Rose, C., Cha, A., Kang, G., Dirlikov, E., Pevzner, E., Rose, D., Ritchey, M. D., Villanueva, J., Philip, C., Liburd, L., & Oster, A. M. (October 23, 2020). Association between social vulnerability and a county's risk for becoming a COVID-19 hotspot – United States, June 1-July 25, 2020. *Morbidity and Mortality Weekly Report.* https://www.cdc.gov/mmwr/volumes/69/wr/pdfs/mm6942a3-H.pdf

Davidson, T. M., Price, M., McCauley, J. L., & Ruggiero, K. J. (2013). Disaster impact across cultural groups: Comparison of Whites, African Americans, and Latinos. *American Journal of Community Psychology, 52*, 97-105. doi: 10.1007/s10464-013-9579-1

Dean, J. H., & Bush, R. A. (2007). A community psychology view of environmental organization processes. *American Journal of Community Psychology, 40*, 146-166. doi: 10.1007/s10464-007-9123-2

DeLaski-Smith, D. L. (1984). Housing the elderly: Intergenerational family settings *Journal of Housing for the Elderly, 2*(3), 61-70. http://dx.doi.org.ezproxy.depaul.edu/10.1300/J081V02N03_07

Denton, N. (2006). Segregation and Discrimination in Housing. In *A Right to Housing Foundation for a New Social Agenda*. Philadelphia: Temple University Press, 61-81.

Dorn, E., Hancock, B., Sarakatsannis, J., & Viruleg, E. (June 2020). COVID-19 and student learning in the United States: The hurt could last a lifetime. https://webtest.childrensinstitute.net/sites/default/files/documents/COVID-19-and-student-learning-in-the-United-States_FINAL.pdf

Douglas, J. A., Grills, C. T., Villanueva, S., & Subica, A. M. (2016). Empowerment praxis: Community organizing to redress systemic health disparities. *American Journal of Community Psychology, 58*, 488-498. doi: 10.1002/ajcp.12101

Dwyer, A., Zoppou, C., Nielsen, O., Day, S., & Roberts, S. (2004). Quantifying social vulnerability: A methodology for identifying those at risk to natural hazards. *Geoscience Australia Record, 14*.

Ecker, J., & Aubry, T. (2016). Individual, housing, and neighborhood predictors of psychological integration among vulnerably housed and homeless individuals. *American Journal of Community Psychology, 58*, 111-122. doi: 10.1002/ajcp.12066

Ellen, I. G., & Turner, M. A. (1997). Does neighborhood matter? Assessing recent evidence. *Housing Policy Debate, 8,* 833-866.

Ellen, I. G., Dillman, K., & Mijanovich, T. (2001). Neighborhood effects on health: Exploring the links and assessing the evidence. *Journal of Urban Affairs, 23*, 391-408.

Federal Emergency Management Agency. (July 7, 2020a). Individuals and communities. https://www.fema.gov/emergency-managers/individuals-communities

Federal Emergency Management Agency. (July 24, 2020). FEMA'S natural disaster preparedness and response efforts during the coronavirus pandemic. https://www.fema.gov/fact-sheet/femas-natural-disaster-preparedness-and-response-efforts-during-coronavirus-pandemic

FHI 360. (n.d.). Secondary impacts of the COVID-19 pandemic in the United States. https://www.fhi360.org/sites/default/files/media/documents/resource-us-programs-secondary-impacts-covid-19.pdf

Fitzpatrick, K., & LaGory, M. (2000). *Unhealthy places: The ecology of risk in the urban landscape.* New York: Routledge.

Flanagan, B. E., Gregory, E. W., Hallisey, E. J., Heitgerd, J. L., & Lewis, B. (2011). A social vulnerability index for disaster management. *Journal of Homeland Security and Emergency Management, 8*(1), 1-22. doi: 10.2202/1547-7355.1792

Flournoy, R., & Yen, I. (2004). The influence of community factors on health: An annotated bibliography. *Policy Link.* https://www.policylink.org/sites/default/files/ANNOTATEDBIBLIOGRAPHY_FINAL.PDF

Freeman, S., & Eykelbosh, A. (April 14, 2020). COVID-19 and outdoor safety: Considerations for use of outdoor recreational spaces. *National Collaborating Centre for Environmental Health,* 1-15. https://ncceh.ca/sites/default/files/COVID-19%20Outdoor%20Safety%20-%20April%2016%202020.pdf

Garbe, A., Ogurlu, U., Logan, N., & Cook, P. (2020). COVID-19 and remote learning: Experiences of parents with children during the pandemic. *American Journal of Qualitative Research, 4*(3), 45-65. https://doi.org/10.29333/ajqr/8471

García-Ramírez, M., Balcázar, F., & de Freitas, C. Community psychology contributions to the study of social inequalities, well-being and social justice. *Psychosocial Intervention, 23*, 79-81. http://dx.doi.org/10.1016/j.psi.2014.07.009

Gay, J. L., Rob, S. W., Benson, K. M., & White, A. (2016). Can the social vulnerability index be used for more than emergency preparedness? An examination using youth physical fitness data. *Journal of Physical Activity & Health, 13*(2), 121-130.

Gil, R. M., Marcelin, J. R., Zuniga-Blanco, B., Marquez, C., Mathew, T., & Piggott, D. A. (2020). COVID-19 pandemic: Disparate health impact on the Hispanic/Latinx population in the United States. *The Journal of Infectious Diseases, 222*(10), 1592-1595. https://doi.org/10.1093/infdis/jiaa474

Gilmore, L. & Cuskelly, M. (2014). Vulnerability to loneliness in people with intellectual disability: An explanatory model. *Journal of Policy and Practice in Intellectual Disabilities, 11*(3), 192-199. doi: 10.1111/jppi.12089

Ginexi, E. M., Weihs, K., Simmens, S. J., & Hoyt, D. R. (2000). Natural disaster and depression: A prospective investigation of reactions to the 1993 Midwest floods. *American Journal of Community Psychology, 28*(4), 495-518.

Gonzalez-Barrera, A. & Lopez, M. H. (August 13, 2013). Spanish is the most spoken non-English language in U.S. homes, even among non-Hispanics. https://www.pewresearch.org/fact-tank/2013/08/13/spanish-is-the-most-spoken-non-english-language-in-u-s-homes-even-among-non-hispanics/

Goodfellow, T. (February 20, 2015). Social justice as access to affordable housing: Urbanisation and 'real estatisation in the global South. http://siid.group.shef.ac.uk/blog/social-justice-access-affordable-housing/

Goodman, M. S., Sanders Thompson, V. L., Johnson, C. A., Gennarelli, R., Drake, B. F., Bajwa, P., Witherspoon, M., & Bowen, D. (2017). Evaluating community engagement in research: Quantitative measure development. *Journal of Community Psychology, 45*(1), 17-32. doi: 10.1002/jcop.21828

Goodman, R. D., Calderon, A. M., & Tate, K. A. (2014). Liberation-focused community outreach: A qualitative exploration of peer group supervision during disaster response. *Journal of Community Psychology, 42*(2), 228-236. doi: 10.1002/jcop.21606

Graham, B. C., Keys, C. B., & McMahon, S. D. (2014). Transportation and socioemotional well-being of urban students with and without disabilities. *Journal of Prevention & Intervention in the Community, 42*(1), 31-44. http://dx.doi.org.ezproxy.depaul.edu/10.1080/10852352.2014.855056

Halfon, N., & Hochstein, M. (2002). Life course health development: An integrated framework for developing health policy and research. *Millbank Quarterly, 80,* 433-479.

Hatcher, W. (2020). A failure of political communication not a failure of bureaucracy: The danger of presidential misinformation during the COVID-19 pandemic. *The American Review of Public Administration, 50*(6-7), 614-620. doi: 10.1177/0275074020941734

Hathaway, E. D. (2020). American Indian and Alaska Natve People: Social vulnerability and COVID-19. *The Journal of Rural Health,* 1-4. doi: 10.1111/jrh.12505

Harrell, R., Lynott, J., & Guzman, S. (April 2014). Is this a good place to live? Measuring community quality of life for all ages.

https://www.aarp.org/content/dam/aarp/research/public_policy_institute/liv_com/2014/is-this-a-good-place-to-live-report-AARP-ppi-liv-com.pdf

Harris, C., Ahsan, S., Graber, R., Drury, J., Ziotowitz, S., Wilson, S., Hunter, C., Northrop, S., Kagan, C., Douglas, A., Morley, R., & Walker, C. (2020). The importance of community action and community resilience in the response to Covid-19: What role for psychology? *The British Psychological Society, BRE40c*. https://www.bps.org.uk/sites/www.bps.org.uk/files/Policy/Policy%20-%20Files/Community%20action%20and%20resilience%20in%20response%20to%20Covid-19.pdf

Hayes, A. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling 1. http://www.afhayes.com/public/process2012.pdf

Heinze, J. E., Krusky-Morey, A., Vagi, K. J., Reischl, T. M., Franzen, S., Pruett, N. K., Cunningham, R. M., & Zimmerman, M. A. (2018). Busy streets theory: The effects of community-engaged greening on violence. *American Journal of Community Psychology, 62*, 101-109. doi: 10.1002/ajcp.12270

Hikichi, H., Aida, J., Matsuyama, Y., Tsuboya, T., Kondo, K., & Kawachi, I. (2020). Community-level social capital and cognitive decline after a natural disaster: A natural experiment from the 2011 Great East Japan earthquake and tsunami. *Social Science & Medicine, 257*, 111981. https://doi.org/10.1016/j.socscimed.2018.09.057

Hoffman, A. J. (2020). Community service activities reducing hate crimes and extremism: A 'green intervention' approach. *Journal of Prevention & Intervention in the Community*

Hostetler, A. J., & Paterson, S. E. (2017). *Toward a community psychology of aging: A lifespan perspective*. In M. A. Bond, I. Serrano-García, C. B. Keys, & M. Shinn (Eds.), *APA handbooks in psychology®. APA handbook of community psychology: Methods for community research and action for diverse groups and issues*, *2,* 605–622. American Psychological Association. https://doi.org/10.1037/14954-036

Hutton, D. (2010). Vulnerability of children: More than a question of age. *Radiation Protection Dosimetry, 142*(54).

IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.

Illinois Department of Public Health. (April 2017). Disparities report. https://www.dph.illinois.gov/sites/default/files/publications/publicationscmhhealth-disparities-report.pdf

Illinois Department of Public Health. (2020). *COVI*D-19 Statistics. https://www.dph.illinois.gov/covid19/statistics

Illinois Department on Aging. (2019). State plan on aging for FY2017-FY2019. https://www2.illinois.gov/aging/Resources/Documents/StatePlanOnAging.pdf

Illinois Primary Health Care Association. (December 2020). Illinois counites by rural/urban classification. http://www.idph.state.il.us/RuralHealth/Rur_Urb_2021.pdf

Issa, N. (April 7, 2020). 42% of Illinois' coronavirus deaths are Black people - but only 15% of the state population is. *Chicago Sun Times.* https://chicago.suntimes.com/coronavirus/2020/4/6/21211355/42-of-illinois-coronavirus-deaths-are-black-people-but-only-15-of-the-state-population-is

Jason, L. A., Glantsman, O., O'Brien, J. F., & Ramian, K. N. (n.d.). *Introduction to community psychology*. Rebus Press.

Javadinejad, S., Eslamian, S., Ostad-Ali-Askari, K., Nekooei, M., Azam, N., Talebmorad, H., Hasantabar-Amiri, A., & Mousavi, M. (2019). Relationship between climate change, natural disaster, and resilience in rural and urban societies. In W. Leal Filho (ed.), *Handbook of Climiate Change Resilience*. https://doi.org/10.1007/978-3-319-71025-9_189-1

Jordana, L., Maisel, E. S., & Steinfield, E. (2008). Increasing home access: Designing for visitability. https://assets.aarp.org/rgcenter/il/2008_14_access.pdf

Kandil, C. Y. (March 26, 2020). Asian Americans report over 650 racist acts over last week, new data says. https://www.nbcnews.com/news/asian-america/asian-americans-report-nearly-500-racist-acts-over-last-week-n1169821

Kapucu, N., Hawkins, C. V., & Rivera, F. I. (2013). Disaster preparedness and resilience for rural communities. *Risk, Hazards & Crisis in Public Policy, 4*(4), 215-233.

Karaye, I. M., & Horney, J. A. (2020). The impact of social vulnerability on COVID-19 in the U.S.: An analysis of spatially varying relationships. *American Journal of Preventive Medicine, 59*(3), 317-325. https://doi.org/10.1016/j.amepre.2020.06.006

Karliner, L. S. (2018). When patients and providers speak different languages. *Agency for Healthcare Research and Quality*. https://psnet.ahrq.gov/web-mm/when-patients-and-providers-speak-different-languages

Keim, M. E. (2008). Building human resilience: The role of public health preparedness and response as an adaptation to climate change. *American Journal of Preventative Medicine, 35*(5), 508-516. https://doi.org/10.1016/j.amepre.2008.08.022

Kerkhoff, A. D., Sachdev, D., Mizany, S., Rojas, S., Gandhi, M., Peng, J., Black, D., Jones, D., Rojas, S., Jacobo, J., Tulier-Laiwa, V., Petersen, M., Martinez, J., Chamie, G., Havlir, D. V., & Marquez, C. (2020). Evaluation of a novel community-based COVID-19 'test-to-care' model for low-income populations. *PLoS ONE, 15*(10): E0239400. https://doi.org/10.1371/journal.pone.0239400

Keys, C. B., McMahon, S. D., & Viola, J. J. (2014). Including students with disabilities in urban public school: Community psychology theory and research. *Journal of Prevention & Intervention in the Community, 42*(1), 1-6. http://dx.doi.org.ezproxy.depaul.edu/10.1080/10852352.2014.855025

Kiaghadi, A., & Rifai, H. S. (2020). Assessing COVID-19 risk, vulnerability and infection prevalence in communities. *PLoS ONE, 15*(10): e0241166. https://doi.org/10.1371/journal.pone.0241166

Kim, S. J., & Bostwick, W. (2020). Social vulnerability and racial inequality in COVID-19 deaths in Chicago. *Health Education & Behavior, 47*(4), 509-513.

Kleinschroth, F., & Kowarik, I. (2020). COVID-19 crisis demonstrates the urgent need for urban greenspaces. *Frontiers in Ecology and the Environment, 18*(6), 318-319. doi: 10.1002/fee.2230

Korean Society of Infectious Diseases, Korean Society of Pediatric Infectious Diseases, Korean Society of Epidemiology, Korean Society for Antimicrobial Therapy, Korean Society for Healthcare-associated Infection Control and Prevention, & Korea Centers for Disease Control and Prevention (2020). Report on the epidemiological features of coronavirus disease 2019 (COVID-19) outbreak in the republic of korea from January 19 to March 2,

2020. *Journal of Korean medical science*, *35*(10), e112. https://doi.org/10.3346/jkms.2020.35.e112

Kraay, A., & McKenzie, D. (2014). Do poverty traps exist? Assessing the evidence. *Journal of Economic Perspectives, 28*(3), 127-148.

Krendl, A. C., & Perry, B. L. (2020). The impact of sheltering in place during the COVID-19 pandemic on older adults' social and mental well-being. *Journal of Gerontology, 76*(2), e53-e58. doi:10.1093/geronb/gbaa110

Krzysztof, K., & Fran, N. H. (1995). In search of altruistic community: Patterns of social support mobilization following hurricane Hugo. *American Journal of Community Psychology, 23*(4), 447-477.

Kung, W. W., Liu, X., Goldmann, E., Huang, D., Wang, X., Kim, K., Kim, P., & Yang, L. H. (2018). Posttraumatic stress disorder in the short and medium term following the World Trade Center attack among Asian Americans. *Journal of Community Psychology, 46*, 1075-1091. doi: 10.1002/jcop.22092

Lara-Garcia, O. E., Retamales, V. A., Suarez, O. M., Parajuli, P., Hingle, S., & Robinson, R. (2020). Application of social vulnerability index to identify high-risk population of contracting COVID-19 infection: A state-level study. *medRxiv.* doi: 10.1101/2020.08.03.20166983

Le Couteur, D. G., Anderson, R. M., & Newman, A. B. (2020). COVID-19 is a disease of older people. *The Gerontological Society of America.* https://ravikollimd.com/resources/glaa077.pdf

Lerner, R. M. (2004). *Liberty: Thriving and civic engagement among American youth*. Thought Oaks, CA: Sage.

Lewis, W. (March 24, 2020). Disaster response expert explains why the U.S. wasn't more prepared for the pandemic. https://dornsife.usc.edu/news/stories/3182/why-u-s-wasnt-better-prepared-for-the-coronavirus/

Li, L., Hung, T., Wang, Y., Wang, Z., Liang, Y., Huang, T., Zhang, H., Sun, W., & Wang, Y. (2020). COVID-19 patients' clinical characteristics, discharge rate, and fatality rate of meta-analysis. *Journal of Medical Virology, 92*(6). https://doi.org/10.1002/jmv.25757

Li, M., Xu, J., He, Y., & Wu, Z. (2012). The analysis of the resilience of adults one year after the 20008 Wenchuan earthquake. *Journal of Community Psychology, 40*(7), 860-870. doi: 10.1002/jcop.21496

Li, Y., Sun, F., He, X., & Chan, K. S. (2011). Sense of community and depressive symptoms among older earthquake survivors following the 2008 earthquake in Chengdu China. *Journal of Community Psychology, 39*(7), 776-785. doi: 10.1002/jcop.20469

Lixin, Y., Ke, C., Xiaoying, C., Yueling, S., Xiaoqing, C., & Ye, H. (2017). Analysis of social vulnerability of residential community to hazards in Tianjin, China. *Natural Hazards, 87*, 1223-1243. https://doi-org.ezproxy.depaul.edu/10.1007/s11069-017-2781-y

Louis-Jean, J., Cenat, K., Njoku, C. V., Angelo, J., & Sanon, D. (2020). Coronavirus (COVID-19) and racial disparities: A perspective analysis. *Journal of Racial and Ethnic Health Disparities*. https://doi.org/10.1007/s40615-020-00879-4

Lynott, J., Harrell, R., Guzman, S., & Gudzinas, B. (June 2019). The livability index 2018: Transforming communities for all ages. https://www.aarp.org/content/dam/aarp/ppi/2018/06/livability-index-transforming-communities-for-all-ages.pdf

Mace, S. E., & Doyle, C. J. (2017). Patients with access and functional needs in a disaster. *Southern Medical Journal, 110*(8), 509-515. doi: 10.14423/smj.0000000000000679

Mahmoud-Elhaj, D., Tanner, B., Sabatini, D., & Feltz, A. (2020). Measuring objective knowledge of potable recycled water. *Journal of Community Psychology, 48*(6), 2033-2052. doi: 10.1002/jcop.22402

Masson, T., Bamberg, S., Stricker, M., & Heidenreich, A. (2019). "We can help ourselves": Does community resilience buffer against the negative impact of flooding on mental health. *National Hazards Earth System Sciences, 19*, 2371-2384. https://doi.org/10.5194/nhess-19-2371-2019

Martin, S. D., Bush, A. C., & Lynch, J. A. (2006). A national survey of terrorism preparedness training among pediatric, family practice, and emergency medicine programs. *Pediatrics, 118*(3). https://doi-org.ezproxy.depaul.edu/10.1542/peds.2005-1875

Matthew, R. A. (2017). Community engagement: Behavior strategies to enhance the quality of participatory partnerships. *Journal of Community Psychology, 45*(1), 117-127. doi: 10.1003/jcop.21830

Mervosh, S., Lu, D., & Swales, V. (April 20, 2020). See which states and cities have told residents to stay at home. *The New York Times.* https://www.nytimes.com/interactive/2020/us/coronavirus-stay-at-home-order.html

Michaels, S. (April 5, 2020). 70 percent of people killed in Chicago by the coronavirus are Black. *Mother Jones*. https://www.motherjones.com/coronavirus-updates/2020/04/70-percent-of-people-killed-in-chicago-by-the-coronavirus-are-black/

Mikolai, J., Keenan, K., & Kulu, H. (2020). Intersecting household-level health and socio-economic vulnerabilities and the COVID-19 crisis: An analysis from the UK. *SSM Population Health, 12*(100628). https://doi.org/10.1016/j.ssmph.2020.100628

Millar, M., Paton, D., & Johnston, D. (1999). Community vulnerability to volcanic hazard consequences. *Disaster Prevention and Management, 8*, 255-260.

Mo, P., Xing, Y., Xiao, Y., Deng, L., Zhao, Q., Wang, H., Xiong, Y., Cheng, Z., Gao, S., Liang, K., Luo, M., Chen, T., Song, S., Ma, Z., Chen, X., Zheng, R., Cao, Q., Wang, F., & Zhang, Y. (2020). Clinical characteristics of refractory COVID-19 pneumonia in Wuhan, China. *Clinical Infectious Diseases, ciaa270*, https://doi.org/10.1093/cid/ciaa270

Molloy, J., Schatzmann, T., Schoeman, B., Tchervenkov, C., Hintermann, B., & Axhausen, K. W. (2020). Observed impacts of COVID-19 on travel behaviour in Switzerland based on a large GPS panel. *Working paper, IVT, ETH Zurich.*

Monahan, C., Macdonald, J., Lytle, A., Apricneo, M., & Levy, S. R. (2020). COVID-19 and ageism: How positive and negative responses impact older adults and society. *American Psychological Association.* doi: 10.1037amp0000699

Morrow, B. H. (1999). Identifying and mapping community vulnerability. *Disasters, 1*(1), 1-18. doi: 10.1111/1467-7717.00102.

Myers, E. M. (2020). Compounding heath risks and increased vulnerability to SARS_CoV-2 for racial and ethnic minorities and low socioeconomic status indivudlas in the United States. *Preprint*. doi: 10.20944/preprints202004.0234.v1

Nafilyan, V., Islam, N., Ayoubkhani, D., Gilles, C., Katikireddi, S. V., Mathur, R., Summerfield, A., Tingay, K., Asaria, M., John, A., Goldblatt, P., Banerjee, A., Glickman, M., &

Khunti, K. (2020). Ethnicity, household composition and COVID-19 mortality: A national linked data study. *medRxiv*. https://doi.org/10.1101/2020.11.27.20238147

National Conference of State Legislatures. (May 21, 2020). COVID-19: Essential workers in the states. https://www.ncsl.org/research/labor-and-employment/covid-19-essential-workers-in-the-states.aspx

National Institute of Standards and Technology. (2019). Compliance FAQs: Federal information processing standards (FIPS). https://www.nist.gov/standardsgov/compliance-faqs-federal-information-processing-standards-fips

Nature. (April 22, 2020). Coronavirus: The first three months as it happened. https://doi.org/10.1038/d41586-020-00154-w

Nayak, A., Islam, S. J., Mehta, A., Ko, Y. A., Patel, S. A., Goyal, A., Sullivan, S., Lewis, T. T., Vaccarino, V., Morris, A. A., & Quyyumi, A. A. (2020). Impact of social vulnerability on COVID-19 incidence and outcomes in the United States. *medRxiv*. https://doi.org/10.1101/2020.04.10.20060962

NBC Chicago. (July 15, 2020). Illinois divided into 11 separate regions for coronavirus response, Pritzker announces. https://www.nbcchicago.com/news/local/illinois-divided-into-11-separate-regions-for-coronavirus-response-pritzker-announces/2305584/

Nelson, G. (2013). Community psychology and transformative policy change in the neo-liberal era. *American Journal of Community Psychology, 52*, 211-223. https://doi.org/10.1007/s10464-013-9591-5

Ngo, E. B. (2011). When disasters and age collide: Reviewing vulnerability of the elderly. *Natural Hazards Review, 2*(2), 80-89.

Noji, E. K. (2000). The public health consequences of disasters. *Prehospital and Disaster Medicine, 15*(4), 147-157.

Norris, F. H., & Murrell, S. A. (1988). Prior experience as a moderator of disaster impact on anxiety symptoms in older adults. *American Journal of Community Psychology, 16*(5), 665-683.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology, 41*, 127-150. doi: 10.1007/s10464-007-9156-6

Novaco, R. W., Stokols, D., Campbell, J., & Stokols, J. (1979). Transportation, stress, and community psychology. *American Journal of Community Psychology, 7*(4), 361-380. http://dx.doi.org.ezproxy.depaul.edu/10.1007/BF00894380

O'Dwyer, L. M., & Parker, C. E. (December 2014). A primer for analyzing nested data: Multilevel modeling in SPSS using an example from a REL study. https://ies.ed.gov/ncee/edlabs/regions/northeast/pdf/REL_2015046.pdf

Pachi, D., & Barrett, M. (2012). Perceived effectiveness of conventional, non-conventional and civic forms of participation among minority and majority youth. *Human Affairs, 22*, 345-359. doi: 10.2478/s13374-012-0029-9

Page., K. R., Venkataramani, M., Beyrer, C., & Polk, S. (2020). Undocumented U.S. immigrants and COVID-19. *The New England Journal of Medicine, 382*: e62. doi: 10.1056/NEJMp2005953

Pappas, S. (June 1, 2020). Fighting inequality in the face of COVID-19. *Monitor on Psychology, 51*(4). https://www.apa.org/monitor/2020/06/covid-fighting-inequity

Paton, D., & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management, 10*(4), 270=277.

Peguero, A. A. (2006). Latino disaster vulnerability: The dissemination of Hurricane mitigation information among Florida's homeowners. *Hispanic Journal of Behavioral Sciences, 28*(1), 5-22. doi: 10.1177/0739986305284012

Phillips, B. D., Thomas, D. S. K., Fothergill, A., & Blinn-Pike, L. (2010). Social vulnerability to disasters. *Boca Raton: CRC Press.*

Popkin, B. M., Du, S., Green, W. D., Beck, M. A., Algaith, T., Herbst, C. H., Alsukait, R. F., Alluhidan, M., Alazemi, N., & Shekar, M. (2020). Individuals with obesity and COVID-19: A global perspective on the epidemiology and biological relationships. *Obesity Reviews, 21*(e13138), 1-17. https://doi.org/10.1111/obr.13128

Public Policy Institute. (July, 13 2018). The livability index: Great neighborhoods for all ages. https://www.aarp.org/ppi/issues/livable-communities/info-2015/livability-index.html

Questa, K., Das, M., King, R., Everitt, M., Rassi, C., Cartwright, C., Ferdous, T., Barua, D., Putnis, N., Snell, A. C., Huque, R., Newell, J., & Elsey, H. (2020). Community engagement interventions for communicable disease control in low- and lower- middle-income countries: Evidence from a review of systematic reviews. *International Journal for Equity in Health, 19*(51), 1-20. https://doi.org/10.1186/s12939-020-01169-5

Quimby, C. C., & Angelique, H. (2011). Identifying barriers and catalysts to fostering pro-environmental behavior: Opportunities and challenges for community psychology. *American Journal of Community Psychology, 47*, 388-396. doi: 10.1007/s10464-010-9389-7

Quinn, S. C., Kumar, S., Freimuth, V. S., Musa, D., Casteneda-Angarita, N., & Kidwell, K. (2011). Racial disparities in exposure, susceptibility, and access to health care in the US H1N1 influenza pandemic. *American Public Health Association, 101*, 285-293. https://doi.org/10.2105/AJPH.2009.188029

Ratnapradipa, D., McDaniel, J. T., Barger, A. (2017). Social vulnerability and lyme disease incidence: A regional analysis of the United States 2000-2014. *Epidemiology Biostatistics and Public Health, 14*(2), e12158-1-e12158-12. https://doi.org/10.2427/12158

Restore Illinois. (n.d.). Actions to combat a resurgence of COVID-19. https://bloximages.chicago2.vip.townnews.com/thesouthern.com/content/tncms/assets/v3/editorial/5/38/538279fb-894c-560b-bb20-b964ff435621/5f0f805ef10b8.pdf.pdf

Rossi, G., Lenzi, M., Sharkey, J. D., Vieno, A., & Santinello, M. (2016). Factors associated with civic engagement in adolescence: The effects of neighborhood, school, family, and peer context. *Journal of Community Psychology, 44*(8), 1040-1058. doi: 10.1002/jcop.21826

Rozenfeld, Y., Beam, J., Maier, H., Haggerson, W., Boudreau, K., Carlson, J., & Medows, R. (2020). A model of disparities: Risk factors associated with COVID-19 infection. *International Journal for Equity in Health, 19*, 1-10. https://doi.org/10.1186/s12939-020-01242-z

Rygel, L., O'Sullivan, D., & Yarnal, B. (2006). A method for constructing a social vulnerability index: An application to hurricane storm surges in a developed country. *Mitigation and Adaptation Strategies for Global Change, 11*(3), 741-764.

Sanchez, T. H., Zlotorzynska, M., Rai, M., & Baral, S. D. (2020). Characterizing the impact of COVID-19 on men who have sex with men across the United States. *AIDS Behavior, 1*(9). https://doi.org/10.1007/s10461-020-02894-2

Sarason, S., & Lorentz, E. (1979). *The challenge of resource exchange.* San Francisco: Jossey-Bass.

Sauer, M., A., Truelove, S., Gerste, A. K., Limaye, R. J. (2021). A failure to communicate? How public messaging has strained the COVID-19 response in the United States. *Health Security, 19*(1), 65-74. doi: 10.1089/hs.2020.0190

Shadmi, E., Chen Y., Dourado, I., Faran-Perach, I., Furler, J., Hangoma, P., Hanvoravongchaj, P., Obando, C., Petrosyan, V., Rao, K. D., Lorena Ruano, A., Shi, L., Eugenio de Souza, L., Spitzer-Shohat, S., Sutrgiss, E., Suphanchaimat, R., Villar Uribe, M., & Willems, S. (2020). Health equity and COVID-19: Global perspectives. *International Journal of Equity in Health, 19*(104). https://doi.org/10.1186/s12939-020-01218-z

Singelenberg, J., Stolarz, H., & McCall, M. E. (2014). Integrated service areas: An innovative approach to housing, services and supports for older persons ageing in place. *Journal of Community & Applied Social Psychology, 24*(1), 69-73. http://dx.doi.org.ezproxy.depaul.edu/10.1002/casp.2175

Slater, S. J., Christiana, R. W., & Gustat, J. (2020). Recommendations for keeping parks and green spaces accessible for mental and physical health during COVID-19 and other pandemics. *Preventing Chronic Disease, 17*(E59), 1-5. www.cdc.gov/pcd/issues/2020/20_0204.htm

Smith, K. W. (April 2, 2020). Essential work should pay more than not working. *Politics & Policy*. https://www.bloomberg.com/opinion/articles/2020-04-02/essential-workers-deserve-more-pay-than-non-essential-non-workers

Srinivasa Rao, A. S. R., Miller, D., Berman, A. E., Hess, D. C., & Krantz, S. G. (2020). Immediate and near future prediction of COVID-19 patients in the U.S. population aged 65+ with the prior medical conditions of hypertension, cardiovascular, and lung diseases: Methods, models and acute care estimates. *medRxiv*. https://doi.org/10.1101/2020.04.12.20062166

Stacey, C., Stern, A., Blagg, K., Su, Y., Noble, E., Rainer, M., & Ezike, R. (October 6, 2020). The unequal commute. https://www.urban.org/features/unequal-commute

Steinglass, P. & Gerrity, E. (1990). Natural disasters and post-traumatic stress disorder short-term versus long-term recovery in two disaster-affect communities. *Journal of Applied Social Psychology, 20*(21). https://doi.org/10.1111/j.1559-1816.1990.tb01509.x

Tirachini, A., & Cats, O. (2020). COVID-19 and public transportation: Current assessment, prospects, and research needs. *Journal of Public Transportation, 22*(1), 1-21. https//doi.org/10.5038/2375-091.22.1.1

Toolis, E. E. (2017). Theorizing critical placemaking as a tool for reclaiming public space. *American Journal of Community Psychology, 59*(1-2), 184-199. http://dx.doi.org.ezproxy.depaul.edu/10.1002/ajcp.12118

Trickett, E. J. (1984). Toward a distinctive community psychology: An ecological metaphor for the conduct of community research and the nature of training. *American Journal of Community Psychology, 12*, 261-279.

Tyrrell, C. J., & Williams, K. N. (2020). The paradox of social distancing: Implications for older adults in the context of COVID-19. *American Psychological Association, 12*(51), S214-S216. doi: 10.1037/tra0000845

UITP. (2020). Management of COVID-19: Guidelines for public transport operators. *International Association of Public Transportation (UITP)*. https://www.uitp.org/management-covid-19-guidelines-public-transport-operators

United States Census Bureau. (2019). Annual estimates of the resident population: April 1, 2010 to July 1, 2019. *U.S. Census Bureau, Population Division.* http://www.census.gov/

United States Department of Agriculture. (October 13, 2020). Racial and ethnic minorities made up about 22 percent of the rural population in 2018, compared to 43 percent in urban areas. https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=99538

United States Department of Education: National Center for Education Statistics. (July 2019). Adult literacy in the United States. https://nces.ed.gov/datapoints/2019179.asp

United States Department of Health and Human Services Office of Minority Health. (August 22, 2019). Profile: Black/African Americans. https://www.minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=61

USAID. (n.d.). Leadership during a pandemic: What your municipality can do. https://www.paho.org/disasters/index.php?option=com_docman&view=download&category_slug=tools&alias=518-what-your-municipality-complete-toolkit&Itemid=1179&lang=en

Voorhees, C. C. W., Vick, J., & Perkins, D. D. (2007). 'Came hell and high water': The intersection of hurricane Katrina, the news media, race and poverty. *Journal of Community & Applied Social Psychology, 17*, 415-429. doi: 10.1002/casp.945

Wan, S., Xiang, Y., Fang, W., Zheng, Y., Li, B., Hu, Y., Lang, C., Huang, D., Sun, Q., Xiong, Y., Huang, X., Lv, J., Luo, Y., Shen, L., Yang, H., Huang, G., & Yang, R. (2020). Clinical features and treatment of COVID-19 patients in northeast Chongqing. *Journal of Medical Virology, 92*(7), https://doi.org/10.1002/jmv.25783

Weber, L., & Houghton, K. (October 1, 2020). The mask hypocrisy: How COVID memos contradict the White House's public face. https://khn.org/news/mask-wearing-hypocrisy-how-covid-white-house-memos-contradict-administration-coronavirus-defense-policy/

Winstein, R. S. (2002). Overcoming inequality in schooling: A call to action for community psychology. *American Journal of Community Psychology, 30*(1), 21-42.

Weller, C. (June 18, 2020). Systemic racism makes COVID-19 much more deadly for African-Americans. https://www.forbes.com/sites/christianweller/2020/06/18/systemic-racism-makes-covid-19-much-more-deadly-for-african-americans/#3afaa7d17feb

White House. (2020). Guidelines opening up America again. https://www.whitehouse.gov/openingamerica/

Wolfe, S. M. (2014). The application of community psychology practice competencies to reduce health disparities. *American Journal of Community Psychology, 53*(1-2), 231-234. http://dx.doi.org.ezproxy.depaul.edu/10.1007/s10464-013-9622-2

Wolff, T. (2014). Community psychology practice: Expanding the impact of psychology's work. *American Psychologists, 69*(8), 803-813. http://dx.doi.org.ezproxy.depaul.edu/10.1037/a0037426

World Health Organization. (2020). COVID-19: Vulnerable and high risk groups. https://www.who.int/westernpacific/emergencies/covid-19/information/high-risk-groups

World Health Organization. (n.d.). Urban health. https://www.who.int/health-topics/urban-health

Wu, J., Liu, J., Zhao, X., Liu, C., Wang, W., Wang, D., Xu, W., Zhang, C., Yu, J., Jiang, B., Cao, H., & Li, L. (2020). Clinical characteristics of imported cases of coronavirus disease 2019 (COVID-19) in Jiangsu province: A multicenter descriptive study. *Clinical Infectious Diseases,* doi: 10.1093/cid/ciaa199

Wu, S., Yarnal B., & Fisher, A. (2002). Vulnerability of coastal communities to sea-level rise: A case study of Cape May County New Jersey, USA. *Climate Research, 22*, 255-270.

Yan, B. W., Ng, F., Chu, J., Tsoh, J., & Nguyen, T. (July 13, 2020). Asian Americans facing high COVID-19 case fatality. https://www.healthaffairs.org/do/10.1377/hblog20200708.894552/full/

Yee, C. W., Cunningham, S. D., & Ichovics, J. R. (2019). Application of the social vulnerability index for identifying teen pregnancy intervention need in the United States. *Maternal and Child Health Journal, 23*, 1516-1524.

Yen, I. H., & Syme, S. L. (1999). The social environment and health: A discussion of the epidemiologic literature. *Annual Review of Public Health, 20,* 287-308.

Yeletaysi, S., Ozceylan, D., Fiedrich, F., Harrald, J. R., & Jefferson, T. A. (2009). A framework to integrate social vulnerability into catastrophic natural disaster preparedness planning. Proceedings of the TIEMS Annual Conference, June 9-11; Istanbul.

YourABA. (September 28, 2020). 'Embed equity' in disaster response, experts say. https://www.americanbar.org/news/abanews/publications/youraba/2020/0928/embed-equity-in-disaster-response/

Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). Indirect effects of COVID-19 on the environment. *Science of the Total Environment, 728*(138813). https://doi.org/10.1016/j.scitotenv.2020.138813

Zani, B., & Barrett, M. (2012). Engaged citizens? Political participation and social engagement among youth, women, minorities, and migrants. *Human Affairs, 22*, 273-282. doi: 10.2478/s13374-012-0023-2

Appendix A

Map of Illinois' 11 Regions for COVID-19 Response

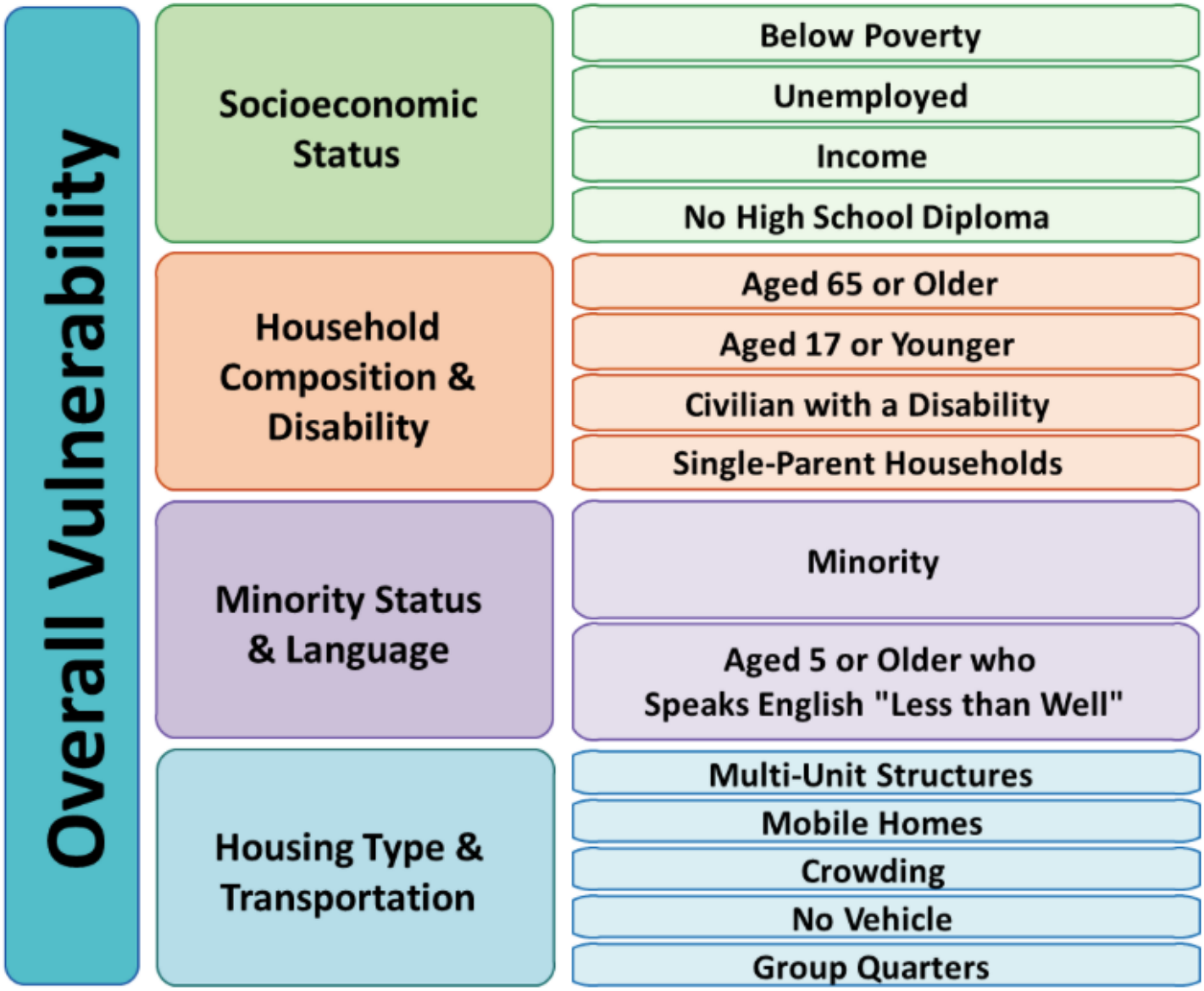
1. **NORTH:** Boone, Carroll, DeKalb, Jo Daviess, Lee, Ogle, Stephenson, Whiteside, Winnebago
2. **NORTH-CENTRAL:** Bureau, Fulton, Grundy, Henderson, Henry, Kendall, Knox, La Salle, Livingston, Marshall, McDonough, McLean, Mercer, Peoria, Putnam, Rock Island, Stark, Tazewell, Warren, Woodford
3. **WEST-CENTRAL:** Adams, Brown, Calhoun, Cass, Christian, Greene, Hancock, Jersey, Logan, Macoupin, Mason, Mason, Menard, Montgomery, Morgan, Pike, Sangamon, Schuyler, Scott
4. **METRO EAST:** Bond, Clinton, Madison, Monroe, Randolph, St. Clair, Washington
5. **SOUTHERN:** Alexander, Edwards, Franklin, Gallatin, Hamilton, Hardin, Jackson, Jefferson, Johnson, Marion, Massac, Perry, Pope, Pulaski, Saline, Union, Wabash, Wayne, White, Williamson
6. **EAST-CENTRAL:** Champaign, Clark, Clay, Coles, Crawford, Cumberland, De Witt, Douglas, Edgar, Effingham, Fayette, Ford, Iroquois, Jasper, Lawrence, Macon, Moultrie, Piatt, Richland, Shelby, Vermillion
7. **SOUTH SUBURBAN:** Kankakee, Will
8. **WEST SUBURBAN:** DuPage, Kane
9. **NORTH SUBURBAN:** Lake, McHenry
10. **SUBURBAN COOK:** Suburban Cook
11. **CHICAGO:** City of Chicago

All public health criteria included in this document are subject to change. As research and data on this novel coronavirus continue to develop, this plan can and will be updated to reflect the latest science and data.

Restore Illinois. (n.d.). Actions to combat a resurgence of COVID-19. https://bloximages.chicago2.vip.townnews.com/thesouthern.com/content/tncms/assets/v3/editorial/5/38/538279fb-894c-560b-bb20-b964ff435621/5f0f805ef10b8.pdf.pdf

Appendix B

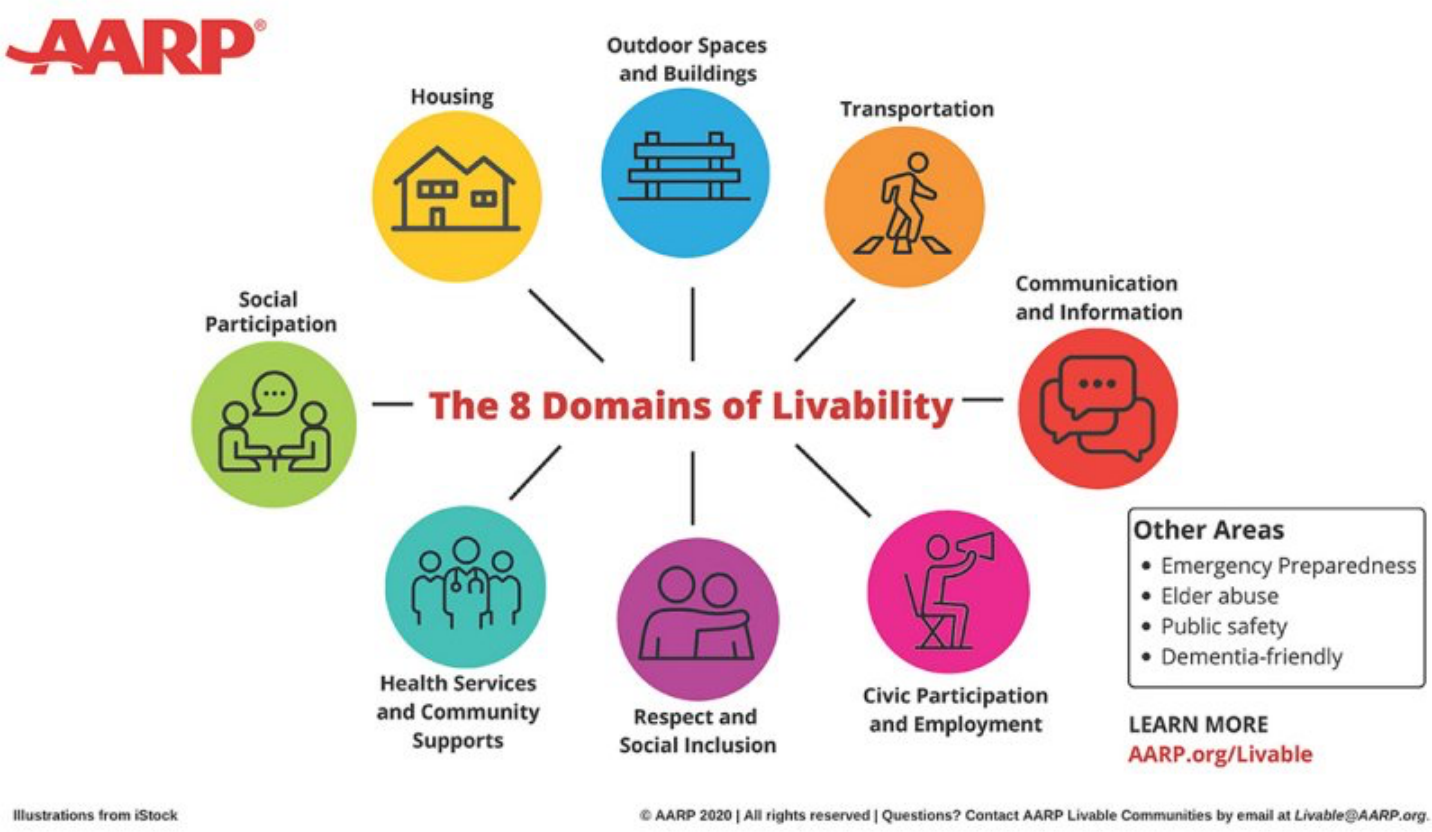
Social Vulnerability Index Themes and Tracks



Agency for Toxic Substances and Disease Registry. (n.d.). CDC SVI Documentation 2018. https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/SVI_documentation_2018.html

Appendix C

AARP Eight Domains of Community Livability



Note: The present study analyzed seven domains of livability because AARP has yet to collect data on the eighth domain, communication and information.

AARP. (n.d.b). AARP Livability Index. https://livabilityindex.aarp.org

Appendix D

Social Vulnerability Index Overall and Themes Raw Scores for Counties Organized by Region

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
North		*M* = .437, *SD* = .274	*M* = .366, *SD* = .222	*M* = .490, *SD* = .284	*M* = .669, *SD* = .210	*M* = .367, *SD* = .206
	Boone	.614	.525	.584	.931	.376
	Carroll	.228	.406	.317	.376	.188
	DeKalb	.158	.198	.149	.446	.248
	Jo Daviess	.059	.109	.297	.475	.069
	Lee	.396	.228	.168	.693	.614
	Ogle	.406	.287	.426	.822	.307
	Stephenson	.683	.505	.921	.564	.295
	Whiteside	.455	.218	.762	.802	.297
	Winnebago	.931	.822	.782	.911	.713
North-Central		*M* = .400, *SD* = .344	*M* = .401, *SD* = .297	*M* = .481, *SD* = .212	*M* = .527, *SD* = .306	*M* = .369, *SD* = .336
	Bureau	.366	.238	.753	.772	.178
	Fulton	.822	.861	.733	.634	.574
	Grundy	.139	.099	.178	.753	.119
	Henderson	.099	.267	.525	.069	.050
	Henry	.248	.297	.446	.673	.109
	Kendall	.178	.069	.238	.951	.099
	Knox	.891	.842	.564	.683	.921
	La Salle	.555	.624	.376	.782	.475
	Livingston	.624	.465	.673	.465	.812
	Marshall	.248	.555	.465	.139	.208
	McDonough	.050	.188	.287	.228	.040
	McLean	.941	.871	.951	.337	.881
	Mercer	.149	.248	.396	.168	.149
	Peoria	.772	.634	.574	.891	.693

Appendix D continued.

Social Vulnerability Index Overall and Themes Raw Scores for Counties Organized by Region

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
North-Central (continued)						
	Putnam	.030	.050	.317	.654	.030
	Rock Island	.901	.644	.723	.901	.861
	Stark	.069	.257	.495	.129	.020
	Tazewell	.109	.059	.277	.307	.337
	Warren	.802	.743	.485	.852	.743
	Woodford	.020	.010	.158	.149	.079
West-Central		*M* = .450, *SD* = .276	*M* = .473, *SD* = .273	*M* = .476, *SD* = .299	*M* = .426, *SD* = .294	*M* = .499, *SD* = .218
	Adams	.337	.178	.703	.287	.505
	Brown	.693	.604	.010	.792	.990
	Calhoun	.297	.347	.584	.000	.446
	Cass	.881	.792	.693	.931	.673
	Christian	.347	.416	.347	.208	.525
	Greene	.317	.654	.545	.030	.198
	Hancock	.168	.356	.416	.109	.139
	Jersey	.129	.158	.069	.396	.366
	Logan	.277	.386	.079	.426	.465
	Macoupin	.089	.030	.099	.871	.059
	Mason	.426	.376	.297	.584	.535
	Menard	.040	.089	.545	.089	.089
	Montgomery	.545	.762	.228	.327	.733
	Morgan	.673	.545	.604	.505	.802
	Pike	.525	.693	.871	.178	.436
	Sangamon	.990	.980	.960	.564	.911
	Schuyler	.604	.327	.634	.654	.822

Appendix D continued.

Social Vulnerability Index Overall and Themes Raw Scores for Counties Organized by Region

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
West-Central (continued)						
	Scott	.762	.822	.891	.723	.287
Metro East		*M* = .249, *SD* = .213	*M* = .262, *SD* = .250	*M* = .127, *SD* = .096	*M* = .390, *SD* = .256	*M* = .512, *SD* = .331
	Bond	.475	.446	.059	.386	.951
	Clinton	.218	.149	.129	.366	.663
	Madison	.267	.139	.020	.812	.762
	Monroe	.000	.000	.040	.287	.010
	Randolph	.584	.713	.257	.604	.644
	St. Clair	.119	.317	.248	.010	.238
	Washington	.079	.069	.129	.267	.317
Southern		*M* = .723, *SD* = .205	*M* = .746, *SD* = .225	*M* = .715, *SD* = .238	*M* = .423, *SD* = .225	*M* = .625, *SD* = .232
	Alexander	1.00	1.00	1.00	.555	.941
	Edwards	.376	.386	.822	.198	.356
	Franklin	.861	.960	.941	.099	.564
	Gallatin	.723	.753	.990	.257	.317
	Hamilton	.208	.208	.772	.109	.119
	Hardin	.713	.951	.455	.149	.555
	Jackson	.871	.852	.089	.822	.960
	Jefferson	.970	.921	.822	.545	.970
	Johnson	.594	.802	.356	.337	.654
	Marion	.782	.703	.812	.614	.703
	Massac	.951	.891	.970	.455	.792
	Perry	.842	.901	.505	.337	.852
	Pope	.564	.911	.505	.208	.406
	Pulaski	.852	.990	.743	.614	.426
	Saline	.753	.604	.624	.842	.614

Appendix D continued.

Social Vulnerability Index Overall and Themes Raw Scores for Counties Organized by Region

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
Southern (continued)						
	Union	.921	.881	.802	.52	.842
	Wabash	.495	.465	.614	.495	.485
	Wayne	.644	.495	.842	.436	.683
	White	.743	.673	.931	.228	.723
	Williamson	.634	.574	.713	.644	.545
East-Central		*M* = .533, *SD* = .250	*M* = .547, *SD* = .256	*M* = .511, *SD* = .308	*M* = .455, *SD* = .281	*M* = .553, *SD* = .299
	Champaign	.535	.307	.000	.911	1.00
	Clark	.327	.366	.901	.069	.218
	Clay	.832	.663	.980	.515	.594
	Coles	.663	.723	.218	.525	.832
	Crawford	.515	.564	.366	.703	.515
	Cumberland	.287	.436	.663	.040	.277
	De Witt	.703	.594	.109	.861	.772
	Douglas	.564	.455	.376	.713	.753
	Edgar	.465	.535	.852	.248	.386
	Effingham	.307	.119	.406	.475	.584
	Fayette	.792	.970	.475	.406	.634
	Ford	.416	.515	.881	.317	.158
	Iroquois	.505	.584	.654	.723	.267
	Jasper	.386	.485	.683	.277	.347
	Lawrence	.960	.941	.535	.723	.931
	Macon	.733	.812	.030	.584	.980
	Moultrie	.356	.277	.257	.188	.782
	Piatt	.010	.020	.208	.059	.000

Appendix D continued.

Social Vulnerability Index Overall and Themes Raw Scores for Counties Organized by Region

		Social Vulnerability Index				
			Themes			
Region	County	Overall Social Vulnerability	Socioeconomic Status	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
East-Central (continued)						
	Richland	.654	.772	.792	.406	.455
	Shelby	.198	.426	.436	.050	.228
	Vermillion	.980	.931	.911	.762	.901
South Suburban		*M* = .574, *SD* = .476	*M* = .431, *SD* = .427	*M* = .421, *SD* = 315	*M* = .921, *SD* = .056	*M* = .574, *SD* = .448
	Kankakee	.911	.733	.644	.881	.891
	Will	.238	.129	.198	.960	.257
West Suburban		*M* = .337, *SD* = .210	*M* = .183, *SD* = .217	*M* = .188, *SD* = .210	*M* = .980, *SD* = .014	*M* = .406, *SD* = .014
	DuPage	.188	.030	.040	.970	.416
	Kane	.485	.337	.337	.990	.396
North Suburban		*M* = .441, *SD* = .007	*M* = .475, *SD* = .434	*M* = .525, *SD* = .476	*M* = .495, *SD* = .686	*M* = .376, *SD* = .308
	Lake	.446	.168	.188	.980	.594
	McHenry	.436	.782	.861	.010	.158
Suburban Cook		.802	.683	.119	1.00	.871
Chicago		.802	.683	.119	1.00	.871

Note: Mean and standard deviation values are presented for each of the 11 regions. Raw social vulnerability scores are presented for each of the 102 counties. Chicago scores cannot be abstracted independent of Cook County because Social Vulnerability Index scores are calculated by county. For the overall score and each theme, higher scores indicate greater social vulnerability in that category.

Appendix E

Livability Index Overall and Dimension Raw Scores for Counties Organized by Region

		Livability Index							
			Dimensions						
Region	County	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
North		*M* = 49.79, *SD* = 2.23	*M* = 54.89, *SD* = 2.23	*M* = 44.00, *SD* = 2.92	*M* = 49.00, *SD* = 4.64	*M* = 56.44, *SD* = 8.34	*M* = 43.00, *SD* = 4.39	*M* = 53.44, *SD* = 11.95	*M* = 47.89, *SD* = 7.17
	Boone	48.25	45	46	50	59	41	42	55
	Carroll	49.50	58	40	46	58	40	67	38
	DeKalb	52.13	57	47	48	51	49	56	57
	Jo Daviess	53.13	55	39	51	73	50	64	40
	Lee	49.38	58	44	45	52	37	55	55
	Ogle	47.25	53	47	41	42	39	61	48
	Stephenson	50.13	58	43	51	59	43	53	44
	Whiteside	51.75	57	44	52	59	43	55	52
	Winnebago	46.63	53	46	57	55	45	28	42
North-Central		*M* = 50.78, *SD* = 2.69	*M* = 55.15, *SD* = 6.34	*M* = 43.05, *SD* = 3.61	*M* = 50.10, *SD* = 4.97	*M* = 52.75, *SD* = 8.16	*M* = 42.55, *SD* = 6.29	*M* = 56.30, *SD* = 13.78	*M* = 55.55, *SD* = 13.45
	Bureau	48.88	57	42	46	48	46	61	42
	Fulton	46.50	58	42	54	46	33	51	42
	Grundy	50.13	43	45	52	48	49	45	69
	Henderson	46.38	59	38	47	47	29	79	26
	Henry	52.88	55	45	50	51	43	63	63
	Kendall	51.50	33	51	51	53	54	39	79
	Knox	47.38	61	43	49	54	42	31	52
	La Salle	50.88	55	45	49	64	44	48	51
	Livingston	50.75	57	44	46	47	50	52	59
	Marshall	52.13	56	41	51	61	40	52	64
	McDonough	52.00	58	40	40	51	35	79	61
	McLean	49.00	61	38	43	59	46	64	32
	Mercer	53.88	58	43	49	49	36	71	71

Appendix E continued.

Livability Index Overall and Dimension Raw Scores for Counties Organized by Region

		Livability Index							
			Dimensions						
Region	County	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
North-Central (continued)									
	Peoria	50.25	57	45	58	67	42	35	48
	Putnam	46.88	54	40	49	40	40	52	53
	Rock Island	54.38	60	47	60	60	44	51	59
	Stark	52.75	60	36	47	63	38	68	57
	Tazewell	52.38	54	48	58	37	48	56	66
	Warren	50.50	57	44	49	61	42	53	47
	Woodford	56.13	50	44	54	49	50	76	70
West-Central		*M* = 50.04, *SD* = 3.45	*M* = 57.22, *SD* = 6.73	*M* = 41.39, *SD* = 4.54	*M* = 47.28, *SD* = 4.10	*M* = 58.11, *SD* = 9.60	*M* = 36.67, *SD* = 8.70	*M* = 55.61, *SD* = 8.17	*M* = 54.11, *SD* = 13.84
	Adams	56	59	43	52	76	34	62	66
	Brown	51.25	66	42	50	63	32	38	68
	Calhoun	46.88	59	35	42	46	26	60	60
	Cass	50.25	58	41	45	62	37	48	61
	Christian	50.25	58	44	48	59	31	58	54
	Greene	45.50	60	39	46	63	28	52	31
	Hancock	49.63	60	41	49	62	39	65	31
	Jersey	51.25	56	37	45	69	33	52	67
	Logan	47.00	58	41	45	42	2	49	42
	Macoupin	52.38	33	55	56	50	55	46	72
	Mason	49.00	53	48	38	46	41	59	58
	Menard	55.50	55	43	49	64	42	65	71
	Montgomery	47.88	60	39	44	52	40	48	52
	Morgan	49.88	59	42	49	63	38	50	48
	Pike	43.75	60	37	44	43	28	60	34
	Sangamon	48.63	63	38	50	63	24	56	46

Appendix E continued.

Livability Index Overall and Dimension Raw Scores for Counties Organized by Region

		Livability Index							
			Dimensions						
Region	County	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
West-Central (continued)									
	Schuyler	56.38	55	41	50	67	48	65	69
	Scott	49.38	58	39	49	56	32	68	44
Metro East		*M* = 49.91, *SD* = 2.91	*M* = 54.71, *SD* = 4.61	*M* = 43.00, *SD* = 4.44	*M* = 43.00, *SD* = 6.11	*M* = 53.86, *SD* = 8.21	*M* = 39.29, *SD* = 10.61	*M* = 56.43, *SD* = 17.16	*M* = 59.00, *SD* = 10.91
	Bond	49.63	57	41	44	61	34	50	60
	Clinton	50.25	52	45	43	43	51	48	70
	Madison	51.88	54	48	54	64	58	30	55
	Monroe	55.25	46	49	38	60	34	85	75
	Randolph	47.63	59	40	41	47	33	54	59
	St. Clair	47.13	59	41	46	47	33	61	43
	Washington	47.63	56	37	35	55	32	67	51
Southern		*M* = 47.97, *SD* = 2.82	*M* = 61.10, *SD* = 4.33	*M* = 37.40, *SD* = 4.82	*M* = 47.05, *SD* = 7.27	*M* = 58.85, *SD* = 8.24	*M* = 32.85, *SD* = 7.46	*M* = 59.70, *SD* = 7.06	*M* = 38.95, *SD* = 11.79
	Alexander	49.38	71	30	54	61	31	56	43
	Edwards	53.00	62	41	43	63	39	65	58
	Franklin	47.13	61	43	42	58	39	56	31
	Gallatin	45.00	69	31	48	63	25	53	26
	Hamilton	49.00	59	36	46	78	13	67	44
	Hardin	40.88	63	31	39	41	26	65	21
	Jackson	49.38	60	38	61	62	43	52	29
	Jefferson	52.00	56	33	59	57	40	53	68
	Johnson	44.13	58	36	34	64	34	54	29
	Marion	50.50	57	44	44	63	44	57	45
	Massac	46.00	59	38	50	52	26	52	45
	Perry	46.50	61	40	45	55	32	58	34

Appendix E continued.

Livability Index Overall and Dimension Raw Scores for Counties Organized by Region

		Livability Index							
			Dimensions						
Region	County	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
Southern (continued)									
	Pope	48.25	63	33	42	63	38	71	28
	Pulaski	46.75	67	33	42	62	31	63	29
	Saline	48.75	54	48	40	53	40	54	52
	Union	48.13	62	38	44	64	35	58	36
	Wabash	51.38	61	38	59	50	34	79	39
	Wayne	46.38	59	36	47	63	26	60	34
	White	49.13	64	38	47	62	32	63	38
	Williamson	47.75	56	43	55	43	29	58	50
East-Central		*M* = 49.11, *SD* = 3.63	*M* = 57.86, *SD* = 4.54	*M* = 40.90, *SD* = 4.94	*M* = 46.67, *SD* = 7.17	*M* = 57.00, *SD* = 10.72	*M* = 36.95, *SD* 8.77	*M* = 56.33, *SD* = 9.24	*M* = 48.10, *SD* = 12.02
	Champaign	54.25	57	52	65	67	54	50	35
	Clark	51.00	55	42	44	77	34	68	37
	Clay	50.50	61	37	52	61	29	64	49
	Coles	47.50	59	45	53	42	44	45	45
	Crawford	48.88	57	41	45	58	37	57	47
	Cumberland	48.13	59	36	41	64	26	56	55
	De Witt	47.63	44	46	50	45	46	43	59
	Douglas	51.25	58	45	40	61	41	57	57
	Edgar	50.50	58	40	57	61	36	58	44
	Effingham	54.63	59	39	39	78	37	53	77
	Fayette	42.38	57	34	38	47	32	55	34
	Ford	49.88	62	44	45	44	44	58	52
	Iroquois	45.25	54	37	37	55	43	56	35
	Jasper	47.13	55	36	42	48	35	67	47
	Lawrence	48.63	65	40	49	63	28	45	50

Appendix E continued.

Livability Index Overall and Dimension Raw Scores for Counties Organized by Region

		Livability Index							
			Dimensions						
Region	County	Overall Livability	Housing	Neighborhood	Transportation	Environment	Health	Engagement	Opportunity
East-Central (continued)									
	Macon	46.00	62	42	52	42	37	53	34
	Moultrie	51.75	55	47	45	60	39	59	57
	Piatt	54.25	53	48	47	46	50	72	64
	Richland	53.88	64	36	51	64	42	60	60
	Shelby	45.63	62	35	37	64	22	71	28
	Vermillion	42.38	59	37	51	50	20	36	44
South Suburban		*M* = 51.21, *SD* = 0.97	*M* = 42.00, *SD* = 12.73	*M* = 51.00, *SD* = 7.07	*M* = 50.50, *SD* = 2.12	*M* = 59.50, *SD* = 0.71	*M* = 49, *SD* = 7.07	*M* = 45, *SD* = 2.83	*M* = 62, *SD* = 7.07
	Kankakee	50.63	51	46	49	60	44	47	57
	Will	52.00	33	56	52	59	54	43	67
West Suburban		*M* = 53.50, *SD* = 3.71	*M* = 35.00, *SD* = 1.41	*M* = 63.00, *SD* = 5.66	*M* = 57.50, *SD* = 2.12	*M* = 52.50, *SD* = 4.95	*M* = 62.00, *SD* = 11.31	*M* = 45.00, *SD* = 9.90	*M* = 59.50, *SD* = 3.54
	DuPage	56.13	34	67	59	49	70	52	62
	Kane	50.88	36	59	56	56	54	38	57
North Suburban		*M* = 49.88, *SD* = 2.47	*M* = 45.50, *SD* = 17.68	*M* = 48.50, *SD* = 13.44	*M* = 55.50, *SD* = 4.95	*M* = 57.00, *SD* = 5.66	*M* = 42.50, *SD* = 17.68	*M* = 52.00, *SD* = 8.49	*M* = 45.00, *SD* = 12.73
	Lake	51.63	33	58	59	53	58	46	54
	McHenry	48.13	58	39	52	61	33	58	36
Suburban Cook		51.88	46	68	75	45	53	34	42
Chicago		54.00	53	73	87	46	35	35	36

Note: Mean and standard deviation values are presented for each of the 11 regions. Raw livability scores are presented for each of the 102 counties. For the overall score and each dimension, higher scores indicate greater livability in that category.

Appendix F

COVID-19 Positive Case Rate Raw Scores by County Organized by Region

Region	County	COVID-19 Positive Case Rate
North		$M = 3.58$, $SD = 0.66$
	Boone	4.39
	Carroll	4.33
	DeKalb	2.89
	Jo Daviess	2.94
	Lee	2.99
	Ogle	3.25
	Stephenson	3.24
	Whiteside	3.72
	Winnebago	4.46
North-Central		$M = 2.65$, $SD = 0.56$
	Bureau	3.43
	Fulton	2.17
	Grundy	2.59
	Henderson	2.38
	Henry	1.96
	Kendall	2.66
	Knox	3.24
	La Salle	2.89
	Livingston	2.43
	Marshall	1.63
	McDonough	3.02
	McLean	2.79
	Mercer	2.60
	Peoria	3.03
	Putnam	2.11
	Rock Island	3.48
	Stark	2.02
	Tazewell	2.52
	Warren	3.72
	Woodford	2.27
West-Central		$M = 2.70$, $SD = 0.68$
	Adams	3.87
	Brown	2.27
	Calhoun	1.98
	Cass	3.98
	Christian	3.25
	Greene	2.86
	Hancock	2.40
	Jersey	2.45
	Logan	2.65
	Macoupin	2.12

Appendix F continued.

COVID-19 Positive Case Rate Raw Scores by County Organized by Region

Region	County	COVID-19 Positive Case Rate
West-Central (continued)		
	Mason	2.82
	Menard	1.67
	Montgomery	2.60
	Morgan	3.36
	Pike	3.44
	Sangamon	2.69
	Schuyler	1.65
	Scott	2.48
Metro East		M = 3.73, SD = 0.94
	Bond	3.57
	Clinton	5.41
	Madison	3.14
	Monroe	3.29
	Randolph	4.62
	St. Clair	3.35
	Washington	2.73
Southern		M = 2.83, SD = 1.00
	Alexander	2.78
	Edwards	1.94
	Franklin	3.10
	Gallatin	2.67
	Hamilton	1.96
	Hardin	1.65
	Jackson	3.07
	Jefferson	2.90
	Johnson	3.42
	Marion	3.46
	Massac	1.39
	Perry	2.67
	Pope	1.17
	Pulaski	4.85
	Saline	2.95
	Union	5.09
	Wabash	2.42
	Wayne	3.53
	White	2.33
	Williamson	3.34

Appendix F continued.

COVID-19 Positive Case Rate Raw Scores by County Organized by Region

Region	County	COVID-19 Positive Case Rate
East-Central		$M = 3.09$, $SD = 0.96$
	Champaign	3.49
	Clark	2.30
	Clay	2.85
	Coles	4.58
	Crawford	3.75
	Cumberland	3.20
	De Witt	2.09
	Douglas	4.73
	Edgar	1.15
	Effingham	4.29
	Fayette	3.77
	Ford	1.83
	Iroquois	2.41
	Jasper	3.23
	Lawrence	2.57
	Macon	3.85
	Moultrie	3.76
	Piatt	2.01
	Richland	2.39
	Shelby	3.80
	Vermillion	2.81
South Suburban		$M = 3.57$, $SD = 0.48$
	Kankakee	3.91
	Will	3.23
West Suburban		$M = 3.38$, $SD = 0.56$
	DuPage	2.99
	Kane	3.78
North Suburban		$M = 3.03$, $SD = 0.61$
	Lake	3.46
	McHenry	2.59
Suburban Cook		3.84
Chicago		4.11

Note: Mean and standard deviation values are presented for each of the 11 regions. Raw values are presented for each of the 102 counties. COVID-19 infection positivity rate was calculated by dividing total tests performed by positive infection cases. Higher scores indicate greater COVID-19 infection rates.