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Sense of Purpose in Life and Likelihood of Future Illicit Drug Use or Prescription Medication Misuse

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Abstract

**Objective:** In the United States, 28.6 million people used illicit drugs or misused prescription drugs in the last 30 days. Thus, identifying factors linked with lower likelihood of future drug misuse are important targets for research and practice. Sense of purpose in life has been linked with better behavioral and physical health outcomes. Furthermore, a higher sense of purpose may reduce likelihood of drug misuse because it has been linked with several protective factors including: enhanced ability to handle stress, higher pain tolerance, and lower impulsivity. However, the association between sense of purpose and drug misuse has been understudied. Thus, we tested whether people with a higher sense of purpose at baseline had a lower likelihood of future drug misuse 9-10 years later.

**Methods:** This study included 3,535 middle-aged adults from the Midlife in the United States Study (MIDUS) who were not misusing drugs at baseline. Using multiple logistic regression models, we assessed whether baseline purpose in life was associated with risk of misusing drugs 9-10 years later.

**Results:** Among respondents not misusing drugs at baseline, people in the highest quartile of purpose (versus lowest quartile) had substantially lower likelihood of future drug misuse in a model adjusting for demographic variables (OR=0.50, 95% CI=0.31-0.83). Associations remained evident after additionally adjusting for psychological distress, baseline health, and health behaviors.
**Conclusions:** A growing knowledge base suggests that a sense of purpose can be increased. Additional research is needed to evaluate sense of purpose as a novel target in the prevention and reduction of drug misuse.

**Key Words:** purpose in life, drug misuse, psychological well-being, substance abuse

**Acronyms**

**HRS:** Health and Retirement Study

**MIDUS:** Midlife in the United States Study

**MIDUS R:** Midlife in the United States Study Refresher

**SD:** Standard Deviation

**SAMHSA:** Substance Abuse and Mental Health Services Administration

**NSDUH:** National Survey on Drug Use and Health

**NHSDA:** National Household Survey on Drug Abuse

**CIDI-SF:** Composite International Diagnostic Interview Short Form Scale

**GED:** General Educational Development

**EFTF:** Enhanced Face-to-Face

**IRB:** Institutional Review Board
In the United States, an estimated 28.6 million people used illicit drugs or misused prescription drugs in the last 30 days (1). This growing drug epidemic negatively impacts society through many pathways, including: diminished mental, behavioral, and physical health as well higher: healthcare costs, motor vehicle accidents, child abuse/neglect, and violence/crime (2). Currently, U.S. life expectancy ranks 27th out of the 36 Organization for Economic Cooperation and Development (OECD) countries. According to a recent Surgeon General report, a substantial portion of this low ranking is attributable to substance misuse and the array of problems that it unleashes (2). Thus, a central challenge is to identify potentially modifiable factors that may reduce the likelihood of drug misuse, of whatever type, and among diverse age cohorts of adults—a need particularly critical in the current climate. Additionally, the number of middle-aged adults and older adults experiencing problems with substance misuse is growing rapidly and thus is an age group that needs particular attention (3).

A growing body of research shows that psychological well-being is independently associated with a wide range of enhanced health outcomes and behaviors (4–6). In particular, purpose in life—the extent to which individuals see their lives as having meaning, a sense of direction, and broader goals to live for (4,7–11), has been associated with lower risk of chronic conditions (e.g., cognitive impairment, stroke, cardiovascular events) (12–19), higher likelihood of engaging in healthier behaviors (e.g., higher: physical activity, use preventive health screenings, medication adherence) (20–22), better biologic function (e.g., lower allostatic load, enhanced glucoregulation) (23–25), and lower risk of mortality (16). Past research also finds that a higher sense of purpose is associated with protective factors that reduce the likelihood of drug misuse, including: higher ability to handle stress, higher pain tolerance, lower impulsivity, and
lower risk of depression and chronic conditions (26–30). Together, these studies suggest that having a higher sense of purpose in life influences key protective factors likely to reduce drug misuse. Although purpose in life is shaped by social structural factors and changing life circumstances, several studies suggest that purpose can potentially be modified using methods that range from volunteering to group programs organized around cognitive behavioral therapy based modules (4,31–35). Thus, it might be a novel and promising target for prevention and intervention efforts aimed at reducing drug misuse.

A small number of pioneering studies have contributed substantially to this literature by demonstrating links between a higher sense of purpose and lower risk of drug misuse (36–42); while findings are suggestive, they are limited in a number of ways. First, all studies used data from specific subpopulations (e.g., high school or college students, people from drug recovery programs), and we do not know if those results generalize to healthy populations, or adults beyond their early 20’s. Second, all studies had cross-sectional designs except for two—one among cocaine users in a residential treatment program, and the other among people in their early 20’s. Third, most studies had smaller sample sizes. Fourth, many studies did not adequately account for potential confounders (e.g., demographics, psychological distress, baseline health). Fifth, some studies used measures of purpose in life that have not been psychometrically evaluated. Thus, additional work is needed, in larger, representative, and prospective studies, with more control for potential confounders, and the use of validated purpose in life measures.

We built upon these important studies and used data from the Midlife in the United States Study to test whether a higher sense of purpose in life was associated with lower drug misuse
over time. We also used data from the Health and Retirement Study, to test a complementary hypothesis that would provide potential insight into a mechanism, whether a higher sense of purpose in life was associated with lower likelihood of drug misuse to cope with stress.

METHODS

Study Sample

**MIDUS.** Data were from the Midlife in the United States (MIDUS) study, an ongoing nationally representative study of U.S. adults begun in 1995 with the aim of investigating biopsychosocial processes of aging. At baseline (MIDUS 1), 7,108 non-institutionalized adults (ranging in age from 25-74) were surveyed via a telephone interview and self-administered questionnaire. Two follow-up interviews (each approximately 9-10 years later) were completed to create MIDUS 2 and 3. After adjusting for mortality, longitudinal retention rates for both follow-up waves were 75%. Since data on drug misuse and the full purpose in life measure were first assessed in MIDUS 2, this study focuses on data from MIDUS 2 (baseline for this study) and the MIDUS 3 follow-up interview. Additionally, in 2012 a new national sample of 3,577 U.S. adults (also aged 25-74) was recruited (the MIDUS Refresher (MIDUS R)). Data from MIDUS R are included here to assess the consistency of findings obtained from the main analyses. The final analytic samples were n=3,535 (for MIDUS 2/MIDUS 3) and n=2,591 (for MIDUS R); Figures S1 and S2 describe inclusion criteria for each sample in detail.

**HRS.** Data were also from the Health and Retirement Study (HRS), an ongoing nationally representative panel study of US adults aged >50 that began in 1992 and re-interviews people every two years. Starting in 2006, a random 50% of the HRS longitudinal panel was selected for
an enhanced face-to-face (EFTF) interview (and the other half was interviewed in 2008) (43). After the interview, respondents were given a self-report psychosocial questionnaire that they completed and returned by mail. Information about drug misuse as a method of coping was only asked in an experimental module in 2008; these modules were administered to random subsets of HRS members at each wave. Our analyses were restricted to those who completed this module and the psychosocial questionnaire. The final analytic sample was 511; Figure S4 describes inclusion criteria.

Extensive documentation about the protocol, instrumentation, and sampling strategy exist for both MIDUS (http://www.midus.wisc.edu/) and HRS (http://hrsonline.isr.umich.edu/). Because the study used de-identified, publicly available data, the Harvard T.H. Chan School of Public Health IRB exempted it from review.

**Measures**

**Purpose in life.** Purpose in life was assessed in MIDUS 2, the MIDUS Refresher, and in the 2008 wave of HRS using the seven-item purpose in life subscale from the Ryff Psychological Well-Being Scales, previously validated in a nationally representative sample of adults (44). On a seven-point Likert scale (in MIDUS) and six-point Likert scale (in HRS) respondents rated the degree to which they endorsed seven items (e.g., “I have a sense of direction and purpose in my life”). The sum of all seven items was taken to create a scale where higher scores reflected higher levels of purpose (Cronbach α = 0.72 in MIDUS; Cronbach α = 0.74 in HRS). To facilitate comparison of effect size across studies, we standardized scores derived for the current study
Furthermore, to examine the possibility of threshold effects we created quartiles based on the baseline distribution of purpose scores in the sample.

**Drug Misuse.** Drug misuse was assessed in MIDUS 2, MIDUS 3, and MIDUS R, using questions developed by the Substance Abuse and Mental Health Services Administration (SAMHSA) for use in its annual nationwide survey on drug misuse: the National Survey on Drug Use and Health (NSDUH; formerly known as the National Household Survey on Drug Abuse (NHSDA)) (45). The survey asked participants (yes/no) if they used any of the following 10 categories of substances in the past 12 months: without a doctor’s prescription, in larger amounts than prescribed, or for a longer period than prescribed: 1) Sedatives, 2) Tranquilizers, 3) Amphetamines, 4) Painkillers, 5) Anti-depressants, 6) Inhalants, 7) Marijuana, 8) Cocaine, 9) Hallucinogens, 10) Heroin. Participants were considered drug misusers if they reported using any of these substances. See Methods and Results in the Supplemental Digital Content for further details about this assessment.

**Misuse of Drugs to Cope.** Misuse of drugs to cope was assessed during the 2008 wave of HRS in an experimental module using a question adapted from the National Survey of Black Americans (46). Study participants were given the following prompt: “Because of all the demands of work, home, family or friends, we all feel stressed at times. The following questions ask about things you are most likely to do after having what you think is a stressful event or day,” then HRS participants were asked the degree to which they endorsed using “prescription or other drugs to help make it [stress] easier to bear,” on a 5-point Likert scale ranging from “never” (=1) to “very often” (=5). Due to the low number of people in each Likert-scale
category, the cell sizes were not large enough for analyses; thus, we re-categorized the outcome into a yes/no binary—anyone outside the “never” category was considered to be misusing drugs to cope.

**Potential Confounders.** Potential confounders included demographic variables, psychological distress, baseline health factors, and health behaviors. All covariates were assessed by self-report in MIDUS 2, MIDUS R and HRS (in 2008); unless otherwise noted, they were coded in the same way. Please see Methods and Results in the Supplemental Digital Content for more detailed information about several of the variables. Demographic factors included: age (continuous), sex (male/female), race/ethnicity (White, African-American, Other), marital status (married/not married), educational attainment (<high school, GED or high school diploma, ≥college degree), total income (in MIDUS) or total wealth (in HRS; both based on quintiles of the score distribution), health insurance (yes/no), and employment status (yes/no). Psychological distress included: depression (in MIDUS: the Composite International Diagnostic Interview Short Form Scale (CIDI-SF) (47) and in HRS: the Center for Epidemiologic Studies Depression Scale) (48), anxiety (in MIDUS: generalized anxiety disorder was assessed using the CIDI-SF (47,49) and in HRS: elevated anxiety was assessed in the Beck Anxiety Inventory) (47,48), and lifetime stressors. We included a wide range of baseline health factors as they are risk factors for increased risk of drug misuse and potential confounders. Baseline health factors included: number of nights the participant was a patient in a hospital overnight (MIDUS asked about the past one year, HRS asked about the past two years), chronic pain, and chronic conditions (defined as having ≥1 [yes/no] of the following conditions (see Methods and Results in the Supplemental Digital Content for full list)) and assessed via participants report of a doctor’s
diagnosis, number of nights participant was a patient in a hospital overnight (MIDUS asked about the past one year, HRS asked about the past two), and chronic pain. Health behaviors included current (yes/no): self-reported drinking or smoking.

**Statistical Analysis**

In MIDUS, we used logistic regression to evaluate the likelihood of future drug misuse (yes/no) at follow-up among participants who did not report drug misuse at baseline. We evaluated 4 models for all our analyses. Model 1 adjusted for age. Model 2, the demographic model, included age, sex, race/ethnicity, marital status, educational attainment, income/total wealth, health insurance, and employment status. We then considered the outcome of sequentially adding other potential confounders, including baseline health (chronic conditions, chronic pain, number of nights hospitalized) and psychological distress (depression, anxiety, lifetime stressors; model 3). The last model additionally adjusted for health behaviors (current drinker, current smoker; model 4). In all analyses, purpose in life was first considered as a continuous, and then as a categorical variable (quartiles). Analyses were conducted in Stata version 15.0.

**Additional Analyses**

We ran four additional analyses. First, we evaluated if a similar association between purpose and drug misuse would be observed in the MIDUS Refresher cohort (MIDUS R), a new cohort created to augment the existing MIDUS study with a new national sample recruited ~18 years after the initial baseline sample (MIDUS 1). MIDUS R did not have follow-up data, thus analyses were cross-sectional. Second, we also evaluated the cross-sectional association between
purpose and drug misuse in MIDUS 2. Third, In HRS, we used logistic regression to evaluate the likelihood of drug misuse to cope with stress. Fourth, to evaluate the potential presence of effect modification by age, we included an interaction term for age x purpose in life.

Missing Data

In MIDUS, we imputed missing data on all covariates and outcomes using an imputation by chained equations multiple imputation procedure (and generated 5 datasets) as this method provides a more accurate estimate of association than other methods of handling missing data such as complete-case analyses (52–55). In HRS, we did not use multiple imputation because <5% of study respondents were dropped in complete-case-analyses.

RESULTS

Descriptive Statistics

Among non-drugs users at baseline in MIDUS 2, the average age of respondents was 57 years (SD = 13.4) and they were primarily women (55%) and college-educated, or more (63%). Furthermore, 8.8% reported misusing drugs at follow-up 9-10 years later. In HRS, the average age of respondents at study baseline was 71 years (SD = 9.0) and they were primarily women (60%) and high school educated (54%). Additionally, 14.5% reported misusing drugs to cope with stress. Table 1 provides further descriptive statistics. Table S1 provides further information about how much each substance was misused and Table 2 provides information on the percentage of respondents who misused multiple substances.
Purpose in Life and Future Drug Misuse

Among MIDUS 2 respondents who were not misusing drugs at baseline, each standard deviation increase in purpose in life was associated with 22% lower odds (95% CI: 0.65, 0.92; Table 2) of future drug misuse 9-10 years later (in MIDUS 3), after adjusting for demographic factors. When considering quartiles of purpose in life, we observed a graded relationship between increasing quartiles of purpose and decreasing likelihood of future drug misuse in all models. For example, in the demographic factors model, compared to adults in the lowest purpose in life quartile, those in the middle-high purpose quartile had 35% lower odds (95% CI: 0.39, 1.08) of future drug misuse, while those in the highest quartile had 50% lower odds (95% CI: 0.31, 0.83). When purpose was considered as a continuous variable or in quartiles, associations between purpose in life and future drug misuse were consistent and persisted across all 4 covariate models. See Methods and Results in the Supplemental Digital Content for results from the cross-sectional analyses in the MIDUS Refresher sample (Tables S2 and S3). The pattern of results for both sets of cross-sectional results were largely similar to the longitudinal results, but slightly stronger in magnitude.

Additionally, there was no interaction between purpose and age ($P$ for interaction = 0.87).

Purpose in Life and Misuse of Drugs to Cope with Stress

In HRS, each standard deviation increase in purpose in life was associated with 39% lower odds (95% CI: 0.47, 0.80; Table 3) of misusing drugs to cope with stress in the demographic factors model. When considering quartiles of purpose in life, we again observed a
graded relationship. When purpose was considered as a continuous variable or in quartiles, the main association of interest was consistent and persisted across all 4 models.

**DISCUSSION**

We observed a strong relationship between increasing levels of baseline purpose in life (MIDUS 2) and decreasing likelihood of future drug misuse at 9-10-year follow-up (MIDUS 3). In a second cohort (MIDUS R), we observed the same pattern. In a third cohort (HRS), we observed a strong relationship between increasing levels of purpose in life and decreasing likelihood of misusing drugs to cope with stress—providing complementary evidence to our main findings. Future research should further evaluate this latter finding as a potential mechanism using longitudinal data and formal mediation methods. All three sets of findings were maintained after close control for potential confounding factors, including demographic variables, and still evident (although attenuated), even after further adjustment for psychological distress, baseline health, and health behaviors. Our findings are consistent with results from two bodies of research that have evaluated the association between higher purpose and: 1) lower risk of drug misuse (33–39); as well as 2) higher likelihood of recovery from drug misuse or alcohol dependence (56–58).

Although the mechanisms underlying these findings are unclear, mounting research finds that people with a higher sense of purpose differ on numerous processes known to predict drug misuse, including: higher ability to handle stress, higher pain tolerance, lower impulsivity, and lower risk of depression and chronic conditions. Evidence suggests that a higher sense of purpose in life buffers against stress through enhanced emotion regulation. For example, people
with higher purpose have a slower eye-blink startle reflex in response to negative picture stimuli and faster recovery to pre-stress cortisol levels after exposure to acute social laboratory stressors (23,24). Moreover, a recent daily diary study observed that on days when people faced higher amounts of daily stressors, those with higher purpose displayed less pronounced spikes in negative affect and physical symptoms (30). Thus, having a higher sense of purpose may reduce the likelihood of drug misuse due to an enhanced ability to cope with and/or recover from daily stressors. Additional research shows that people with a higher sense of purpose display an enhanced ability to habituate to pain (28), which may in turn decrease the need for analgesics. People with high purpose also display a heightened ability to curb impulsivity (29), which may in turn help reduce the likelihood of drug misuse. Higher purpose has also been associated with lower risk of depression and several chronic conditions (e.g., cardiovascular events, Alzheimer’s disease) — (15,16) that are additional risk factors for future drug misuse. Although the temporal ordering of our data did not allow us to accurately test potential mechanisms, future research with appropriate data should.

Our study has several limitations. Confounding by unmeasured variables is a limitation in observational research; however, findings were maintained after careful control for multiple demographic factors, psychological distress, baseline health, and health behaviors. Biased estimates due to attrition may be a problem because people who start misusing drugs are more likely to drop out; however we used a multiple imputation method that helps alleviate this concern (49–52). Our drug misuse assessment asked about misuse only in the past 12 months. Although we tried limiting potential confounding introduced by prior drug misuse, we were unable to exclude people who misused drugs >12 months ago due to the wording of the drug
misuse assessment. Furthermore, due to the nature of the drug misuse assessment, we were unable to differentiate between important nuances including: 1) initiation, 2) maintenance, 3) cessation, and 4) relapse to drug misuse; each of these behavioral processes might be influenced by different dynamics and future research should evaluate these nuances. The range of misused drugs examined in MIDUS is broad, but due to power issues, we were unable to evaluate specific drug categories; future research should evaluate this question as some of the drugs evaluated are riskier than others and have more adverse effects. Moreover, intensity nor frequency of drug misuse was assessed and should be investigated in future work. Future research should also evaluate potential mechanisms underlying the purpose in life and drug misuse association. Finally, these cohorts are representative of middle- and older-aged adults and results may not generalize to younger populations.

This study also has considerable strengths. Data were from large, prospective, diverse, and national samples of U.S. adults. Furthermore, MIDUS is one of the few studies with detailed information about purpose in life, a broad set of relevant risk factors, and measures of drug misuse over time. Additionally, both the primary exposure, and outcome, were assessed with validated and widely used measures. The prospective nature of our data reduces potential concerns that the associations reported in this study are attributable to reverse causation or retrospective reporting bias. Evidence of a purpose-drug misuse association in a completely independent sample (MIDUS Refresher) is another strength, as is complementary evidence from a third dataset (HRS).

Healthcare professionals are struggling to contain the growing drug epidemic in the
United States and a comprehensive and multidisciplinary effort is needed. Although much more research is required, emerging research suggests that a sense of purpose in life might serve as a novel target for prevention (e.g., screener may help identify those vulnerable to future drug misuse) and multi-level intervention efforts aimed at stemming the tide of our nation’s growing drug epidemic.
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Role of the Sponsor: The funding sources had no influence on the design or conduct of the study; collection, management, analysis or interpretation of the data; or preparation, review, or approval of the manuscript. All authors had full access to all data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to the design of the study and interpretation of the findings, and have read, commented on, and approved the manuscript.

Disclosures: There are no conflicts of interest.

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REFERENCES


Table 1. Characteristics of Study Participants at Baseline (MIDUS 2 n=3,535; MIDUS Refresher n=2,591; HRS Coping n=511)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIDUS 2 (n=3,535)&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>Demographic Factors</td>
<td></td>
</tr>
<tr>
<td>Mean Age (SD)</td>
<td>57.1 (13.4)</td>
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<tr>
<td>Female (%)</td>
<td>55.5</td>
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<tr>
<td>Race/Ethnicity (%)</td>
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<tr>
<td>White (%)</td>
<td>90.5</td>
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<tr>
<td>African-American (%</td>
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<tr>
<td>Other (%)</td>
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<tr>
<td>Married (%)</td>
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<td>Education (%)</td>
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<td>High School</td>
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<tr>
<td>≥College</td>
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<tr>
<td>Income (MIDUS) or Total Wealth (HRS) (%)</td>
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</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Quintile</td>
<td>22.0</td>
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<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Quintile</td>
<td>18.4</td>
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<td>5&lt;sup&gt;th&lt;/sup&gt; Quintile</td>
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<tr>
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<td>Depression (%)</td>
<td>10.7</td>
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<tr>
<td>Anxiety (%)</td>
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<tr>
<td>Mean Lifetime Stressors (SD)</td>
<td>3.4 (2.6)</td>
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<td>Baseline Health</td>
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<tr>
<td>Chronic Condition(s) (%)</td>
<td>77.6</td>
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<tr>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Mean # of Nights Hospitalized (SD)</td>
<td>1.0 (5.4)</td>
</tr>
<tr>
<td>Chronic Pain (%)</td>
<td>38.2</td>
</tr>
</tbody>
</table>

### Health Behaviors

| Current drinker (%) | 57.3 | 60.9 | 49.7 |
| Current smoker (%) | 15.7 | 11.1 | 11.6 |

a^MIDUS 2 participants who did not misuse drugs at baseline (longitudinal analyses)

b^MIDUS Refresher participants (cross-sectional analyses)

c^HRS coping module participants (cross-sectional analyses)

d^Generalized anxiety disorder was assessed in MIDUS using the CIDI-SF and defined as a score of ≥3 (47,49). Elevated anxiety was assessed in HRS using the Beck Anxiety Inventory and defined as a score of ≥12 (50,51). There is no established cutoff score for anxiety disorder in HRS, thus elevated anxiety was used—which does have a previously tested cutoff score in this cohort (50). The difference in assessed level of anxiety (e.g., anxiety disorder vs. elevated anxiety) and cutpoints helps explain the higher rate of anxiety in HRS participants when compared to MIDUS participants. As a sensitivity analysis, we also created a new HRS anxiety disorder cutoff score that matched MIDUS anxiety disorder prevalence rates (2%-2.5%). When using this new cutoff score, in lieu of the originally constructed elevated anxiety score, results were nearly identical. Thus, we continued using the validated anxiety cutoff score in our main analyses.
Table 2. Odds Ratios for the Longitudinal Association Between Baseline Purpose in Life and Future Drug Misuse 9-10 Years Later (MIDUS 2 and MIDUS 3; n=3,535)

<table>
<thead>
<tr>
<th>Models</th>
<th>Purpose in Life</th>
<th>Continuous Purpose Score&lt;sup&gt;a&lt;/sup&gt;(n = 873)</th>
<th>Quartile 1 (n = 90 misusers)</th>
<th>Quartile 2 (n = 89 misusers)</th>
<th>Quartile 3 (n = 78 misusers)</th>
<th>Quartile 4 (n = 52 misusers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age-adjusted</td>
<td></td>
<td>0.76 (0.64, 0.90)</td>
<td>Reference</td>
<td>0.87 (0.61, 1.24)</td>
<td>0.61 (0.38, 0.98)</td>
<td>0.48 (0.29, 0.79)</td>
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<tr>
<td>Demographics&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>0.78 (0.65, 0.92)</td>
<td>Reference</td>
<td>0.92 (0.64, 1.34)</td>
<td>0.65 (0.39, 1.08)</td>
<td>0.50 (0.31, 0.83)</td>
</tr>
<tr>
<td>Demographics, Psychological Distress,&lt;sup&gt;c&lt;/sup&gt; Baseline Health&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>0.82 (0.70, 0.98)</td>
<td>Reference</td>
<td>1.00 (0.68, 1.47)</td>
<td>0.73 (0.44, 1.22)</td>
<td>0.58 (0.35, 0.95)</td>
</tr>
<tr>
<td>Demographics, Psychological Distress,&lt;sup&gt;c&lt;/sup&gt; Baseline Health, Health Behaviors&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
<td>0.81 (0.68, 0.97)</td>
<td>Reference</td>
<td>0.98 (0.66, 1.45)</td>
<td>0.71 (0.42, 1.19)</td>
<td>0.56 (0.34, 0.93)</td>
</tr>
</tbody>
</table>

<sup>a</sup> per 1 SD increase in purpose in life score

<sup>b</sup>Demographic factors included: age, sex, race/ethnicity, marital status, education, income, health insurance, employment status

<sup>c</sup>Psychological distress factors included: depression, anxiety, life stressors

<sup>d</sup>Baseline health factors included: chronic conditions, chronic pain, number of nights hospitalized

<sup>e</sup>Health behaviors included: current drinker, current smoker