Pain and Self-Assessed Health: Does the Association Vary across the Life Course?

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Abstract

The association between pain and self-assess health among adults 20 and older is examined using data from the National Health and Nutrition Examination Survey (NHANES). Models emphasize whether and how the association differs across age cohorts. Pain is measured two ways: as general and site-specific. Self-assessed health is categorized into groups ordered from fair/poor to excellent. Ordered logistic regressions reveal pain measured both ways has a robust inverse association on self-assessed health. The association remains robust after adjusting for more objective health conditions and indicators plus demographic, socioeconomic and social support characteristics. Models test age by pain interactions and confirm variation across cohorts. Middle-aged 40-59 display the strongest association while self-assessed health is virtually unassociated among oldest-old. Findings suggest that health and pain are in part socially constructed. Conclusions discuss the importance of considering pain as a health condition and implications for well-being across the life course.

Introduction

The current study examines the link between general and specific pain and global assessments of self-assessed health among a sample aged 20 and older from the National Health and Nutrition Examination Survey (NHANES) with specific emphasis on how the link varies across age cohorts. Global self-assessments of health are drawn from survey questions that ask, "how would you rate your overall health," with possible response categories such as, "excellent, very good, good, fair, poor." This broad measure is believed to represent an accurate, valid, inclusive and holistic conception of health despite the seemingly crude nature of the question (Kaplan & Camacho 1983; Idler 1993; Krause et al., 1994; Menec et al., 1999; Molarius & Janson, 2002). As such, responses to a self-assessment of health reflect not just current physical conditions but also aspects of mental and social well-being (Linn & Linn, 1980; Mossey & Shapiro, 1982; Idler & Kasl 1991; Rakowski et al., 1991). The World Health Organization has defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (1948). Each of these aspects of well-being is reflected in a self-assessment of health.

Self-assessments of health in the current study are hypothesized to vary based on the experience of two types of pain. General pain refers to a non-site specific pain lasting for twenty-four hours or more experienced within the month leading up to time of interview. Specific pain refers to a site-specific pain, including neck, low back, joints, and headache, experienced within the last year or three months (depending on the specific site). Like self-assessed health, pain can be an amorphous and unstructured health concept impacted upon by a wide range of chronic and psychosomatic disorders. The origin of pain can often be difficult to identify and it can be chronic and/or acute (Young et al., 2003). There can be variation in the ways in which individuals react to and define their pain (Racine et al., 2012; Pinkus et al., 2002). Moreover, it can be difficult to determine how general

and specific pain associate with other indicators of well-being that might be mentally, physically or socially constructed (Hartvigsen et al., 2004; Soklaridis et al., 2010; Andersson et al., 1993). Yet, like self-assessed health, pain can be a broad indicator of well-being and quality of life. Hence, it is surprising that, with a few notable exceptions (Reyes-Gibby et al., 2001; Mantyselka et al., 2003; Siedlecki 2006), there has been little research to date that links pain and global perceptions of health.

The current study seeks to advance the literature in several ways. First, it considers the association adjusting for a large number of health and non-health covariates in an attempt to isolate, to the degree possible, the independent impact of pain. Second, investigating a broad age sample from young adults upward, with a perspective suggests the impacts of pain on self-assessments of health can be socially constructed; it takes account of possible age variations in the association.

Background

While global self-assessed health can appear on the surface to represent an overly subjective and simplistic measure of well-being, it has have proven to be a robust predictor of more objective health outcomes such as morbidity and mortality, and have a stronger association with these more objective measures than characteristics such as age, medical conditions, socio-demographic and economic status (Linn & Linn, 1980; Mossey & Shapiro, 1982; Idler & Kasl 1991; Rakowski et al., 1991). While some have suggested that it best serves as a secondary measure to be used when more objective ones are not available (Garrity et al., 1978), others advocate self-assessed health as itself a reliable and valid indicator of health status (Idler & Benyamini, 1997; Lunderberg & Manderbacka, 1996). Since it has proven to offer valuable insight into the totality of health as experienced by an individual, researchers have for decades been attempting to understand how a self-assessed health perception is formed. A wide selection of covariates in addition to other more objective health

measures have shown to be associated with self-assessed health, such as demographic characteristics, socioeconomic status and the experience of social support (Dowd et al., 2007; Frankenberg & Jones, 2004; Kaplan & Camacho 1983; Idler 1993; Krause et al., 1994; Menec et al., 1999; Molarius & Janson, 2002; Schulz et al., 2006; Kawachi et al., 1999). Cultural variation in the measure has been revealed (Jylha et al., 1998; Ostrove et al., 2000; Zimmer et al., 2000; Dowd et al., 2007). Similarly, and important for the current study, research has indicated a relationship between age and self-assessments of health with older persons tending to provide more favorable assessments *ceteris paribus* (Idler 1993; Idler & Angel, 1990). A large chronicle of studies has therefore suggested that while it is a valid and reliable measure, a self-assessment of health relies upon both physical and social constructions of health.

Pain has been shown to negatively associate with various health outcomes (Von Korff et al., 2005) and its impact on psychological health is particularly robust (Fishbain et al., 1997; Banks & Kerns, 1996; Magni et al., 1994; Ahmedzai 1995). Like self-assessed health, the experience of pain can provide information about the well-being of an individual that is beyond what can be found in a medical record. Self-reports of pain vary along demographic categories (Racine et al., 2012; Pinkus et al., 2002; Hartvigsen et al., 2004; Soklaridis et al., 2010; Andersson et al., 1993), suggesting that the experience of pain is dependent upon social context. But how pain associates with self-assessed health, independent of objective health conditions, is not well understood. Yet, there are good reasons to explore the association in detail, particularly for the purpose of better understanding how individuals socially construct their perception of self-assessed health and subsequently understand their current health status and can predict, by way of self-assessment, future health changes.

There are a few earlier studies that indicate an association exists between these two health measures (Reyes-Gibby et al., 2001; Mantyselka et al., 2003; Siedlecki 2006). Reyes-Gibby et al., (2001), notably examine data from the Asset and Health Dynamics among the Oldest Old data (AHEAD) and indicate a negative association between persistent pain and self-assessed health in adults aged 70 and over controlling for physical and mental clinical health status, socio-demographic characteristics, and access to care. A couple of other studies suggest there is a social construction aspect with respect to the link between pain and self-assessed health. Mantyselka et al. (2003) draw upon data collected in a household survey in Finland. Comparing two age cohorts (age 15-44 and age 45-74), they found age variation, with chronic pain having an effect on self-assessed health but being stronger for the younger age group. Siedlecki (2006) found low levels of power or autonomy and high levels of depression to be more important predictors of self-assessed health than chronic nonmalignant pain.

This earlier research notwithstanding, important questions remain about the association between pain and self-assessed health. On a basic level, there is a need to validate the small number of earlier studies that exists using different samples and diverse operationalizations of pain. While the link between pain and self-assessed health has been established by a limited number of studies, many subtleties in the relationship have yet to be explored, and it is these nuances that will help us to better understand how assessments of health are reliant upon social determinants. For instance, given that pain is not necessarily linked to a single condition, more information is needed as to the extent to which associations are a function of or external to the presence of specific health conditions. In the current study, we adjust for as many chronic conditions as is possible given NHANES data. We also consider mental health and health care utilization. Moreover, in order to isolate the impact of pain on self-assessed health, controls are added for a large number of socio-

demographic, economic and social support measures. The latter have been particularly absent from earlier studies despite a well-recognized association between social support and health (Kaplan & Camacho 1983; Kawachi et al., 1999; Berkman et al., 2000).

Furthermore, previous studies have mostly been limited to studying populations of older adults. Research shows that while the reporting of some types of pain increase with age, it can be a common experience at all ages and throughout the life course (Idler 1993; Idler & Angel, 1990). But, there are indeed a number of reasons why the association could differ across age cohorts. Causes of pain differ between older and younger individuals (Andersson et al., 1993). Medications are more likely being taken by older persons, which could impact on the severity of acute pain. Self-assessed health is itself impacted upon by a wide range of factors, including age. For these reasons, how pain associates with subjective assessments would be expected to vary across the life course (Mantyselka et al., 2003).

This study asks several questions: Is there an association between pain and self-assessed health? Does the association depend upon the specific type of pain, be it general and wide-spread or explicitly site-specific? Is the association between pain and self-assessed health substantially diminished after account is taken for a large number of more objective health measures, like chronic conditions, other measures of well-being, demographic, socio-economic and social support covariates? Finally, do these associations differ across age cohorts? The final question is based on the literature outlined that suggests both pain and self-assessed health are in part socially constructed concepts that depend on how health is differentially viewed across the life course.

Methods

Data

Data come from the National Health and Nutrition Examination Survey (NHANES). The primary purpose of NHANES is to assess and monitor the health and nutritional status of adults and children living in the United States. NHANES is a cross-sectional survey employing a stratified, multistage probability design that results in a nationally representative sample of the civilian, non-institutionalized US population (CDC 2014). Beginning in 1999, it has been conducted on a continuous cycle with different survey waves focusing on different sets of health topics or population groups. Each wave therefore contains modules of non-repeated items based on emerging needs. Data for the current analysis come from the 2003-04 NHANES, which included a specific module on pain. Questions about pain were asked of all 7,252 respondents aged 20 and older. In addition, in this wave of NHANES, selected items about social support, some of which are included in the current analysis, were asked only of those aged 40+. Most of our analyses are based on the full sample, but when including social support the sample is reduced to 4,435. Procedures detailed below apply probability weights that are included in NHANES data. NHANES data have been employed for thousands of health related studies of the U.S. population.

Measures

Self-assessed health is the dependent variable examined in this study. The specific question in NHANES asked: "Would you say your health in general is excellent, very good, good, fair, or poor?" Because a very small proportion assesses their health as poor, this category was combined with fair. Categories were arranged from least to most favorable (poor/fair to excellent) and treated as an ordered variable in the multivariate models presented below.

NHANES contains a number of items that assess the experience of musculoskeletal pain. Kamaleri et al. (2008) make a case for distinguishing pain items into widespread and localized or single site pain, stating that site-specific pain has less impact on items that tend to parallel health outcomes, such as physical fitness or social activity. Other studies draw a distinction between localized and widespread pain (Andersson et al. 1993; Hardt et al. 2008). Following this, we created two pain measures. The first, which we labeled *general pain*, comes from a single item that asks respondents if they have, in the last month, experienced a pain problem lasting longer than twenty-four hours. Those that answer yes were coded as having general pain. The second, labeled *specific pain*, comes from questions that ask whether respondents have experienced site-specific pain including lower back, neck, headache or joint pain lasting a day or longer. The time period referenced is in the last three months, except for joint pain where the reference period is the past year. Those who answered yes to any of these items were coded as having specific pain.

Age was categorized into four groups that, according to preliminary tests, best assess the nuanced effect of age on the relationship between pain and self-assessed health. Those 20-39 were designated as young, those 40-59 were labeled as middle age, 60-79 year-olds were coded as young-old, and those 80-plus were labeled as oldest-old.

Models adjust for available socioeconomic and demographic indicators that have been shown, in previous research, to impact on self-assessed health. These include sex, marital status, race, education, household income, household size, and work status. Each was categorically coded. Sex (female versus other) and work status (not working versus other) are dichotomous. Marital status consists of single never married, divorced or separated, widowed, and married or living with partner. Race was coded into Hispanic (with Mexican American and other Hispanic being combined), white,

black, and other. Education included less than high school graduate, high school graduate, some college or associates degree, and completed college or graduate studies. Household income consisted of low (less than $25,000 per year), medium ($25,000-$65,000 per year) and high (more than $65,000 per year). Household size was coded into four categories: 1, 2, 3 or 4, and 5+. The number of missing responses for all variables is negligible, except for about 5% of responses for income. Missing income was therefore coded as a separate category. Other missing data were coded as the modal category and sensitivity analyses assured that alternate coding or elimination of missing response does not substantially alter the results reported here.

In order to adjust the impact of pain for other health problems that can influence self-assessed health, multivariate models include a series of specific medical conditions, a measure of health care utilization and a measure of mental health. Dichotomous measures of self-reported diagnoses with various medical conditions were based on questions that ask "Has a doctor or other health professional ever told you that you have…" The specific conditions include asthma, arthritis, various heart conditions, stroke, emphysema, overweight, bronchitis, liver conditions, thyroid conditions, and cancer. "Don't know" responses characterized less than 0.3% of responses for any single item, and these were coded as no. For utilization, respondents were asked about the number visits to a medical professional or to receive medical care over the past year. Responses were coded into four categories: no visits, 1 to 3, 4 to 9 and 10 and over. While this wave of NHANES did not include specific information on mental health, respondents were asked whether or not they have seen a mental health professional in the past year, and a dichotomous variable was obtained from this item.

Because previous research shows social support variables to have a significant impact on self-assessed health (Kaplan & Camacho, 1983; Idler & Benyamini, 1997), this study includes items

regarding access to emotional support and number of close friends. Emotional support was coded dichotomously. No emotional support and not needing emotional support are coded as no and others as yes. The number of close friends was coded into three categories: 0 to 3, 4 to 9, and 10+.

Distributions for all study variables are included in Table 1. The table shows that there is a good distribution of self-assessed health, although fewer report their health as poor/fair or excellent than report health as good or very good. It also shows that individuals are much more likely to report specific than general pain. Part of the reason for this is the difference in reference period, which is much longer for specific pain.

Table 1 describes the percent distribution of the study variables. Dissimilar distributions of pain variables confirm that general versus specific pain represent different concepts, as confirmed by previous studies (Andersson et al., 1993; Hardt et al, 2008; Kamaleri et al., 2008). Specific pain is reported much more frequently (71.2%) in comparison to general (28.3%). In analyzing specific pain items separately, 48.2% of the total sample reported having experienced joint pain and 39.2% of respondents reported low back pain.

Statistical Analysis

We began the analysis by examining the bivariate association between pain and self-assessed health for the total sample and then stratified by age cohort. We then went on to test a series of multivariate models. Since self-assessed health is an ordered response measure, we used an ordered logistic regression model. Using maximum likelihood estimation, the ordered model provides the association of a one unit change in an independent variable on the log-odds of being in a higher category of self-assessed health. Since self-assessed health is categorized from least favorable

(fair/poor) to most favorable (excellent), a positive coefficient can generally be interpreted as increasing the probability of being in very good or excellent health while decreasing the probability of being in good or poor/fair health. In contrast, a negative coefficient can be interpreted as decreasing the probability of being in very good or excellent health.

Self-assessed health was regressed on general and specific pain in separate sets of models so that the association can be assessed independently for widespread and site-specific pain. Each set of models begins with an equation that controls for age, sex and other socio-demographic and socio-economic variables. The second model adds other health-related variables. A third model includes social support variables. Since social support items were not collected for anyone under the age of 40, this is a reduced sample size model. Log-likelihood tests are able to assess model fit changes from the first to second model, but not to the third since number of observations changes. Finally, in order to assess whether and how the relationship between pain and self-assessed health varies by age cohort, interaction effects were created between measures of pain and each age category. These interactions were entered into a final full-sample model with all variables except social support. Supplementary tests showed interaction effects are generally consistent when social support variables are also included, although number of observations and number of age categories differs due to the reduced sample size.

Results

Table 2 displays the percentage distribution of self-rated health by pain for the total sample and stratified by age group. For the total sample, there is a very strong bivariate association between pain and self-assessed health in that those that experience pain are much more likely to rate their health as poor/fair and those that do not experience pain are much more likely to rate their health as

excellent. Also, very good health is more likely reported by those without pain, while good health is more likely reported by those with pain. To provide some specific examples, 31.0% of those with general pain report their health as poor/fair compared to only 13.5% of those without general pain. For specific pain, the comparison is 22.2% versus 9.1%. The percentage rating their health as excellent is 9.3% for those with general pain compared to 25.2% for those without. For specific pain, it is 16.4% versus 31.3%.

The association generally holds across age groups in that the percentage that assesses their health as poor/fair increases and the percentage assessing their excellent decreases when pain is experienced, whether general or specific, regardless of age group. However, the association is less robust is among the oldest-old. In particular, when it comes to specific pain, the oldest old without pain are not much more likely to rate their health as excellent versus the oldest old with pain (10.7 versus 13.0 percent). There is also little difference in the percent assessing their health as very good. Chi-square values are significant for all associations with the exception of specific pain among the oldest-old.

Main effect multivariate models are presented in Table 3. The first three models, labeled 1a to 3a, examine associations with general pain plus covariates and the next three, 1b to 3b, show associations for specific pain and covariates. For each set of models, the first includes the measure of pain plus demographic and socioeconomic variables; the second adds health conditions; and the third includes demographic, socioeconomic, health conditions and social support variables.

Models 1a and b demonstrate that the association between pain and self-assessed health is strongly and significantly negative for both general and specific pain adjusting for age, sex, race, education,

marital status, household income, household size, and work status. The association is somewhat more robust for general pain. We would expect the associations between pain and self-assessed health to weaken when other health characteristics are added in Models 2a and b. They do, but only moderately. Exponentiation of the coefficients from these models indicate that the odds of being in a higher level of self-assessed health is lessened by a factor of ($e^{-.744}$) or 0.47 when an individual experiences general pain versus no pain and ($e^{-.486}$) or 0.62 when an individual experiences specific pain versus no pain, even after adjusting for a long list of health conditions that might be associated with or even be the cause of pain, mental health and health care visits. Model 3 additionally reveals that the association between pain and self-assessed health remains robust when further controlling for social support and reducing the sample to those aged 40 and older.

Associations with other covariates and self-assessed health are primarily in keeping with findings from previous research (Dowd et al., 2007; Frankenberg & Jones, 2004; Kaplan & Camacho 1983; Idler 1993; Krause et al., 1994; Menec et al., 1999; Molarius & Janson, 2002; Schulz et al., 2006; Kawachi et al., 1999). Self-assessments of health are most favorable for the youngest age group. The oldest age group has the least favorable assessments when health is not controlled. Once other health characteristics are controlled, as shown in Models 2a and 2b, the oldest old are no longer most likely to assess their health poorly. Instead, those in middle age have the least favorable self-assessed health. Women tend to rate their health better than men, all else being equal. The effect of being in any racial category other than White is negative, meaning that those who identify as Hispanic, Black, or Other/Multi-racial have lower odds of being in a higher category of health. Education displays a very strong linear effect such that the lower the level of education the less likely to be in a higher category of self-assessed health. Those that are divorced and separated have worse self-assessed health than those in other marital states. Lower household income relates to less

favorable health assessments. This adjusts for household size, another variable in the model, which is important since larger household sizes are likely to have higher household income. Those not working have worse self-assessments of health than do others, all else being equal.

Nearly all of the medical conditions have a negative effect on self-assessed health and adding medical conditions to the model has a substantial impact on the log-likelihood thereby improving model fit. Two conditions however display positive effects. Those with cancer or those that have ever had cancer assess their health more positively than others. There is a non-significant association between having ever had a heart attack and self-assessed health.

Finally, as expected, social support relates to self-assessed health positively. Those reporting no emotional support, and those reporting fewer close friends, are less likely than others to rate their health favorably.

Table 4 displays log-odds ratios for interaction effects, which were included in models that adjust for all other covariates from Models 2a and 2b in Table 3. Interaction effects are highly significant. The main effects of general and specific pain indicate the log-odds ratio for those in middle-age, who are the comparison age group. For the middle-aged, pain has a very substantial association with self-assessed health (log odds ratios of -.972 and -.588 for general and specific pain respectively). Positive interaction effects indicate that the association is generally lower for those in other ages. But, the oldest-old are most affected by the interaction. The net effect of pain is almost negligible for this age cohort.

The associations between pain and self-assessed health can be seen more clearly in Figure 1, which shows predicted probabilities of reporting either excellent or fair/poor health for each age group separately. These probabilities are calculated by holding all covariates, with the exception of pain and age cohort, constant at their means. The probabilities therefore depict the chances of reporting excellent or fair/poor health for a hypothetical person that is average with respect to covariates in the models. Generally, those reporting pain have a lower probability of excellent health and a higher probability of poor/fair. However, there is substantial variation by age. Looking at the upper left hand chart as an example, the probability of being in excellent health among the young aged is .18 when they experience general pain and.11 when not. The difference is greater for the middle aged, with a .17 probability of excellent health if they do not experience general pain and a .07 probability if they do. For the young old the probabilities are .18 and .10 for those with and without the experience of pain. But, for the oldest old, the difference in probabilities is very slight; only .15 versus .13 for those that do and do not experience pain respectively. Similar probabilities are seen for poor/fair health, although the association is in the opposite direction, and for specific as opposed to general pain. However, with specific pain, the probability of excellent health is actually greater for the oldest old in pain versus the oldest old not in pain, with the probability of poor/fair health is lower for those with pain. For instance, looking at the bottom right hand chart, oldest old without specific pain have a .15 probability of fair/poor health. The probability decreases to .13 for oldest old that do experience pain.

Conclusion

This study used NHANES data to examine the connection between two measures of pain, general and site-specific, and self-assessed health across age cohorts. Part of the significance of the investigation rests in the notion that self-assessments capture beyond what can be portrayed and

described by more objective measures of health (Mossey & Shapiro, 1982; Idler & Benyamini, 1997). Indeed, self-assessed health is very predictive of later health outcomes (Menec et al., 1999). But, self-assessed health is also made complex by social construction elements such that those with similar objective health may self-assess differently at different points in the life course (Idler 1993). Pain is an understudied component of this construction. Like self-assessed health, pain may or may not be tied to specific, recognized and diagnosed medical conditions. Yet, pain is clearly an important influence on an individual's conceptualization of their well-being. Several notable studies have linked pain and self-assessed health; although these have generally not explored the nuanced nature of the association across the life course (Reyes-Gibby et al., 2001).

The current study verified that an extremely robust association exists between pain and self-assessed health. In fact, the analyses showed pain measures to be strongly connected to self-assessed health even after controlling for a large number of chronic conditions, mental health and health-care utilization, while also adjusting for demographic, socio-economic and social support covariates. The link between pain and self-assessed health cannot, therefore, be explained by the health characteristics included in this study. Moreover, our models indicated that, particularly with respect to general pain, the association is even more robust than some of the more objective measure of health. Therefore, an individual that experiences say general pain is less likely to assess their health as excellent as is an individual who has heart disease or a thyroid condition. While we obviously are unable to control for every possible facet of health that might explain away the association, our results still make apparent that pain is an extraordinarily important constituent of self-assessed health.

At the same time, tests of interaction effects revealed that the relationship between pain and self-assessed health varies broadly across age cohorts. The self-assessed health of those in middle age (defined as age 40 to 59) was most strongly associated with general and specific pain. At the same time, the self-assessed health of the oldest-old is almost completely unaffected by pain. In fact, when it comes to specific pain, those in the oldest-old age group who reported such pain were a little more likely to be in a more favorable category of self-assessed health than those who did not. In supplementary analyses we experimented with cutting age into different categories. The lack of an association between pain and self-assessed health proved to be present in every age group except the oldest-old, and the most robust associations always exist among those categorized as around middle age. Our findings on balance are therefore consistent with the notion that how pain acts to shape conceptions about health and well-being is in part socially constructed, varying across the life course.

There are a number of possible factors that explain the variation in associations across age cohorts. While it is beyond the scope of this study to test for these, it is worth speculating on what underlies the interaction as this can provide impetus for building hypotheses and theory. In the most general sense, the social construction of health and illness has been widely examined among social theorists. As Conrad and Barker (2010) note, the experience of health is not purely a biological phenomenon, but rather is shaped by a particular social context within which it is interpreted. Perhaps the oldest old do not see pain as being an important constituent of health because in itself it does not signify a life threatening condition. Cultural norms and standards among the oldest-old may deemphasize the experience of pain. Older individuals may have expectations of experiencing pain, and may be comparing their experience to others within their own cohort. Pain may not play a large part in limiting the daily activities that the oldest-old expect to be able to accomplish. The fact that site-specific pain has the least impact on the oldest old may further suggest that they are likely to be

using pharmaceutical interventions that could be limiting the impact of the pain on their ability to function. Those taking medication to relieve pain may indeed experience more life satisfaction as a result of being asymptomatic. The opposite may be true of those in middle age. They may place more emphasis on pain as a determinant of well-being if interpreted as being uncommon among their age cohort and if the pain experienced is likely to restrict what the middle age consider as normal daily activities.

Our findings are in keeping with previous studies that draw a distinction between general and specific pain (Kamaleri et al. 2008; Andersson et al., 1993). The effect of general pain was somewhat more robust. This could be because a more localized experience is more effectively managed. Despite these differences, both general and specific pain was robustly related to lower levels of self-assessed health. In additional analyses we combined these two measures into a single measure of pain, but the results did not prove to be more instructional than what is presented here.

Several limitations to the current study should be noted. Most significantly, measures available in the NHANES data are not sufficient to totally capture the complex experience of pain. Pain researchers have long been analyzing the validity of various pain measures (Ferreira-Valente et al., 2011). Some have suggested a detailed continuous scale is a more valid tool for capturing the full experience of pain. Still, our distinction between general and specific pain provides somewhat more nuance than previous studies. Further, it is possible that the time reference differences between the experiences of general versus specific pain in the NHANES could influence the strength of each in determining self-assessed health. General pain occurred within the month prior to interview while specific could have been experienced up to a year before the interview. This may put the general pain experience more foremost in the mind of individuals.

Our analysis suggests some questions that require further research. NHANES data is cross-sectional and questions about pain were not repeated over time. Without longitudinal data, strong causal inference is not possible. It is likely that the association between pain and self-assessed health includes some endogeneity whereby conceptions of health can impact upon the tendency to report pain. Future studies using longitudinal data would allow for stronger causal connections. As suggested above, future studies should consider additional variables that might be able to tease out underlying factors that lead to variation in associations between pain and self-assessed health over the life course. It would be helpful to also examine interactions between age and other measures, such as chronic conditions, to assess whether similar age variation exists with other health indicators.

In sum, among most age cohorts our findings suggest that pain itself is an important factor leading to an individual's conception of their health therefore warranting further attention. Pain should be more frequently considered a separate condition that negatively impacts health and quality of life. After controlling for health conditions that may cause pain, the association between pain and self-assessed health remains robust. The implications of this are significant. Given that self-assessed health has been shown to predict morbidity and mortality (Molarius & Janson, 2002; Menec et al., 1999), it follows that those who report having pain would be at greater risk for future negative health outcomes. Current policy debates over opioid prescribing (Bohnert et al., 2011) may benefit from understanding what underlies this connection. Moreover, in this study we have studied to measures that are both subjective and difficult at times to link to specific medical conditions. We have shown that these measures contribute to the validity of lay perceptions of health and well-being.

References

Ahmedzai, S. (1995). "Recent clinical trials of pain control: impact on quality of life." European Journal of Cancer **31**: S2-S7.

Andersson, H. I., et al. (1993). "Chronic pain in a geographically defined general population: studies of

differences in age, gender, social class, and pain localization." The Clinical journal of pain **9**(3): 174-182.

Banks, S. M. and R. D. Kerns (1996). "Explaining high rates of depression in chronic pain: A diathesis-stress framework." Psychological Bulletin **119**(1): 95.

Berkman, L. F., et al. (2000). "From social integration to health: Durkheim in the new millennium." Social science & medicine **51**(6): 843-857.

Bohnert, A. S., et al. (2011). "Association between opioid prescribing patterns and opioid overdose-related deaths." Jama **305**(13): 1315-1321.

Dowd, J. B. and A. Zajacova (2007). "Does the predictive power of self-rated health for subsequent mortality risk vary by socioeconomic status in the US?" International Journal of Epidemiology **36**(6): 1214-1221.

Ferreira-Valente, M. A., et al. (2011). "Validity of four pain intensity rating scales." Pain **152**(10): 2399-2404.

Fishbain, D. A., et al. (1997). "Chronic pain-associated depression: antecedent or consequence of chronic pain? A review." The Clinical journal of pain **13**(2): 116-137.

Frankenberg, E. and N. R. Jones (2004). "Self-rated health and mortality: does the relationship extend to a low income setting?" Journal of health and social behavior **45**(4): 441-452.

Garrity, T. F., et al. (1978). "Factors influencing self-assessment of health." Social Science & Medicine. Part A: Medical Psychology & Medical Sociology **12**: 77-81.

Hardt, J., et al. (2008). "Prevalence of chronic pain in a representative sample in the United States." Pain Medicine **9**(7): 803-812.

Hartvigsen, J., et al. (2004). "Psychosocial factors at work in relation to low back pain and consequences of low back pain; a systematic, critical review of prospective cohort studies." Occupational and Environmental Medicine **61**(1): e2-e2.

Idler, E. L. (1993). "Age differences in self–assessments of health: Age changes, cohort differences, or survivorship?" Journal of Gerontology **48**(6): S289-S300.

Idler, E. L. and R. J. Angel (1990). "Self-rated health and mortality in the NHANES-I Epidemiologic Follow-up Study." American journal of public health **80**(4): 446-452.

Idler, E. L. and Y. Benyamini (1997). "Self-rated health and mortality: a review of twenty-seven community studies." Journal of health and social behavior: 21-37.

Idler, E. L. and S. Kasl (1991). "Health perceptions and survival: Do global evaluations of health status really predict mortality?" Journal of Gerontology **46**(2): S55-S65.

Jylhä, M. (2009). "What is self-rated health and why does it predict mortality? Towards a unified conceptual model." Social science & medicine **69**(3): 307-316.

Kaplan, G. A. and T. Camacho (1983). "Perceived health and mortality: a nine-year follow-up of the human population laboratory cohort." American journal of epidemiology **117**(3): 292-304.

Kawachi, I., et al. (1999). "Social capital and self-rated health: a contextual analysis." American journal of public health **89**(8): 1187-1193.

Krause, N. M. and G. M. Jay (1994). "What do global self-rated health items measure?" Medical care **32**(9): 930-942.

Linn, B. S. and M. W. Linn (1980). "Objective and self-assessed health in the old and very old." Social Science & Medicine. Part A: Medical Psychology & Medical Sociology **14**(4): 311-315.

Magni, G., et al. (1994). "Prospective study on the relationship between depressive symptoms and chronic musculoskeletal pain." Pain **56**(3): 289-297.

Manderbacka, K., et al. (1999). "Do risk factors and health behaviours contribute to self-ratings of health?" Social science & medicine **48**(12): 1713-1720.

Mäntyselkä, P. T., et al. (2003). "Chronic pain and poor self-rated health." Jama **290**(18): 2435-2442.

Menec, V. H., et al. (1999). "Self-perceptions of health: A prospective analysis of mortality, control, and health." The Journals of Gerontology Series B: Psychological Sciences and Social Sciences **54**(2): P85-P93.

Molarius, A. and S. Janson (2002). "Self-rated health, chronic diseases, and symptoms among middle-aged and elderly men and women." Journal of clinical epidemiology **55**(4): 364-370.

Mossey, J. M. and E. Shapiro (1982). "Self-rated health: a predictor of mortality among the elderly." American journal of public health **72**(8): 800-808.

National Center for Health Statistics. The National Health and Nutrition Examination Survey (NHANES) 2003-2004 data files. Available at: http://www.cdc.gov/nchs/nhanes.htm. Accessed January 20, 2014.

Ostrove, J. M., et al. (2000). "Objective and subjective assessments of socioeconomic status and their relationship to self-rated health in an ethnically diverse sample of pregnant women." Health Psychology **19**(6): 613.

Pincus, T., et al. (2002). "A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain." Spine **27**(5): E109-E120.

Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19 June-22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 July 1948.

Racine, M., et al. (2012). "A systematic literature review of 10years of research on sex/gender and pain perception–Part 2: Do biopsychosocial factors alter pain sensitivity differently in women and men?" Pain **153**(3): 619-635.

Rakowski, W., et al. (1991). "The association of self-rated health with two-year mortality in a sample of well

elderly." Journal of Aging and Health **3**(4): 527-545.

Reyes-Gibby, C. C., et al. (2002). "Impact of pain on self-rated health in the community-dwelling older adults." Pain **95**(1): 75-82.

Schulz, A. J., et al. (2006). "Discrimination, symptoms of depression, and self-rated health among African American women in Detroit: results from a longitudinal analysis." American journal of public health **96**(7): 1265-1270.

Siedlecki, S. L. (2006). "Predictors of self-rated health in patients with chronic nonmalignant pain." Pain Management Nursing **7**(3): 109-116.

Soklaridis, S., et al. (2010). "Looking upstream to understand low back pain and return to work: psychosocial factors as the product of system issues." Social science & medicine **71**(9): 1557-1566.

Von Korff, M., et al. (2005). "Chronic spinal pain and physical–mental comorbidity in the United States: results from the national comorbidity survey replication." Pain **113**(3): 331-339.

Young, S., et al. (2003). "Correlation of clinical examination characteristics with three sources of chronic low back pain." The Spine Journal **3**(6): 460-465.

Zimmer, Z., et al. (2000). "A cross-national examination of the determinants of self-assessed health." Journal of health and social behavior: 465-481.

Table 1. Percent distribution of study variables[1]

Variable		Variable	
Self-Assessed Health		HH Size	
Poor/Fair	18.4	One	13.6
Good	31.3	Two	35.4
V. Good	29.6	Three/four	34.7
Excellent	20.7	Five and higher	16.3
		Not working	35.6
Pain			
Has general pain	28.3	Health	
Has specific pain	71.2	Conditions	
		Asthma	12.8
Socioeconomic and Demographic		Arthritis	24.5
Age Group		Heart failure	2.6
Young (20-39)	38.8	Heart disease	4.0
Middle age (40-54)	38.5	Angina	3.1
Young-old (55-69)	18.4	Heart attack	4.0
Oldest-old (70+)	4.2	Stroke	2.8
Female	52.0	Emphysema	2.0
Race		Overweight	29.1
Hispanic	11.4	Chronic bronchitis	6.9
White	72.1	Liver condition	3.4
Black	11.2	Thyroid condition	10.3
Other	5.4	Cancer	8.6
Education		Health care utilization	
Not a high school graduate	18.4	Zero times/yr.	15.2
High school graduate	27.0	1-3 times/yr.	46.2
Some college/AA	31.3	4-9 times/yr.	24.2
Completed college	23.2	10+ times/yr.	14.4
Marital Status		Saw mental health professional	8.0
Never married	17.5		5.7
Divorced/separated	12.0	Social Support	
Widowed	6.9	Has emotional support	29.7
Married/living with partner	63.7	No emotional support	44.0
HH Income		Number of close friends	26.3
Low (<$25k/yr)	23.1	0-3	
Medium ($25k-$65k/yr)	40.0	4-9	
High (>$65k/yr)	31.2	10-50	
Missing HH income	5.7		

[1]N=7252 except for social support items where N=4435

Table 2. Percent distribution of self-assessed health by experience of pain and age group

		General pain		Specific pain	
		Yes	No	Yes	No
Total sample	Poor/Fair	31.0	13.5	22.2	9.1
	Good	35.1	29.8	32.5	28.3
	Very good	24.5	31.6	28.9	31.3
	Excellent	9.3	25.2	16.4	31.3
	Total	100.0	100.0	100.0	100.0
χ^2		463.7***		307.8***	
Young	Poor/Fair	20.4	9.5	15.7	5.3
	Good	34.6	28.4	31.7	26.4
	Very good	30.8	32.5	31.7	32.8
	Excellent	14.2	29.6	20.9	35.5
	Total	100.0	100.0	100.0	100.0
χ^2		107.4***		113.6***	
Middle-age	Poor/Fair	33.3	11.7	22.7	7.1
	Good	38.7	29.4	33.7	28.7
	Very good	21.0	34.0	28.4	33.5
	Excellent	7.0	24.9	15.2	30.7
	Total	100.0	100.0	100.0	100.0
χ^2		311.2***		138.7***	
Young-old	Poor/Fair	44.4	21.8	31.2	18.9
	Good	27.1	31.5	30.9	29.1
	Very good	21.8	27.8	26.3	25.9
	Excellent	6.8	18.9	11.6	26.1
	Total	100.0	100.0	100.0	100.0
χ^2		77.1***		51.6***	
Oldest-old	Poor/Fair	41.3	28.0	33.6	23.9
	Good	33.3	38.7	36.0	41.3
	Very good	22.2	20.2	19.6	21.7
	Excellent	3.2	13.2	10.7	13.0
	Total	100.0	100.0	100.0	100.0
χ^2		7.9**		2.9	

*0.10 > p > 0.05; **0.05 < p < 0.01; ***0.01 > p

Table 3. Ordered regression log-odds ratios predicting self-assessed health (N=7252)

	General pain			Specific pain		
	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
N	7252	7252	4435	7252	7252	4435
Pain						
General pain	-1.056***	-.744***	-.858***	---	---	---
Specific pain	---	---	---	-.760***	-.486***	-.456***
Age group						
Young	.467***	.247***	---	.471***	.244***	---
Middle age	---	---	---	---	---	---
Young-old	-.020	.215***	.249***	-.050	.267***	.316***
Oldest-old	-.182	.048	.168	-.070	.130	.271*
Female	.154***	.285***	.210***	.153***	.290***	.232***
Race						
Hispanic	-.455***	-.667***	-.600***	-.407***	-.645***	-.572***
White	---	---	---	---	---	---
Black	-.174**	-.240***	-.320***	-.167**	-.241***	-.298***
Other	-.224**	-.389***	-.098	-.176*	-.365***	-.130
Education						
Not a HS graduate	-1.387***	-1.393***	-1.183***	-1.328***	-1.356***	-1.123***
HS graduate	-.791***	-.845***	-.692***	-.744***	-.819***	-.659***
Some college/AA	-.427***	-.421***	-.206**	-.404***	-.407***	-.189**
Completed college	---	---	---	---	---	---
Marital Status						
Never married	-.072	-.205***	-.219	-.060	-.200***	-.265**
Divorced/separated	-.226***	-.253***	-.209**	-.190**	-.228***	-.184*
Widowed	-.065	-.073	-.054	-.043	-.053	-.044
Married/living with	---	---	---	---	---	---
HH Income						
Low	-.638***	-.615***	-.568***	-.655***	-.628***	-.604***
Med	-.249***	-.240***	-.164**	-.265***	-.250***	-.193***
High	---	---	---	---	---	---
Missing	-.255**	-.252**	-.141	-.236**	-.240**	-.129

Continued on next page

Table 3 continued.

	General pain			Specific pain		
	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
HH Size						
One	---	---	---	---	---	---
Two	-.034	-.145*	-.243**	-.031	-.153*	-.268**
Three or four	-.010	-.190**	-.357***	-.036	-.221**	-.387***
Five+	-.147	-.355***	-.581***	-.169*	-.388***	-.622***
Not working	-.491***	-.288***	-.521***	-.544***	-.309***	-.529***
Medical conditions						
Asthma	---	-.084	-.262***	---	-.081	-.271***
Arthritis	---	-.338***	-.281***	---	-.350***	-.319***
Heart failure	---	-1.034***	-.987***	---	-1.064***	-1.046***
Heart disease	---	-.576***	-.632***	---	-.561***	-.622***
Angina	---	-.907***	-.852***	---	-.962***	-.910***
Heart attack	---	.117	.133	---	.104	.129
Stroke	---	-.723***	-.642***	---	-.704***	-.586***
Emphysema	---	-.954***	-.749***	---	-.950***	-.808***
Overweight	---	-.625***	-.523***	---	-.613***	-.519***
Chronic bronchitis	---	-.786***	-.551***	---	-.821***	-.579***
Liver condition	---	-.400***	-.343**	---	-.408***	-.349**
Thyroid condition	---	-.223***	-.261***	---	-.249***	-.287***
Cancer	---	.149**	.194**	---	.154*	.184**
Health Care Utilization						
0 times/yr.	---	1.015***	1.392***	---	1.118***	1.464***
1-3 times/yr.	---	.773***	1.145***	---	.857***	1.211***
4-9 times/yr.	---	.271***	.484***	---	.317***	.525***
10+ times/yr.	---	---	---	---	---	---
Saw mental health prof.	---	-.268***	-.059	---	-.292***	-.121
Social Support						
Has emotional supp.	---	---	---	---	---	---
No emotional supp.	---	---	-.739***	---	---	-.733***
0-3 close friends	---	---	-.243***	---	---	-.235***
4-9 close friends	---	---	-.008	---	---	.018
10-50 close friends	---	---	---	---	---	---
Intercept 1	-2.985	-3.059	-2.911	-3.166	-3.108	-2.906
Intercept 2	-1.211	-1.096	-.925	-1.438	-1.171	-.960
Intercept 3	0.355	.586	.823	.104	.497	.757
Log-likelihood	-6127.0	-8005.8	-4974.3	-6204.1	-8140.8	-5049.8

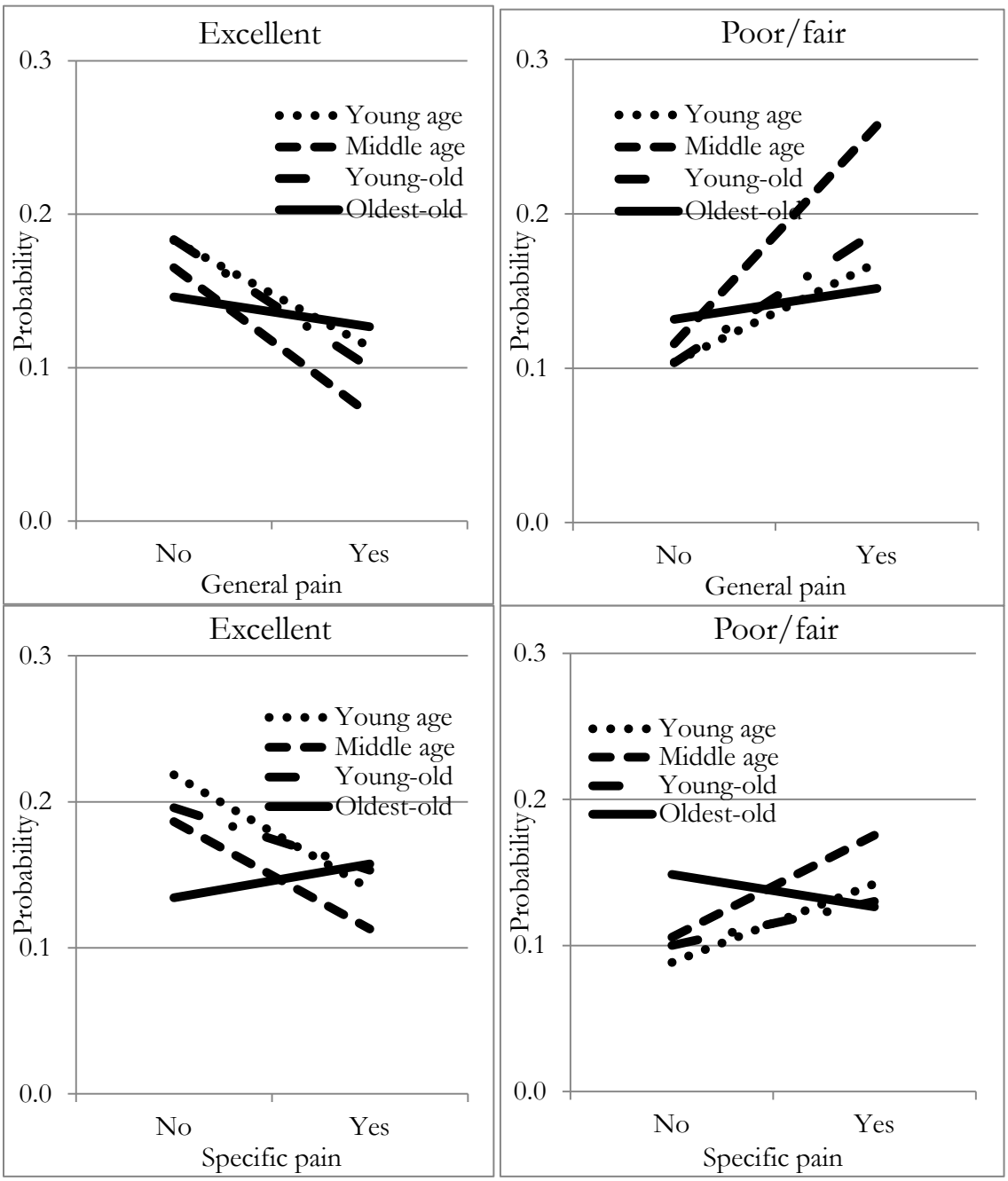
*0.10 > p > 0.05; **0.05 < p < 0.01; ***0.01 >

Table 4. Log-odds ratios for interaction effects[1]

	General pain model	Specific pain model
General pain	-.972***	---
Specific pain	---	-.588***
Young	.123*	.199**
Young-old	.127	-.062
Old-old	-.146	-.390*
General X Young	.414***	---
General X Young-old	.270*	---
General X Oldest-old	.807***	---
Specific X Young	---	.051
Specific X Young-old	---	.290**
Specific X Oldest-old	---	.775***
Log-likelihood	-7996.5	-8134.6

[1] Models control for covariates from Model 2a and b from Table 3.

Figure 1. Predicted probability of excellent or poor/fair self-assessed health by general and specific pain and age cohort[1]



[1] Calculated from interaction models, holding other covariates constant at their means