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Agency or Structure?
Community and Individual Level factors impacting Recycling Behaviors

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Abstract

The present study combined Ajzen Theory of Planned Behavior (Ajzen, 1991) and Schwartz's Value Theory (1992) with socio-demographic factors to analyze their impact on intention to recycle. The variables were classified into two categories, namely individual level determinants and contextual level determinants and utilized a hierarchical analysis to determine whether greater predictive power was obtained when combining individual level predictors (personal values, perceived behavioral control and attitude) with contextual level predictors (subjective norms and demographics). Our findings indicate that socio-demographics, personal values, perceived behavioral control and attitude all predict recycling behavior with significantly greater predictive power obtained when combining individual level and community level predictors of recycling behavior. Implications for community psychology are discussed.

Introduction

Consumer electronics have become an important mainstay of most modern societies. Inevitably, such importance has led to an increase in consumption that has resulted in a previously inconceivable amount of electronic waste (called here, *e-waste*) with approximately 44 million metric tons being generated every year, and rising (Parajuly et al., 2019). Recycling such e-waste becomes paramount both for the environmental impacts such as removing safely lead, mercury, cadmium, chlorofluorocarbons and flame retardants but also because it can generate a number of valuable and precious materials such as silver, copper, palladium, iron, aluminum, and gold (Aboelmaged, 2021). Such resources can provide important sources of revenue and employment in the various countries such where recycling occurs (Lundgren, 2012). Despite the importance of recycling to avoid environmental harms and to contribute to circular economies (Knickmeyer, 2020), many consumers still do not recycle appropriately. Psychology plays an important role in ascertaining the determinants of recycling behavior, particularly when looking at different contexts and is an important source of information for policy makers who wish to increase appropriate recycling behaviors.

The present study contributed to the literature by combining Ajzen's Theory of Planned Behavior (Ajzen, 1991) and Schwartz's Value Theory (1992) which has not yet been explored. It utilized two levels of determinants: individual and contextual level. This study also utilized a community psychology framework to interpret results. Focusing on personal values, subjective norms, attitude, perceived behavioral control and socio-demographics the present study utilized a hierarchical analysis to determine whether combining individual level predictors (personal values, perceived behavioral control and attitude) with contextual level predictors (subjective norm and demographics) provided greater explanatory power.

Recycling Intention

An important construct that psychology has used to understand recycling behavior is *intention to recycle* (RI). Intention to recycle

primarily refers to the self-commitment an individual adopts to engage in such recycling behavior (Park & Ha, 2014). Predicting recycling intention has resulted in several studies primarily looking at two-factors, namely cognitive and contextual factors. Cognitive factors mainly consist of factors at the individual level such as values, perceived control to carry out recycling behaviors, while contextual factors encompass more system level factors such as income, education and distance to recycling centers. Understanding the relationship between these factors is key to understanding what motivates persons to recycle and how such motivation can be further stimulated by policy makers.

Individual Level-predictors of Recycling Intention

Individual level factors are an important part of pro-environmental behavior (Geiger et al., 2019). When persons entertain positive feelings about certain behaviors, they are more likely to engage in such behavior (Taufik et al., 2016). Similarly, when negative feelings are anticipated inhibition of such behaviors is to be expected (Carrus et al., 2008). Identifying the factors that motivate or inhibit recycling behavior within individuals has been an important area of research and this research has identified several important factors such as: how people evaluate recycling behavior (Ajzen, 1991), the expected costs and benefits of recycling (Ajzen, 1996), environmental attitudes or beliefs (Steg et al., 2011), knowledge of environmental issues (Schultz, 2002), knowledge of how to recycle (Schultz et al., 1995), personal values (Schwartz, 1992) and the perceived importance of recycling behaviors by significant others (Geiger et al., 2019). Within this present study two theoretic frameworks informed individual level predictors of recycling behavior theoretical frameworks, namely the Theory of Planned Behavior (Ajzen, 1991) and Schwartz's Value Theory (1992).

TPB theories of action

An important theory when considering recycling behavior has undoubtedly been the *theory of planned behavior* (TPB) (Ajzen, 1991). The theory of planned behavior posits that intention is the greatest predictor of behavior, however intention requires three other phenomena for it to be formed, namely: *attitude* (ATT) which comprises whether an individual evaluates a behavior as positive or negative, *perceived behavioral control* (PBC) which measures how much control an individual perceives to have over an individual action and whether there are any obstacles to impede such a behavior and, *subjective norms* (SN) which includes the perceived pressure put on by the social network of the individual to perform such a behavior.

TPB has proven a useful tool when predicting recycling behavior and has produced significant interactions between SN, PBC, ATT and RI in a number of studies (Aguilar-Luzon et al., 2012; Pakpour et al., 2014: Mannetti et al., 2004; Ramayah et al., 2012; Wan, et al., 2012). There have been a number of critiques of the theory and how it has been operationalized in various studies (Ma et al., 2021). Ma and colleagues (2021) noted that a number of studies found either elements or the entire theory was not statistically significantly predictive of RI (Khan, et al., 2019; White & Hyde, 2012; Davis et al., 2006, Botetzagias et. al., 2015; Park & Ha, 2014, Wan, et al., 2014).

Another critique of TPB that Ma et al. (2021) raised lies in the fact that the intention to recycle does not always predict very accurately the actual recycling behavior. While TPB might have strong explanatory power in clarifying the mental processes that lead up to the desire to recycle, other factors

may need to be considered to explain the gap between the intention to recycle and the actual behavior (Ma et al., 2021).

Another critique of TPB delves into its methods of measurement. When looking at the subscales of SN, PBC and RI. Ma and colleagues (2021) found that in several studies (including our own) RI was measured simply by one-item which fails to capture the nuance of intention to recycle. These authors also argued that PBC was also considered unnuanced in approach with many studies not factoring in perceived control and merely stopping at the perceived level of difficulty indicating that at least more than one dimension was at play in measuring PBC. Similarly, with SN the relational source of the norms in question was often considered within several studies as being family and friends (Ma et. al, 2021). However, expanding notions of SN to include more communal level factors is more likely to provide greater predictive ability (Nduneseokwu, et al., 2017; Strydom, 2018; Wang et al., 2019)

Schwartz's Value Theory

Another frequently utilized theory when predicting pro-social behaviors including blood donations (Ferrari & Leippe, 1992; Ferrari & Leippe, 1985) as well as recycling intentions and behaviors has been Schwartz's *Value Theory* (1992). A number of studies have underscored that when influencing behavior particularly within consumer paradigms (including recycling) personal values play a very important role (Bardi & Schwartz, 2003; Lee & Kim, 2016; Vermeir & Verbeke, 2008). When the consumer behavior encompasses some form of moral or socially responsible behavior personal values become increasingly important (Freestone & McGoldrick, 2008; Green, et al., 2016; Lee & Kim, 2016;) as they are more likely to "increase self-enhancement, impression management, affiliation with aspirational reference groups, and communication of one's identity to significant others" (Lee & Cho, 2019, p 125).

Values, according to Schwartz's (1992) model, have "psychological, practical and social consequences," (p.4) which then impact behavior and choices. Schwartz (1992) posited that there are 11 broad concepts namely power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, spirituality, and security. These values are inter-related (Bardi & Schwarz, 2003) and have been presented as being in tension with one another on two orthogonal poles with self-enhancement and self-transcendence on two ends and openness to change and conservatism on two other poles (Schwartz, 1994). Pro-environmental behavior (such as recycling) often activates the self-transcendent and self-enhancing pole, with persons having high self-transcendent values more likely to engage with pro-environmental behaviors such as recycling (Cheung et al., 2014).

When looking at the two theories that are best posited to explain away individual determinants of recycling behavior, one can observe a significant degree of overlap. When talking about ATT in TPB, Ajzen and Driver (1992) suggested that when conceptualizing the construct of attitude, one is in fact referring to the feeling towards the behavior and an evaluation of that behavior. Such considerations are highly influenced by another construct entitled *Moral norm,* which includes the perceived recycling benefits and an individual's moral considerations (Chen & Tung, 2009, Tonglet et al., 2004). Moral norm is such an important consideration that Chan and Bishop (2013) posited that it indeed substitutes ATT to predict recycling intention.

Bridging the gap between Schwartz's Value Theory and TPB, therefore, becomes much easier with moral evaluations of recycling behavior becoming the product of positioning

on the orthogonal poles between self-enhancement and self-transcendence. Such bridging of the two theories is in line with Kollmuss and Agyeman's (2002) findings which determined that personal values can encourage the formation of habits which result in a narrowing of the attitude-to-intention behavior gap. We therefore propose a model wherein personal values will stand in for moral norm for the following study while also exploring subjective norm, perceived behavioral control and attitude.

Contextual Factors Impacting Recycling Intention: Community Psychology Contributions

Despite most of the literature focusing on individual level determinants of recycling behavior, a number of studies have acknowledged that a number of contextual factors play an important role in facilitating or inhibiting recycling behavior (Varrotto & Spagnolli, 2017). Oskamp and colleagues (1991) identified home ownership and type of housing as an important factor in determining recycling behavior with individuals who owned their house and those living in single-family housing being more likely to recycle (see also Hage et al., 2009). Other factors recognized to impact positively recycling behavior include: the possession of a recycling bin (Robertson & Walkington, 2009), the presence of recycling facilities in the area lived in (D'Amato et al., 2016; Pearson et al., 2012). Distances between recycling facilities also impacted recycling behavior, with shorter distances promoting more recycling behavior (Hage et al., 2009; Schultz et al., 1995) as well as the size of the neighborhood with smaller neighborhoods promoting more recycling behavior (Derksen & Gartrell, 1993). Other factors include households' trust in in local authorities and recycling programs (Loan et al., 2017).

Another important source of variance with regards to recycling behavior lies in socio-demographic characteristics. Milovantseva & Saphores (2013) identify that traditionally gender, income, education, age, and ethnicity have been used predominantly to identify predictors of recycling behavior. Studies have found that persons identifying as women tend be more active recyclers (Saphores et al., 2012; Barr, 2007) but such a finding has been disputed (do Valle et al., 2004; Domina & Koch, 2002). Income and education have also had some success in predicting variance in recycling behaviors with traditionally higher income and more highly educated individuals most likely been linked with more recycling (Barr, 2007; Clarke & Maantay, 2006) yet others have once again disputed such a finding (Saphores et al., 2012; Meneses & Palacio, 2005; do Valle et al., 2004). Age has also produced contradictory results with some studies finding older people tending to recyle more (Barr, 2007; Li, 2003) while others found differently (Saphores et al., 2012). Overall socio-demographic characteristics have provided inconsistent results in predicting recycling behaviors.

When contributing to issues of environmental behavior, community psychology has several interesting insights to provide. It is interesting that most of the studies available study very deeply variables related to individuals (Vinning & Ebrero, 2002) seemingly locating most of the responsibility for change in such a behavior on individuals and seemingly better marketing aimed at individuals. Often no mention is often made of the community in which the research is carried out and very little context in terms of history and politics are provided to understand some of the results that emerge from the literature. Such an omission perhaps accounts for the reason why socio-demographic variables have produced such inconsistent results, because without sufficient accommodation and customization to unique community experiences socio-demographic variables alone are not sufficiently explanatory without key insights

provided by community histories to contextualize such findings. Throughout our review of the literature only one study by Kurz and colleagues (2007) provided in-depth insight into the community history that might justify some of the findings.

Even contextual factors omit key factors of history, prejudice and structural oppression that can help explain findings better. Many of the factors mentioned previously in contexts seem to indicate that privileged (in various senses) neighborhoods and neighbors are more likely to engage in recycling behavior. None of the studies reviewed in the current search however took sufficient time to unpack how the community stories, historic legacies of various forms of discrimination might account for the pro-environmental behavior. Kurz and colleagues (2007) urge us to explore the concept of social capital (Putnam, 2000) as a factor in explaining pro-environmental behavior. Understanding the individual in context is paramount if psychology aims not merely to reproduce the status quo that brings about change in an equitable and sensitive manner (Tabernero et al., 2015).

The present study adds to the existing literature by combining Ajzen's (1991) Theory of Planned Behavior with Schwartz's Value Theory (1992). However, unlike previous studies which sought to identify which of the various variables in the two previously mentioned theories held greater explanatory power, the present study grouped the variables into individual level predictors and contextual level predictors. The aim of our investigation was to ascertain whether individual-level predictors, contextual level predictors, or a combination of both had the greatest explanatory power when predicting intention to recycle. Such an approach is in line with community psychology framing which eschews over-emphasis on individual determinants of behavior but takes an ecological view which embeds individuals into meso and macro structures.

Contextual level predictors were examined by investigating subjective norms, given that it represented external pressure by the broader community and socio-demographic factors as these were more likely to be good stand-ins for privilege as contextual level-predictors. With regards to individual level factors, personal values namely self-transcendent and self-enhancing values, perceived behavioral control and attitude were used to measure more cognitive individual level predictors. The study examined the following hypotheses:

> ***Hypothesis 1:*** *Demographic variables will not predict intention to recycle*
>
> ***Hypothesis 2:*** *Self-transcendent and self-enhancing values will predict intention to recycle*
>
> ***Hypothesis 3:*** *Perceived behavioral control and attitude will predict intention to recycle*
>
> ***Hypothesis 4:*** *Subjective norms will predict intention to recycle*
>
> ***Hypothesis 5:*** *Individual level-predictors and contextual level-predictors will predict more strongly intention to recycle.*

Methods

Participants

There was a total of 935 study participants of which most identified as men (*n* = 479). Another 456 of participants identified as

women. With regards to age, the most numerous category was 65 or older (*n* = 189), 35-44 (*n* = 164), followed by 55-64 (*n* = 158), 25-34 (*n* = 154), 45-54 (*n* = 142) and 18-24 (*n* = 127). Most participants were college graduates (*n* = 318), had some college education (*n* = 238) and high school or equivalent (*n* = 170). Most participants earned before tax between $50,000 and $74,999 (*n* = 159), followed by $100,000 or over (*n* = 155) and $15,000 – $29,999 (*n* = 148). For more information, please refer to Table 1.

Procedure

The data were collected through an online panels sample that was managed by Qualtrics. Qualtrics handled all the aspects of recruitment, collection of data, and compensation of participants. Researcher paid $5 for each of the participants and requested that quality checks such as speeding, and attention failures were noted but not dismissed. 935 complete surveys were gathered which were considered eligible. Approval for this study was gained by the University of New Mexico's Institutional Review Board and was provided with the following ID 1385229-4.

Table 1
Demographic Factors

Variable		%
Gender		
	Men	51.2
	Women	48.2
	Other/Non-Binary	0.4
	Did not disclose	0.1
Level of Education		
	High School or Equivalent	18.2
	Trade School	3.1
	Some College	25.5
	College Graduate	34.0
	Advanced College Degree	16.1
	Prefer not to say	0.5
	Did not disclose	2.6
Income before tax		
	Under $15,000	12.9
	$15,000-$29,999	15.8
	$30,000-$39,999	11.0
	$40,000-$49,999	8.4
	$50,000-74,999	17.0
	$75,000-$99,000	12.2
	$100,000≤	16.6
	Prefer not to say	3.4
	Did not disclose	2.6
Age		
	18-24	13.6
	25-34	16.5
	35-44	17.5
	45-54	15.3
	55-64	16.9
	65 or older	20.2

Note: *N* = 935

Psychometric Measures

The *self-transcendence scale* is a scale developed by Stern and colleagues (1998) which measures the importance of certain guiding values corresponding to universalism and benevolence based on Schwartz' Value Theory (1992). It is a 6-item scale with item responses that ranged from 1 (not at all important) to 7 (extremely important). Sample items included "protecting the environment, persevering nature" and "a world at peace, free of war and conflict" (*M = 5.61, SD* = 1.18, α = .916).

The *self-enhancing scale* is a scale also developed by Stern and colleagues (1998) which measures the importance of certain guiding values corresponding to power and achievement in Schwartz' Value Theory (1992). It is a 3-item scale with item responses that ranged from 1 (not at all

important) to 7 (extremely important). Sample items included "authority, the right to lead" and "wealth, materials and possessions". (*M = 4.43, SD* = 1.51, α = .797)

The *subjective norm scale* measured the impact of social pressure on the desire to recycle. The scale is an adaptation of the scale used by Wan and colleagues (2017) based on the Theory of Planned Behavior (Ajzen, 1991). The scale has three items namely, "People in my social circle expect me to recycle e-waste.", "social media and other media sources I pay attention to encourage me to recycle e-waste", and "People I look up to recycle their e-waste". Responses ranged from 1 (strongly disagree) to 7 (strongly agree). (*M = 4.2, SD = 1.65, α = .913).*

The *perceived behavioral control scale* is a scale adapted from the one utilized by Milovantseva and Saphores (2013) and is based on the Theory of Planned Behavior (Ajzen, 1991). The scale has three items namely, "It is mostly up to me whether or not I recycle old electronic devices stored in my home," "I feel that I could recycle my old electronic devices if I wanted to," and "I have the means to recycle my old electronic devices if I wanted to." Responses ranged from 1 (completely disagree) to 7 (completely agree) (*M* = 5.57, *SD* =1.19, *α = .657).*

The *attitude scale* is adapted from the scale utilized by Milovantseva and Saphores (2013) and is based on the Theory of Planned Behavior (Ajzen, 1991). This 10-item scale includes items such as: "I would feel guilty if I did not recycle my old electronic devices," and "I would recycle electronic devices because I derive satisfaction from improving the environment." Responses ranged from 1 (completely disagree) to 7 (completely agree) (*M* = 5.06, *SD* = .94, *, α = .833).*

The *intention to recycle* item is a one item measurement which asked about the likelihood of recycling E-waste in the next 6 months. Responses ranged from 1 (very unlikely) to 7 (very likely) (*M=4.94, SD=2.0).*

Results

Proposed Analysis

A four-block hierarchical multiple regression analysis was carried out for the intention to recycle dependent variable. The first block comprised of demographics (gender, education, income, and age group) to determine whether the intention to recycle was predicted. The second block added self-transcendent values and self-enhancing values. The third block added perceived behavioral control and attitudes. The fourth block added the subjective norm scale. A *hierarchical multiple regression* determined if the addition of self-transcendent and self-enhancing values, perceived behavioral control and attitude, as well as subjective norm improved the prediction of intention to recycle over and above socio-demographic variables (gender, education, income, and age group: see Table 2 for details). Linearity was determined by running partial regression plots and a plot of studentized residuals was run against the predicted values. A Durbin-Watson statistic of 1.917 confirmed independence of residuals. Multi-collinearity was assessed by ensuring that no VIF value was greater than 10. After the removal of 10 outliers, there were no studentized residuals above +/- 3 SD. Additionally, no values for Cook's distance were detected above 1 and no leverage value was above 0.2. The assumption of normality was assessed by Q-Q plot and met.

The complete model of socio-demographic variables (gender, education, income, and age group), self-transcendent and self-enhancing values, perceived behavioral control and attitude, as well as subjective norm (Model 4) was statistically significant R^2 = .422, *F* (22, 775), = 25.71, *p* < .001, adjusted R^2 = .406. The primary model (Model 1) with socio-

demographic variables (gender, education, income and age group) was a statistically significantly predictor of intention to recycle R^2 = .118, F (17,780) = 6.142, p < 0.001. The addition of self-transcendent values and self-enhancing values (Model 2) led to a statistically significant increase in R^2 = .152, F (2, 778) = 81.12, p < .001. The addition of perceived behavioral control and attitude (Model 3) led to a statistically significant increase in R^2 = .103, F (2,776) = 63.66 p < 0.001. The addition of subjective norm (Model 4) led to a statistically significant increase in R^2 = .049, F (1,775) = 66.27, p < .001.

Table 2
Multiple Hierarchical Regression with Socio-Demographic Variables, Individual Level Factors, and Community Level Factors

	Adjusted R^2	R^2 Change	F Change	p
Model 1 *(Gender, Education, Income, and Age Group)*	.099	-	6.14	<.000
Model 2 *(Self-Transcendent and Self-Enhancing Values)*	.252	.152	81.12	<.000
Model 3 *(Perceived behavioral control and Attitude)*	.356	.103	63.66	<.000
Model 4 *(Subjective Norm)*	.406	.049	66.27	<.000

Note: N = 935

Discussion

The present study ascertained whether the addition of community-level predictors might add explanatory power to intention to recycle, rather than simply individual-level predictors. We hypothesized that demographic variables would not significantly predict intention to recycle (Hypothesis 1), while personal values (Hypothesis 2), perceived behavioral control and attitude (Hypothesis 3), and subjective norms would predict significantly (Hypothesis 4) intention to recycle. Overall, we predicted that greater explanatory power was to be obtained combining individual level-predictors with community-level predictors (Hypothesis 5).

The results of this study indicated that contrary to our first hypothesis, some of the demographic variables did predict significantly the intention to recycle (namely education and income). For instance, while gender and age was not significantly predictive of intention to recycle in all models, lower levels of education (trade school and high school or equivalent, negatively and significantly predicted intention to recycle. With regards to income, participants who earned less that $75,000 earned less significantly and negatively predicted intention to recycle. Our results vary from the previous literature (Saphores et al., 2012; Barr, 2007, Clarke & Maantay, 2006) that found that women, older persons, more highly educated as well as persons with higher salary tending to recycle more.

Interestingly, more predictive power was obtained by personal values than by variables included in the theory of planned behavior

such as attitude and perceived behavioral control. Such a finding indicates that values are probably a better way to measure the intention to recycle as opposed to merely attitude or perceived behavioral control. Values, are likely to be more nuanced and requiring deliberate intention resulting in a better measure of cognitive factors influencing the intention to recycle than attitude and should likely become an integral part of theories surrounding the reason why people recycle. Interestingly, the perception of possibility as measured to perceived behavioral control likely indicates that if a person's values align with recycling they will likely take significant steps, despite perceived difficulty, to carry out the recycling action.

The least increase in predictive power occurred when subjective norm was included in the regression. Such a finding is likely due to the fact that we could not significantly account for various communities and their pro or indifferent attitudes towards recycling. Consequently, individuals from communities with less social pressure could have been oversampled leading to a distorted baseline that did not allow for accurate measurement of community impact.

Within this study the second, third and fourth hypotheses, however, were confirmed. Personal values, attitude and perceived behavioral control all predicted significantly intention to recycle. The confirmation of our hypotheses led to the confirmation of the fifth hypothesis; namely, greater explanatory power is obtained with intention to recycle if community and individual level predictors are combined.

The present study indicated an interesting shift with theories of planned behavior (or parts thereof as explained above) presenting less statistical explanatory power than personal values. A possible reason for this finding might be that environmental concerns have taken such a dominant position in political discourse that there have even been discussions about new forms of anxiety arousing from such discourse (eco-anxiety, Ojala et al., 2021). Such a shift in cultural and political discourse would mean that personal values would become more salient (and more politicized) than other more mundane actions. We believe that this might account for the shift in greater predictive value offered by Schwartz's (1992) Theory of Values than Ajzen's (1991) Theory of Planned Behavior.

The lesser increase in predictive power in demographics and subjective norm (what we have deemed as community-level predictors) can be explained due to a limitation of the dataset, namely, that it was an online panel with participants responding from all over the country thereby indicating a heterogeneity of communities and contexts. Nonetheless the very fact that despite this limitation both socio-demographics and subjective norm aided in increasing the predictive power of the model highlights the need for further nuancing environmental research by introducing nesting community-level variables and contextualizing factors.

Our study, of course, has limitations such that it failed to contextually nuance the findings by talking about the politics and history of the context in which the participants find themselves in. We did not expand on the demographic variables suggested by the results; future studies need to dive deeper into understanding who is likely to recycle including demographic measures such as race, type of household and various measures of SES such as car ownership. Additionally, given that such a study utilized archival data, the possibility of adding measures such as sense of community and neighborhood/residential attachment which are staples of community psychology literature could not be added into the analysis. Furthermore, our sample was not a representative sample and therefore cannot

be perfectly generalized to the entire US population. Finally, our study used intention to recycle as a dependent variable, however merely having the intention to recycle is not immediately and automatically equivalent to actually carrying out recycling behavior, which could therefore mean that there is an overestimation of predictors on the actual final behaviors.

Despite the above limitations, however, our study contributed significantly to community psychology and more broadly social psychology by indicating that community level predictors are important factors that should be accounted for in any future study looking at environmental behaviors such as recycling. Future studies might add more measures that are found in much community psychology research such as sense of community, psychological home and neighborhood attachment to verify whether they increase predictive power. Additionally carrying out analyses about the relationship between individual level variables and community level variables would also lead to important insights for the field of psychology. Thus, we reiterate our claim that social behaviors require a mixture of individual-level and community-level variables in order to have better and more predictive models, and more importantly socially just conceptualizations of research.

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