Personal Relative Deprivation and Mental Health Among University Students:
Cross-sectional and Longitudinal Evidence

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Abstract

Colleges and universities are a unique context in which students encounter similar aged peers from a wide range of economic backgrounds. As emerging adults coping with major life transitions, students may be especially sensitive to upward contrasts with other students who have advantages that they feel they deserve (personal relative deprivation or PRD). We surveyed a population of university students when they were second- and third-year students ($N = 309$), and two years later, when they were fourth- and fifth-year students ($N = 400$). Increased PRD predicted increased anxiety and depression – even after accounting for students' access to social support, the degree to which they identified with the university, and their gender, family income, ethnic background and whether the student was a first-generation college student. For a third separate sample of students who completed both surveys ($N = 168$), PRD predicted students' mental health two years later even after accounting for their earlier anxiety and depression. In all three samples, PRD mediated the relationship between self-reported family income and mental health. These data indicate that universities and colleges should consider a broad range of interventions and policies that can mitigate the impact of upward social contrasts.

Keywords: relative deprivation, undergraduates, social comparison, mental health, social support, perceived discrimination, university identification

The number and variety of United States high school graduates who begin college or university continues to increase (Complete College America, 2014; Leonhardt, 2018; Pfeffer, 2018). However, the benefits of college (including higher wages, lower unemployment, better long-term health, and higher life satisfaction) are based on college graduation, not entry (Astin, 1993; Pascarella & Terenzini, 2005). Therefore, the low rates of college graduation among students from lower socioeconomic backgrounds are alarming (Leonhardt, 2018). For example, among students from families in the bottom 40% of U.S. incomes (measured when students were between the ages of 10 and 14 years old), only 12% completed a college degree by age 25. This percentage is a stark contrast to the 32% of those in the middle 40% and the 60% of those in the top 20% of family incomes who graduate by age 25 (Pfeffer, 2018).

Financial constraints such as needing to work for pay and differences in academic preparation can explain part of this income-based achievement gap, but not all (Armstrong & Hamilton, 2013; Hamilton & Cheng, 2018; Spitzer & Aronson, 2015; Stephens, Hamedani, & Destin, 2014; Stephens, Markus, & Phillips, 2014). In this paper, we argue that previous explanations miss how students' interpretations of their local economic position influence their experiences (Johnson, Richeson, & Finkel, 2011; Ostrove, 2003; Ostrove & Long, 2007). Colleges and universities are a unique context in which students encounter, often for the first time, other people from a wide range of economic backgrounds (Gurin, Nagda, & Lopez, 2004). As emerging adults coping with major life transitions, they could be especially sensitive to the economic comparisons created by studying and living with similar aged peers (Armstrong & Hamilton, 2013; Arnett, 2000). As first described by Stouffer and his colleagues (1949), people interpret their own situation in comparison to the situation of similar others. If one witnesses others coping with similar or worse financial constraints, they will view their economic circumstances as reasonable and fair. However, if one sees others receiving advantages and resources that they feel they also deserve, they will feel

deprived and resentful. These interpretations influence people's attitudes and behavior (Smith, Pettigrew, & Huo, 2019; Smith, Pettigrew, Pippin, & Bialosiewicz, 2011).

Personal Relative Deprivation

Personal relative deprivation (PRD) is the product of an upward comparison that indicates that one's personal disadvantaged situation is undeserved coupled with anger and resentment (Smith et al., 2011). PRD is associated with a wide range of mental health outcomes. For example, in an internet-based survey of 2999 English-speaking adults (Beshai, Mishra, Meadows, Parmar, & Huang, 2017), PRD explained between 13% and 25% of the variance in depressive symptoms, even after accounting for income, gender, education, age and marital status, stress, dysfunctional negative attitudes and emotion regulation strategies. Increased PRD also is associated with increased suicidal ideation among Chinese students (Zhang & Tao, 2013), greater depression among Icelanders following the 2010 financial crisis (Ragnarsdóttir, Bernburg, & Ólafsdóttir, 2013), and more anxiety and depression among U.S. university faculty members faced with a 10% pay cut (Osborne, Smith, & Huo, 2012). Finally, a community survey of Canadian community members (recruited from food banks, homeless shelters, employment offices, and the local university) showed that those who reported increased PRD also reported reliably worse mental health, even after accounting for social support and personal income (Mishra & Carleton, 2015; see also Callan, Kim, & Matthews, 2015). For this study, we surveyed a population of university students when they were second- and third-year students, and two years later, when they were fourth- and fifth-year students. A small subset of students completed both surveys. This subset of students allows us to test whether students who report more PRD as second- and third-year students experience more anxiety and depression two years later. As far as we know, this is the first longitudinal test of the relationship between PRD and mental health. Based on previous research, we predict the following:

Hypothesis 1. Increased PRD will predict decreased mental health even after accounting for students' gender, first generation college student status, ethnic background and family income.

Predictors of PRD

RD researchers (Callan et al., 2015; Osborne, Sibley, & Sengupta, 2015; Smith et al., 2019) assume that PRD represents people's proximal experience of their objective position in larger income distributions. Numerous studies demonstrate that PRD predicts physical and mental health even after accounting for objective indicators of income and education (Callan et al., 2015; Smith et al., 2011). A recent survey of New Zealand adults (Osborne et al., 2015) is a rare direct test of whether PRD mediates the relationship between objective income and personal self-esteem. These data confirm that objective socio-economic status indirectly shapes people's self-appraisals through PRD. Therefore, we predict:

Hypothesis 2. PRD will mediate the relationship between students' self-reported family income and their feelings of anxiety and depression, even after accounting for students' ethnic background and whether they are first generation college student or not.

Although we adopt the traditional RD focus on income, students who report lower family incomes are more likely to be a first-generation college student and from minority ethnic backgrounds (Fischer, 2007). Students from these backgrounds can feel alienated and disconnected from the university (Davis, 2010; Lee & Barnes, 2015; Scheffler et al., 2018). Just as income differences could highlight differences and disadvantages, students from ethnic minority backgrounds or who are the first to attend college in their family also might notice the differences and disadvantages that create PRD (Kim, Callan, Gheorghiu, & Skylark, 2018). Therefore, in an exploratory analysis we examine whether first generation college student status and minority ethnic background predict PRD.

We also explore whether local experiences of discrimination toward a number of possible identity groups predict PRD. The study of New Zealand adults described above (Osborne et al., 2015) showed that the relative income inequality in one's local neighborhood indirectly shaped respondents' personal self-esteem through PRD. This pattern echoes people's tendency to be most sensitive to relative differences among local comparison referents (Zell & Krizan, 2014). One set of events that could make these local differences more salient to students are discrimination experiences (which can mark status differences among students). As Gartrell (2002) showed in his network analysis of undergraduate students' comparison of grades, people respond to injustice by seeking out comparisons to others (Tyler, Boeckmann, Smith, & Huo, 1997). More frequent campus-based discrimination experiences could increase the likelihood that students make the upward contrasts that inform PRD. Discrimination marks differences among groups of students and makes injustice salient. As part of the survey of second- and third-year students, we asked respondents to indicate how frequently they experienced discrimination from faculty and other students across a wide range of possible social categories. These data enable us to explore whether students who experience more frequent campus-based discrimination report more PRD, and further, whether discrimination experiences indirectly influence students' mental health through PRD.

Other Predictors of University Student Mental Health

Minority ethnic background, first generation college student status and gender also predict students' reports of anxiety and depression (Davis, 2010; Lee & Barnes, 2015; Scheffler, et al., 2018). Therefore, we include all three characteristics as direct predictors of students' mental health. In addition, we test two other predictors of undergraduate students' mental health; students' perceptions of social support and the degree to which they identify with the university. There are clear and consistent associations between inadequate social support (defined as access to people who

can provide emotional, instrumental and appraisal support when needed) and negative mental health outcomes (Fuhrer, Stansfeld, Chemali, & Shipley, 1999; Marchand & Blanc, 2011). For example, middle aged British civil servants who reported less social support also reported more psychological distress two to three years later even after accounting for their earlier mental health (Fuhrer et al., 1999). Similarly, Canadian workers aged 15 to 55 who reported less social support in their workplace reported more episodes of psychological distress (Marchand & Blanc, 2011). Finally, United States undergraduates who reported weaker social support also reported worsened mental health (DeBerard & Masters, 2014).

Hypothesis 3. Increased perceptions of social support will predict increased mental health.

Stronger identification with one's reference groups (e.g., university students' identification with their institution) is associated with better physical and mental health (Jetten et al., 2017; Jetten, Haslam, & Haslam, 2012). Stronger group identification provides a sense of belonging, meaning and purpose, a source for self-affirmation and appears to reinforce people's sense of (personal) control (Greenaway, Cruwys, Haslam, & Jetten, 2016; Steffens, Haslam, Schuh, Jetten, & van Dick, 2017). In one experiment, psychology undergraduates who wrote about an important group membership responded to failure on a problem-solving task with fewer depressive attributions (e.g., failures reflect internal, stable and global causes) and felt better in comparison to undergraduates who were not primed to think about an important group membership (Cruwys, South, Greenaway, & Haslam, 2015).

University identification could be especially protective for undergraduates' mental health. A meta-analysis of 58 investigations of the relationship between work relevant group identification and health showed that organizational identification (the closest proxy to university identification) predicted employees' mental and physical health as strongly as did measures of work team identification (average $r = .21$, Steffens et al., 2017). Further, students from under-represented

groups who are exposed to interventions designed to increase their sense of belonging to the university are more academically successful and likely to stay (Harackiewicz & Priniski, 2018; Walton & Cohen, 2011). Increased university identification also predicts students' willingness to trust university authorities, interpret negative events more favorably, and engage in university and academic activities (Di Battista, Pivetti, & Berti, 2014; Osborne et al., 2012; Smith, Olson, Agronick, & Tyler, 2009).

Hypothesis 4. Increased university identification will predict increased mental health.

Method

University Context

All respondents were enrolled as undergraduates at a medium-sized public state university. When we began this project, 63% of the approximately 8,000 undergraduate students were women, 48.6% were European-Americans (27.6% indicated a Hispanic background), and 32% received United States Federal Pell grants (<http://web.sonoma.edu/aa/ra/students/index.html>).

Participants

Second and third-year university students. In Fall 2014, we invited all second- and third-year university students to complete an internet-based questionnaire (22.2% response rate). Three hundred and nine students completed the relevant questions. Respondents' mean age was 19.57 ($SD = 0.50$), 67.3% of the respondents described their ethnic background as some form of European-American, 78% described themselves as female, and 42% reported being a first generation college student (i.e., parents and/or immediate guardians did not complete a four year college degree). Respondents chose a family income category from 8 possibilities that ranged from 1 (*less than \$15,000*) to 8 (*more than \$150,000*). The average family income was between \$50,000 and \$75,000. Data for self-reported mental health and discrimination experiences were included in Smith, Jaurique and Ryan (2016), but all the analyses described for this paper are original.

Fourth- and fifth-year university students. In Fall 2016, we contacted the same population of students (22.7% response rate). Four hundred students completed all the relevant questions. Respondents' mean age was 22.72 ($SD = 1.38$), 57.5% of the respondents described their ethnic background as some form of European-American, 73.3% described themselves as female and 41.3% reported that their parents and/or immediate guardians did not complete a four-year college degree. The average family income was between \$50,000 and \$75,000.

Longitudinal data set. We matched 168 respondents who completed all the relevant questions for both questionnaires (their data are excluded from the other two data sets for the analyses). Respondents' mean age was 21.70 ($SD = 1.52$), 61.2% of the respondents described their ethnic background as some form of European-American, 83.4% described themselves as female and 47.6% reported that their parents and/or immediate guardians did not complete a four-year college degree. The average family income was between \$50,000 and \$75,000.

Procedure

A faculty member and team of 15 undergraduates created the questionnaire based on a review of relevant psychological literature and interviews with various campus stakeholders. In Fall 2014, all second- and third-year students who began their college career at the university received a postal letter of invitation addressed to their permanent home address, followed by an email invitation to complete a 30-minute questionnaire hosted by Qualtrics (an internet-based survey software program). We invited all respondents to participate in a separate lottery for 50 \$50.00 electronic gift certificates. We sent three additional email reminders about the survey after the first emailed invitation. We followed the same procedure for the survey of fourth- and fifth-year students.

Measures

At both time points, the survey contained additional student experience measures that were relevant to other collaborators on the broader project. The complete survey at both time points can be accessed on Open Science Framework (<https://osf.io/96wf3/>).

Mental health. Participants indicated from 1 (*never*) to 5 (*all of the time*) the extent during the past few months that they have (a) been a nervous person (reverse scored), (b) felt so down in the dumps that nothing could cheer them up (reversed scored), (c) felt calm and peaceful, (d) been a happy person, and (e) felt downhearted and blue (reversed scored; Ware & Sherbourne, 1992; α (second year students) = .80, α (fourth year students) = .82).

Personal Relative Deprivation. We adapted items from the scale developed by Callan and colleagues (2008, 2015) based on interviews and a pilot test with local university students.

Respondents rated each of the following items from 1 (*strongly disagree*) to 5 (*strongly agree*): (a) Most other students at this university have more money than I do (b) I feel resentful when I see what other students at this university can afford (c) I feel privileged with what I have compared to other students at this university (reverse scored) and (d) Compared to other students at this university, I can afford a more comfortable lifestyle (reverse scored), α (second year students) = .70, α (fourth year students) = .69). The original measure predicts gambling urges, problem and pathological gambling tendencies (Callan, Ellard, Shead, & Hodgins, 2008), antisocial conduct or delinquency (Mishra & Novakowski, 2016), lower conscientiousness (Mishra & Novakowski, 2016), and lower physical and mental health (Beshai et al., 2017; Callan et al., 2015; Mishra, & Carleton, 2015). The original survey included three additional items designed to measure PRD; (a) Since coming to SSU, I have changed my language or dress to fit in better, (b) Attending college creates financial stress for my family, and (c) Financial pressure limits my ability to participate in extra-curricular activities. An anonymous reviewer observed that these items do not capture the comparative nature of PRD, so

we excluded them. However, the patterns are similar if these items are included (further information is available from the first author).

Social Support. Social support was measured on a 1 (*never*) to 5 (*always*) scale (α (second year students) = .94, α (fourth year students) = .93). Items adapted from Cohen, Mermelstein, Kamarck, and Hoberman (1985) asked respondents whether there was someone available to them who would (a) listen to them when they needed to talk, (b) give them good advice about a problem, (c) show them love and affection, (d) help them with daily activities, (e) help them make a difficult decision, and (f) keep their secrets.

University identification. We included three items designed to measure the extent to which respondents identified with the university (Smith et al., 2009; Tyler & Blader, 2000; Tyler, Degoe, & Smith, 1996). Student indicated whether they (a) were proud to think of themselves as students at the university, (b) identified with the university, and (c) avoided telling people that they attended the university (reverse scored). α (second year students) = .78, α (fourth year students) = .78). Respondents rated each item from 1 (*completely disagree*) to 5 (*completely agree*).

Experience campus-based discrimination. We adapted a set of questions asked by Hutchinson, Raymond, and Black (2008) to index experiences with discrimination. We summed participants' responses about how often from 1 (*never*) to 5 (*very often*) other university students or faculty treated them unfairly or harassed them because of 13 different characteristics. The characteristics included: race/ethnicity, gender, sexual orientation, religion, age, accent, dialect, national origin, physical disability, socio-economic class, citizenship status, political views and, learning or other disability. Sums could range from 26 to 130 with a mean of 30.31 ($SD = 7.45$, $\alpha = .91$).

Fourth- and fifth-year students did not complete these questions but did answer whether they had ever been treated unfairly because of a personal characteristic like ethnicity, religion, sexual orientation, ability, or gender (15.3% selected yes).

Demographic Variables

Respondents reported their preferred gender and racial/ethnic background. We coded respondents' open-ended responses as representing male, female or other (the three respondents who did not describe themselves as male or female from the data) and minority or majority ethnic background (we coded respondents who reported multiple ethnic backgrounds as reporting a minority ethnic background). We also asked respondents to estimate their immediate family income.

Second- and third-year respondents reported both their mother's and father's highest level of education. However, in an effort to include respondents who had two same sex parents and/or guardians, we asked fourth- and fifth-year respondents to indicate the highest level of education that either of their parents or legal guardians achieved. In both surveys, choices included grade school, middle school/junior high, high school diploma, AA degree, BA/BS degree, Master's degree, technical or vocational degree, PhD, PsyD, EdD, MD or JD.

Results

We centered all predictors except first generation college student status, gender, and ethnic minority or majority background, before they were included in the analyses. We tested our hypotheses with structural equational modeling (EQS 6.2, Bentler, 2006). We report the normed fit index (NFI), the non-normed fit index (NNFI) and the comparative fit index (CFI) for which higher values indicate better model fit (with values above .90 for the NFI and .95 for the CFI indicating good fit, Byrne, 2006; Hooper, Coughlan, & Mullen, 2008; Pedhazur & Schmelkin, 1991). We also report the standardized root mean square residual (SMSR) and the root mean square error of approximation (RMSEA) for which lower values indicate better model fit (with values of less than

.05 for SMSR and .08 for RMSEA indicating good fit, Byrne, 2006; Hooper et al., 2008; Pedhazur & Schmelkin, 1991). There were 72 incomplete cases in the 2014 sample, 111 incomplete cases in the 2016 sample, and 38 incomplete cases in the longitudinal sample. To address the missing data, we used maximum likelihood estimation.

Second- and Third-Year Students

Table 1 presents the means, standard deviations, and correlations among the variables for this sample. We tested five different structural equation models. First, as shown in Figure 1, we tested a model in which (a) ethnic background, first generation college student status, and self-reported family income predict PRD and (b) PRD, gender, ethnic background and first-generation college student status predict mental health. We allowed the relationships among ethnic minority background, first generation college student status and self-reported family income to covary. This model yields indices that indicate a good fit; $\chi^2(4) = 8.74, p = .07$, NFI = .96, NNFI = .91, CFI = .98, SRMR = .05, RMSEA = .06, 90% $CI_{RMSEA} [.00, .12]$. Respondents who reported lower family incomes ($b^* = -.40, z = -56.35; p < .001$) reported more PRD. Female respondents ($b^* = .20, z = 3.72; p < .001$) and those who reported less PRD ($b^* = -.33, z = -5.83; p < .001$) reported greater mental health. PRD reliably mediated the relationship between self-reported family income and mental health, *indirect effect* = .04, *SE* = .01, 95% *CI* [.02, .06].

The second model includes frequency of discrimination experiences as a direct and indirect predictor of self-reported mental health. For this model, we allowed the relationships among ethnic minority background, first generation college student status, self-reported family income and discrimination experiences to covary (we omitted the relationship between discrimination experiences and self-reported family income). The fit remained good, $\chi^2(9) = 18.73, p = .03$, NFI = .92, NNFI = .90, CFI = .96, SRMR = .05, RMSEA = .02, 90% $CI_{RMSEA} [.00, .10]$. More discrimination experiences predicted more PRD ($b^* = .24, z = -4.23; p < .001$), and less self-reported

mental health ($b^* = -.15$, $z = -2.73$; $p = .006$). PRD reliably mediated both the relationship between discrimination experiences and mental health, *indirect effect* = .03, $SE = .008$, 95% CI [.01, .05] and the relationship between self-reported family income and mental health, *indirect effect* = .06, $SE = .02$, 95% CI [.02, .10]).

In a third model, we included university identification and social support as additional independent predictors of mental health, allowing both predictors to covary with other predictors in the model. The model fit is similar: $\chi^2(11) = 39.40$, $p = .002$, NFI = .92, NNFI = .82; CFI = .94, SRMR = .05; RMSEA = .07, 90% CI_{RMSEA} [.04, .11]. Respondents who reported stronger identification ($b^* = .17$, $z = 3.39$; $p < .001$) and greater social support ($b^* = .32$, $z = 6.26$, $p < .001$) also reported higher mental health. The statistical reliability of the other path coefficients did not change.

Alternative models. If PRD is not included in a fourth model with university identification, social support and demographic characteristics as predictors of mental health, the fit is poor: $\chi^2(15) = 97.25$, $p < .001$, NFI = .73, NNFI = .40; CFI = .75, SRMR = .10; RMSEA = .12, 90% CI_{RMSEA} [.11, .16]. We also tested a fifth model in which we treated mental health (with discrimination experiences and the demographic variables directly predicting mental health) as a predictor of PRD. This model also yielded a poor fit; $\chi^2(10) = 78.23$, $p < .001$, NFI = .78, NNFI = .23; CFI = .79, SRMR = .08; RMSEA = .15, 90% CI_{RMSEA} [.12, .18].

Fourth- and Fifth-Year Students

Table 2 presents the means, standard deviations, and correlations among the variables for this sample. Comparisons between school years revealed that the fourth- and fifth-year student sample included more respondents who mentioned an ethnic minority background (42.5%) in comparison to the second- and third-year student sample (32.7%); $\chi^2(1) = 5.32$, $p = .01$.

As shown in Figure 2, respondents who reported lower family incomes ($b^* = -.40$, $z = -6.95$; $p < .001$) reported more PRD. Respondents who reported less PRD ($b^* = -.27$, $z = -5.05$; $p < .0001$) also reported greater mental health. However, in this model, female respondents did not report greater mental health ($b^* = .09$, $z = 1.80$; $p = .07$). PRD reliably mediated the relationship between self-reported family income and mental health, *indirect effect* = .04, $SE = .01$, 95% CI [.02, .05]. The model yields indices that indicate a good fit; $\chi^2(4) = 9.23$, $p = .06$, NFI = .96, NNFI = .90, CFI = .97, SRMR = .05, RMSEA = .06, 90% CI_{RMSEA} [.00, .11].

The fit for a second model with discrimination experiences as a direct and indirect predictor of self-reported mental health is good, $\chi^2(9) = 13.98$, $p = .12$, NFI = .94, NNFI = .95, CFI = .98, SRMR = .05, RMSEA = .04, 90% CI_{RMSEA} [.00, .07]. An experience with discrimination (coded as 1, no experience as 2) predicted more PRD ($b^* = -.14$, $z = -3.69$; $p < .001$), and less self-reported mental health ($b^* = -.18$, $z = -3.97$; $p < .001$). PRD also reliably mediated both the relationship between discrimination experiences and mental health, *indirect effect* = .007, $SE = .002$, 95% CI [.003, .01] and the relationship between self-reported family income and mental health, *indirect effect* = .03, $SE = .009$, 95% CI [.02, .05]).

In a third model, we included university identification and social support as additional independent predictors of mental health, allowing both predictors to covary with other predictors in the model. The model fit is similar: $\chi^2(11) = 26.91$, $p = .005$, NFI = .94, NNFI = .87; CFI = .96, SRMR = .04; RMSEA = .06, 90% CI_{RMSEA} [.03, .09]. Respondents who reported stronger identification ($b^* = .18$, $z = 3.82$; $p < .001$) and greater social support ($b^* = .33$, $z = 6.85$, $p < .001$) also reported higher mental health. The statistical reliability of the other path coefficients did not change.

Alternative models. If PRD is not included in a fourth model with university identification, social support and demographic characteristics as predictors of mental health, the fit is poor: $\chi^2 (15) = 169.19, p < .001$, NFI = .60, NNFI = .04; CFI = .60, SRMR = .10; RMSEA = .16, 90% CI_{RMSEA} [.14, .18]. We also tested a fifth model in which we treated mental health (with discrimination experiences and the demographic variables directly predicting mental health) as a predictor of PRD. This model yielded a poor fit; $\chi^2 (10) = 98.23, p < .001$, NFI = .77, NNFI = .18; CFI = .77, SRMR = .08; RMSEA = .15, 90% CI_{RMSEA} [.12, .18].

Longitudinal Sample

Table 3 presents the means, standard deviations, and correlations among the variables for this sample. Respondents reported worse mental health at Time 2 ($M = 3.37, SD = 0.60$) in comparison to Time 1 ($M = 3.49, SD = 0.66$); $t(166) = 2.25, p = .03$. They also reported weaker university identification at Time 2 ($M = 4.06, SD = 0.79$) in comparison to Time 1 ($M = 4.29, SD = 0.63$); $t(166) = 3.99, p < .001$.

Before we tested our models, we conducted a confirmatory factor analysis for the four self-reported measures (mental health, PRD, social support and university identification). We compared a model in which we constrained the factor loadings and the covariances among the four measures to be equivalent across time ($\chi^2 (268) = 496.13, p < .001$, NFI = .84, NNFI = .91, CFI = .92, SRMR = .08, RMSEA = .07, 90% CI_{RMSEA} [.06, .08]) with a model in which there were no constraints ($\chi^2 (254) = 466.57, p < .001$, NFI = .85, NNFI = .91, CFI = .92, SRMR = .07, RMSEA = .07, 90% CI_{RMSEA} [.06, .08]). However, because the small sample size could create problems for an adequate test of this measurement model (Bentler & Chou, 1987), we tested the same models with the full two school year samples. Again, we tested a model that constrained the factor loadings and the covariances among the four factors to be equivalent across samples ($\chi^2 (272) = 1062.00, p < .001$,

NFI = .94, NNFI = .96, CFI = .97, SRMR = .04, RMSEA = .04, 90% CI_{RMSEA} [.04, .05]) with a model in which there were no constraints ($\chi^2(253) = 1009.23, p < .001$, NFI = .95, NNFI = .96, CFI = .96, SRMR = .04, RMSEA = .04, 90% CI_{RMSEA} [.04, .05]). Given that the longitudinal data represents the same populations as the two school year samples, the fit indices give us some confidence that the measures capture similar constructs.

We next tested the three models that we tested for the other two samples with the longitudinal data. The first model in which Time 1 mental health and Time 2 PRD were included as additional predictors of Time 2 mental health and Time 2 PRD yields indices that indicate a good fit; $\chi^2(10) = 15.31, p = .12$, NFI = .92, NNFI = .91, CFI = .97, SRMR = .07, RMSEA = .05, 90% CI_{RMSEA} [.00, .11]. Decreased Time 1 PRD ($b^* = -.22, \zeta = -3.06; p < .001$) and increased Time 1 mental health ($b^* = -.45, \zeta = 6.60; p < .001$) both predicted Time 2 mental health. Increased Time 1 PRD ($b^* = .40, \zeta = 5.32; p < .001$) predicted Time 2 PRD, but decreased Time 1 mental health ($b^* = -.13, \zeta = -1.92; p = .05$) did not. Finally, less self-reported family income ($b^* = -.42, \zeta = -5.93; p < .001$) and first-generation college student status ($b^* = -.17, \zeta = -2.45; p < .001$) predicted increased Time 1 PRD.

Time 1 PRD mediated the relationship between self-reported income and Time 2 mental health, *indirect effect* = -.03, *SE* = .01, 95% CI [.01, .05] as well the relationship between self-reported income and Time 2 PRD, *indirect effect* = -.06, *SE* = .02, 95% CI [.03, .09]. Time 1 PRD also mediated the relationship between first generation college student status and Time 2 PRD, *indirect effect* = -.10, *SE* = .04, 95% CI [.01, .18].

A second model in which Time 1 discrimination experiences were included as an additional predictor of Time 1 PRD, Time 2 PRD and Time 2 mental health produced good fit indices, $\chi^2(15) = 20.79, p = .14$, NFI = .90, NNFI = .92, CFI = .97, SRMR = .07, RMSEA = .05, 90% CI_{RMSEA}

[.00, .09]. More frequent discrimination experiences predicted Time 1 PRD ($b^* = .17$, $z = 2.66$; $p = .01$), but not Time 2 PRD ($b^* = .04$, $z = 0.47$; $p = .63$) or Time 2 mental health ($b^* = -.08$, $z = 0.58$; $p = .56$). Time1 PRD mediated the relationship between discrimination experiences and Time 2 PRD, *indirect effect* = $-.06$, $SE = .03$, 95% CI [.01, .10]. The statistical reliability of the other path coefficients did not change.

A third model in which Time 1 university identification and Time 1 social support were included as additional predictors of Time 2 mental health showed poor fit, $\chi^2(30) = 49.89$, $p = .21$, NFI = .81, NNFI = .83; CFI = .91, SRMR = .08; RMSEA = .06, 90% CI_{RMSEA} [.03, .09]. Time 1 university identification ($b^* = -.03$, $z = -0.42$; $p = .67$) and Time 1 social support ($b^* = -.10$, $z = -1.44$; $p = .15$) did not predict Time 2 mental health. The statistical reliability of the other paths did not change.

Discussion

Consistent with our first hypothesis, increased PRD predicted increased anxiety and depression among university students – even after accounting for their gender, ethnic background and whether the student was a first-generation college student. Consistent with our second hypothesis, PRD also mediated the relationship between self-reported family income, and mental health for second- and third-year students, fourth- and fifth-year students and even two years later for students who completed both questionnaires. We also found some evidence for our exploratory questions. First, increased discrimination directly and indirectly predicted decreased mental health among the two student population samples. However, for the longitudinal sample, increased discrimination only increased Time 1 PRD (although Time 1 PRD appears to mediate the relationship between Time 1 discrimination and Time 2 PRD). Second, first generation college students who completed both surveys reported increased Time 1 PRD in comparison to students who were not first-generation college students. However, this relationship did not occur for either

of the other two samples, so we recommend treating this pattern with caution. Finally, we did not find any direct and indirect effects for students' minority ethnic background on PRD or mental health.

Consistent with our third and fourth hypotheses, increased university identification and social support predicted increased mental health for the two school year samples. However, university identification and social support did not predict the mental health two years later for students in the longitudinal sample. Interestingly, students in the longitudinal sample reported worse mental health (and less university identification), a pattern also evident in an analysis of the responses from over 400,000 United States undergraduates (Scheffler et al., 2018). Whether this pattern reflects shifting social networks from within to outside the university as students travel, work more hours, or gain other experiences is unclear. Finally, consistent with past research, female second- and third-year students reported greater mental health in comparison to male second- and third-year students; but this pattern was not reliable for fourth- and fifth-year students.

Implications for Theory

Income inequality clearly shapes educational outcomes (Armstrong & Hamilton, 2013; Pfeffer, 2018). Students from lower economic backgrounds arrive at universities less academically prepared and face more financial constraints-- obstacles that students from higher economic backgrounds have the privilege of not encountering (Armstrong & Hamilton, 2013; Pfeffer, 2018; Walton & Cohen, 2011). However, a focus on objective income inequality misses how students' subjective interpretation of their economic position compared to their peers shapes their behaviors. As these data confirm; subjective appraisals of one's economic circumstances more strongly predict mental health in comparison to objective measures of education and income (Adler & Stewart, 2010; Callan et al., 2015; Smith et al., 2011). More important, RD theory explains why the relationship between objective economic circumstances and people's attitudes and behaviors is not always

straightforward. Sometimes, those with relatively more resources compare their situation to those who have even more, and those with relatively fewer resources compare their situation to those who have even less (Smith et al., 2011). For example, in-depth interviews with students from a broad range of socio-economic backgrounds who attended a highly selective U.S. university revealed that middle class students reported the greatest frustration with campus social life. These students, who compared their social situation with upper class students, were keenly aware that their relative lack of time and money created a social disadvantage (Thiele & Gillespie, 2017). In contrast, students from lower socio-economic backgrounds compared themselves to their less advantaged peers or family members who did not have the same access to elite university spaces, and therefore, reported less resentment about their social experiences (Thiele & Gillespie, 2017).

One important question unanswered by these data is whether the increased anxiety and depression reported by students reflects the unique nature of PRD, or if it is a general consequence associated with more frequent social comparisons of any type (Steers, Wickham, & Acitelli, 2014). Other researchers propose that people who compare more frequently (regardless of direction or dimension) report more depressive symptoms (Steers et al., 2014). Although we cannot rule out this possibility with these data, social comparison researchers demonstrate the extent to which comparison direction (upward or downward) and either contrasting or assimilating the comparison target into one's reference group determines people's emotional reactions to the comparison (Buunk & Ybema, 1997; Leach, Snider, & Iyer, 2002). Upward assimilative comparisons are associated with inspiration, downward contrasts are associated with relief (among other emotions) and upward contrasts are associated with anger and resentment (Buunk & Ybema, 1997; Leach et al., 2002; McKee et al., 2013). Further, the resentment and frustration associated with PRD is different from general assessments of one's social status in the larger community (Callan et al., 2015). In six

different studies, PRD predicted English-speaking adults' physical and mental health more strongly in comparison to a ladder measure of subjective social status (Callan et al., 2015).

We suspect that PRD triggers greater rumination about injustice that in turn, leads to negative health consequences (Eib, von Thiele Schwarz, & Blom, 2015). It is why we predicted that students who experienced more campus-based discrimination would report more PRD – not only would discrimination experiences increase the likelihood that students would contrast their situation with others, it also should heighten questions about fairness and justice. In other words, PRD is distinct from the stress associated with status anxiety, fears about confirming other's stereotypes about one's ability (e.g., stereotype threat) or whether one feels that one belongs at the university (Destin, Rheinschmidt-Same, & Richeson, 2017; Rheinschmidt & Mendoza-Denton, 2014; Walton & Cohen, 2011). Although it is clear that anxiety and lack of control have health consequences, the negative affect and expectations associated with PRD also affect physical and mental health (Adler & Stewart, 2010). It also will be important in future research to disentangle anxiety and depression. On the one hand, students' self-reported financial distress predicts the increased rates of anxiety disorders reported by U.S. university and college counseling centers (Scheffler, et al., 2018). On the other hand, depression, and not anxiety, is linked to poor study habits and performance (Flannery, Luebke, & Becker, 2017).

We included ethnic background and first-generation college student status as additional predictors of PRD and mental health because these characteristics often are intertwined with students' financial position (Fischer, 2007). However, it is critical for future researchers to move beyond these crude measures to consider how different identities inform, transform and conflict with each other (Valdez & Golash-Boza, 2018). For example, interviews with 35 undocumented U.S. university students demonstrate how ethnicity, class and undocumented status shaped students' educational experiences (Valdez & Golash-Boza, 2018). Students described different identities as

more or less central to the different challenges that they faced. Unfortunately, we did not have access to large samples of students who represent different intersectional identities (e.g., a low-income, Latinx, first generation college student) for this project.

Universities and colleagues also occupy different status positions in the larger national context which raises the question as to whether high status university community can compensate for a low status economic position within the university. For example, Johnson and colleagues (2011) show that if students from higher socio-economic backgrounds believed that they would be compared to students from an even higher status university, they showed the same self-regulation deficits (as measured by a Stroop task) as did students from lower socio-economic backgrounds. However, if students from lower socio-economic backgrounds believed that they would be compared to students from a less elite university, they no longer showed these performance deficits. In other words, a focus on one's more prestigious university identity appeared to compensate for a lower economic position within the university (Ellemers, 2002; Spears & Manstead, 1989). However, the potential esteem protection provided by a high-status university identity for low status within the university may not be as accessible as one might expect (Seaton, Marsh, & Craven, 2009; Seta & Seta, 1996). First, local comparisons dominate over more distal comparisons (Zell & Krizan, 2014). Further, the possible protection offered by a university's elite status is not available to students who attend less elite public universities (like the one attended by students in this study). Therefore, it is important to determine whether interventions designed and tested at elite universities to improve the experiences for students from lower socio-economic backgrounds extend to non-elite universities and colleges; especially if these interventions implicitly or explicitly rely on students' recognition of the relatively elite status of their particular university or college.

Implications for Practice

The university environment can increase PRD. For example, majors such as interior design, public relations, and viticulture not only signal class-based occupations, they also are difficult career choices for students without appropriate resources or connections (Armstrong & Hamilton, 2013). University sponsored events can highlight economic differences if they are expensive or offered during narrow time windows when many students work. Shared communal areas in dorms that students are expected to furnish together can expose economic differences – students who are struggling to meet their basic needs might only be able to contribute second-hand furniture, whereas other more privileged roommates may be able to provide an expensive flat screen TV. Similarly, differently priced meal plans and dorm rooms highlight resource differences (Ostrove, 2003; Ostrove & Long, 2007). If different campus living opportunities are priced differently, they easily are associated with class-based stereotypes. Students who cannot afford basic essentials such as adequate, nutritious food compared to their more economically privileged peers report feelings of depression, anger and anxiety (Martinez, Frongillo, Leung, & Ritchie, 2018) – feelings that are likely increased when income-based differences are made salient and visible. Even the timing of new student orientations can create economic difficulties (e.g., asking students and family members to attend a weekend orientation during the summer months as opposed to just before the term begins). Therefore, university and college administrators should subsidize event costs whenever possible, provide similar furnishings for any common areas, and think through the unintended consequences of differently priced dorms and meal plans.

Faculty instructors also can create situations in which students are exposed as having fewer resources in comparison to their peers. For example, a weekly potluck or final class celebration can include some students who are able to afford catered sandwiches and others who only can afford an off-brand package of cookies. Similarly, if instructors offer extra credit to go to a museum or an event that costs admission, students who do not have the necessary financial resources or access to

transportation cannot participate. Even more damaging are instances of either systematic or interpersonal discrimination (Jaurique, Ryan, Smith, & Paolucci-Callahan, 2018). The impact of discrimination on students' mental health is complex (Jaurique et al., 2018; Priest, Perry, Ferdinand, Paradies, & Kelaheer, 2014; Schmitt, Branscombe, Postmes, & Garcia, 2014). These experiences can increase PRD, as we show, stereotype threat (Cohen & Garcia, 2014) and academic disengagement (Major, Spencer, Schmader, Wolfe, & Crocker, 1998) – all factors that impact student success. Therefore, it is important that colleges and universities employ a variety of empirically supported trainings that can decrease the likelihood that these sorts of events will occur (Jaurique et al., 2018).

Limitations

There are at least four limitations to consider. First, students reported their experiences. We have no independent confirmation of their experiences or family income. In fact, one surprise was the number of students who left the family income question blank – an issue if this information is to be part of standard data collection. Second, one could argue that the reliance on self-reports could inflate the relationships among the measures (Conway & Lance, 2010). However, all the measures were separated by other questions about students' experiences, and confirmatory factor analyses support their independent treatment. Most important, we have evidence for PRD's predictive value across time. Still, the strongest predictor of PRD at Time 2 was PRD at Time 1 – suggesting the extent to which our measure of PRD might capture a relatively stable individual difference, or a relatively stable local environment. One important question for future research is to determine whether this stability remains if participants report their experiences across a clear environmental transition that is likely to dramatically change their local comparison context. We suspect that one reason university identification and social support did not predict mental health two years later is that students' relationships to the university and others can change dramatically over the course of students' college careers.

Third, the students who chose to complete either cross-sectional survey (and the relatively few students who completed the survey at both time points) represent a very small proportion of the total student population. These students reported relatively strong university commitment and campus engagement. However, one might argue that any self-selection bias should work against the predictive power of PRD if we assume that those who felt most deprived would be the least likely to participate in campus-based research. It also is possible that the predictive power of perceived social support could reflect the high percentage of women in our samples. Some research suggests that women are more sensitive to the quality and quantity of social support (Marchand & Blanc, 2011) but other research suggests that these gender differences are misleading (Fuhrer et al., 1999). Finally, our measure of discrimination experiences and coding of students' ethnic backgrounds did not enable us to distinguish among more nuanced identities and experiences. It is possible that students for whom undeserved disadvantages are new and unexpected will experience more PRD and worse mental health, or it might be the accumulation of these disadvantages that causes most damage (Geronimus, Hicken, & Keene, 2006; Smith & Walker, 2008).

Fourth, the sample size mean that the tests of these models are underpowered. A properly powered test of the first model for the two student population surveys (that estimates 11 distinct parameters) requires 750 participants to achieve 80% power (MacCallum, Browne, & Sugawara, 1996). A properly powered test for the second model that estimates 14 distinct parameters requires 598 participants to achieve 80% power. A properly powered test for the relevant longitudinal models that estimate 18 and 27 parameters respectively require 508 participants to achieve 80% power. Therefore, a critical challenge for future research will be to gather large enough samples to determine the reliability of these results.

Conclusion

Across the United States, university and college students face significant challenges meeting their basic needs such as eating adequate amounts of food and securing safe, affordable housing (Goldrick-Rab, Richardson, & Hernandez, 2017; Martinez et al., 2018; Patton-López, López-Cevallos, Cancel-Tirado, & Vazquez, 2014). Troublingly, rates of food insecurity, in particular, are higher than the national U.S. household (Coleman-Jensen, Gregory, & Singh, 2014). Students who are food insecure face a multitude of issues compared to their more privileged peers such as worse mental and physical health (Freudenberg et al., 2011; Martinez et al., 2018, 2018; Maroto, Snelling, Linck, 2015) and lower GPAs (Martinez et al., 2018). However, little attention has been paid to how these objective economic circumstances shape students' subjective experiences.

Given the extent to which most U.S. citizens grow up in neighborhoods segregated by class (Owens, 2010; Pickett & Wilkinson, 2015), universities and colleges often are students' first encounter with a wide range of socio-economic backgrounds. Although this diversity can offer access to new networks, resources and opportunities, it also can increase students' feelings of relative deprivation (Thiele & Gillespie, 2017). It is tempting to assume that exposure to others with more resources is an unqualified good but the increased anxiety and depression that upward contrasts can create suggests this assumption is too simplistic.

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Table 1. Means, Standard Deviations and Bivariate Correlations for Second- and Third-Year Students.

	M (SD)	1	2	3	4	5	6	7	8
1. Mental Health	3.32 (0.70)	-							
2. PRD	2.99 (0.73)	-.33**	-						
3. University identification	4.19 (0.72)	.28**	.18*	-					
4. Social Support	4.01 (0.98)	.38**	-.23**	.23**	-				
5. Family Income	5.11 (2.15)	.11	-.41**	.03	.18**	-			
6. Gender	-	.19**	-.05	-.10	.10	.05	-		
7. Ethnic Background	-	-.03	.12	.09	-.04	.33**	.12	-	
8. First generation college student	-	-.03	.16**	-.13*	.07	.35**	.16*	.42**	-
9. Experience discrimination	30.31 (6.89)	-.25**	.27**	-.21**	.20**	-.13	-.09	.01	.04

Note. $N = 309$. PRD = Personal Relative Deprivation. First generation college students are coded as 1 (42.0%) and others are coded as 2, women are coded as 1 (77.9%) and men are coded as 2, respondents who reported European-American backgrounds are coded as 1 (65.8%), those who reported non-European-American background are coded as 2. Discrimination experiences (summed across 13 different characteristics) could range from 13 to 65. * $p < .05$, ** $p < .01$

Table 2. Means, Standard Deviations and Bivariate Correlations for Fourth- and Fifth-Year Students.

	M (SD)	1	2	3	4	5	6	7	8
1. Mental Health	3.33 (0.71)	-							
2. PRD	2.93 (0.74)	-.36**	-		-				
3. University identification	4.08 (0.85)	.28**	.002	-		-			
4. Social Support	3.98 (0.97)	.39**	-.19**	.36**	-		-		
5. Family Income	5.30 (2.00)	.07	-.44**	-.08	.12*	-		-	
6. Gender	-	.12	-.11*	-.17**	-.19**	.16**	-		-
7. Ethnic Background	-	-.07	-.14**	.06	-.13*	-.34**	-.05	-	
8. First generation college student	-	.07	-.23**	-.10	.01	.41**	.13	-.29**	-
9. Experience Discrimination	-	.22**	-.16**	.13*	.16*	.06	-.001	-.09	-.04

Note. $N = 290$. PRD = Personal Relative Deprivation. First generation college students are coded as 1 (41.3%) and others as 2, women are coded as 1 (67.3%) and men are coded as 2, respondents who reported European-American backgrounds are coded as 1 (57.9%) and those who reported non-European-American background are coded as 2. 15.3% of respondents reported that they had experienced discrimination.

* $p < .05$, ** $p < .0001$

Table 3. Means, Standard Deviations and Bivariate Correlations for Longitudinal Sample.

	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. Mental Health Time 1	3.49 (0.66)	-											
2. PRD Time 1	2.87 (0.71)	-.24**	-										
3. University identification Time 1	4.29 (0.63)	.23**	-.12	-									
4. Social Support Time 1	4.02 (0.92)	.40**	-.23*	.27**	-								
5. Mental Health Time 2	3.37 (0.60)	.48**	-.32**	.05	.25**	-							
6. PRD Time 2	2.98 (0.72)	-.23*	.44	-.02	-.21*	-.24**	-						
7. University identification Time 2	4.06 (0.80)	.11	-.10	.47**	.21	.14	-.17*	-					
8. Social Support Time 2	4.11 (0.854)	.22*	-.15	.08	.36**	.29**	-.04	.09	-				
9. Experience discrimination Time 1	28.88 (6.81)	.05	.22**	-.14	-.05	-.06	.05	-.07	-.03	-			
10. Family income	-	.12	.49**	.03	.17	.24*	-.30**	.07	.13	-.10	-		
11. Respondent gender	-	-.16*	.13	-.05	.10	.02	.15	.05	.10	.10	-.08	-	
12. Respondent ethnic background	-	.01	.15*	-.05	-.04	-.04	.13	-.01	-.15	-.02	-.24**	.02	-
13. First generation college student	-	.10	-.31*	.07	.07	.14	-.17*	-.06	-.02	-.04	.34**	-.13	-.18*

Note. $N = 168$. PRD = Personal Relative Deprivation. First generation college students are coded as 1 (46.9%) and others as 2, women are coded as 1 (86.2%) and men are coded as 2, respondents who reported non-European-American backgrounds are coded as 1 (37.7%) and those who reported European-American background as 2. of respondents reported experiencing discrimination.

* $p < .05$, ** $p < .0001$

Figure 1. *Standardized solution for second- and third-year students. $N = 309$. Respondents who reported a minority ethnic background, female gender or first-generation college student status are coded as 1. $\chi^2(4) = 8.74, p = .07$, NFI = .96, NNFI = .91, CFI = .98, SMSR = .05, RMSEA = .06, 90% CI_{RMSEA} [.00 to .12]*

Figure 2. *Standardized solution for fourth- and fifth-year students.* $N = 400$. Respondents who reported a minority ethnic background, female gender or first-generation college student status are coded as 1. $\chi^2(4) = 9.23, p = .06$, NFI = .96, NNFI = .90, CFI = .97, SMSR = .05, RMSEA = .06, 90% CI_{RMSEA} [.00 to .11]

Appendix 1. Multiple Regression Analyses with Students' Personal Relative Deprivation as the Outcome.

	Personal Relative Deprivation		
	2 nd /3 rd Year Students	4 th /5 th Year Students	Longitudinal Sample
Family Income	-.35** (-.41**)	-.39** (-.42**)	-.07 (-.25*)
Gender	-.03 (-.03)	-.07 (-.04)	.10 (.12)
Ethnic background	-.03 (-.04)	-.05 (-.02)	.06 (.06)
First generation college student	-.06 (-.04)	-.06 (-.06)	.02 (-.05)
Adjusted R2	15.4%	18.7%	22.5%
F value	(4,235) = 11.89	(4,282) = 17.59	(4,127) = 3.89
Social support (Time 1)	-.10*	-.17*	-.10 (-.19*)
University identification (Time 1)	-.12+	.03	.08 (.06)
Discrimination Experiences (Time 1)	.18*	-.13*	-.03 (.02*)
Adjusted R2	22.2%	22.1%	27.0%
F value	(7,232) = 10.73	(7,282) = 12.70	(7,124) = 2.92
Personal Relative Deprivation (Time 1)	-	-	.35***
Mental Health	-	-	-.09
Adjusted R2	-	-	51.9%
F value	-	-	(9,122) = 4.28
N	239	289	131

Note. Unless otherwise noted, entries are standardized regression coefficients. Standardized regression coefficients for an equation that does not include the subsequent variables from the next step as predictors are included in parentheses. For fourth- and fifth-year students, 1 indicates discrimination experience, 2 indicates no discrimination experience during last semester.

+ $p < .10$, * $p < .05$ ** $p < .01$ VIFs ≤ 1.50