HEALTH AND LABOR MARKETS

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HEALTH AND LABOR MARKETS

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PREFACE

Research in Labor Economics is a series that publishes new labor economics research. Articles apply economic theory and econometrics to policy-relevant topics often with an international focal point. This volume contains nine articles originally presented at the IZA Workshop on Health and Labor Markets. Four articles deal with the link between health events and labor market outcomes, three with incentive effects of health insurance, one with the relationship between opioid use and employment, and finally one with the health effects on children of parental migration. As you will see, published articles in *Research in Labor Economics* focus on important issues and maintain the highest levels of scholarship. They are indexed in EconLit, Google Scholar, RePEc, and SCOPUS. Readers who have prepared manuscripts that meet these stringent standards are encouraged to submit them via the IZA website (http://rle.iza.org).

In the first article, Daniel Dench and Michael Grossman investigate whether and to what extent health changes induce wage changes, or the opposite, whether a change in the wage rate induces a change in health. Employing longitudinal data of US young adults they uncover a novel causal relationship between one's health and one's wage, namely that a reduction in health leads to an increase in one's wage rate. This seemingly counterintuitive finding is consistent with two models. First is the compensating wage differential model. In this model, a large amount of effort required for a promotion and subsequent wage gain causes a reduction in health. Second is a model in which investments in career advancement compete for time with investments in health.

Adverse health events may not only induce wage changes but also could affect an employee's work capacity as time is needed to recover from a health shock. In the second article, Zornitza Kambourova, Wolter Hassink, and Adriaan Kalwij examine the employment effects of an unfavorable health event among women in the Netherlands, a country which provides employment protection during the first two years after a diagnosis. Using administrative data, which follow women aged 25 to 55 for four years after a medical diagnosis, they find that, independent of severity, diagnosed women start leaving employment during the protection period, and four years later they are about one percentage point less likely to be employed. Looking at working hours, the authors find minor adjustments in the short-term and no adjustments in the long-term. Unlike employment and hours, wages adjust depending on the severity of the health condition with women diagnosed with temporary health conditions experiencing a short-term wage penalty of about 0.5 to 1.7 percent, while those

diagnosed with chronic and incapacitating conditions experienced a long-term wage penalty of about 0.5 percent.

Workplaces often experience financial difficulties and undergo restructuring which involves periods of downsizing. The risk and experience of job loss may affect workers' health. In the third article, Italo A. Gutierrez and Pierre-Carl Michaud examine the effects of job insecurity on the mental health of older workers in the United States. They provide evidence that job insecurity, as measured by the self-reported probability of job loss, increases stress at work and the risk of clinical depression. Their analysis exploits panel data and plausibly exogenous changes in job loss expectations following eliminations of similar positions and other types of jobs at the worker's employer, as well as changes in employment at the industry-state level. This evidence suggests that job insecurity which is outside the control of workers may have large effects on mental health.

While downsizing affects workers' mental health, the next article by Annette Bergemann, Erik Grönqvist, and Soffia Guðbjörnsdóttir shows that career disruption of workers does not impact morbidity for those already diagnosed with type 2 diabetes (T2D). The authors combine unique, high-quality longitudinal data from the Swedish National Diabetes Register (NDR) with matched employer–employee data and focus on individuals diagnosed with T2D, who are established in the labor market and who lose their job in a mass layoff. Using a conditional difference-in-differences evaluation approach, their findings give limited support for job loss having an impact on health behavior, diabetes progression, and cardiovascular risk factors.

One way to estimate the impact of public health insurance on a population's well-being is to examine what happens when an insurance program is arbitrarily eliminated. In the next article Thomas DeLeire examines the effect of disenrollment from Medicaid, a US federal government program that provides health coverage on employment, on sources of health insurance coverage, and on health and health care utilization. Following a change in eligibility rules, the Tennessee Medicaid program disenrolled approximately 170,000 adults from July to September 2005 resulting in a reduction by over 5 percentage points in the fraction of adults covered by the program. The author finds no evidence of an increase in employment rates in Tennessee following the disenrollment. Further, self-reported health and access to medical care worsened. These findings suggest that access to public health insurance increases health insurance coverage, provides access to health care, and improves health, without affecting work incentives, at least for Tennessee's Medicaid eligible population.

Health insurance systems in many countries include compensation for sickness related work absences. The generosity of these benefits may affect one's incentives to claim sick days and is often subject to reforms. In the next article, Márton Csillag examines the change in the number of days spent on sick leave following the 2011 reform which halved the maximum sick day benefits provided by statutory health insurance in Hungary. The author evaluates the reform's short-term effect using a difference-in-differences methodology relying on high-quality administrative data. The analysis shows that the number of days

spent on sick leave fell substantially for those experiencing the full halving of benefits. The estimated elasticity is −0.45.

More generous sick benefits imply higher levels of absenteeism, yet in many countries employers provide sick pay in addition to the public sick pay. In the next article, Alex Bryson and Harald Dale-Olsen show that close to 50% of private sector employers in Britain and Norway provide sick pay in excess of statutory sick pay. The authors argue that employers provide such private sick pay in addition to other benefits in part to attract and retain valuable workers thus enabling them to maximize profits having accounted for different dimensions of labor costs. They also show that the sickness absence rate is much higher in Norway than in Britain, which relates to the threshold for statutory sick pay in the Norwegian public sick pay legislation.

Workers suffering from chronic health conditions often use opioid pain medications prescribed by their physicians, a practice which in the United States has led to an opioid epidemic associated with drug overdoses and mortality. In the next article, Janet Currie, Jonas Jin, and Molly Schnell ask whether the opioid crisis results from unemployment and economic dislocation among less-skilled American workers, or the reverse, whether excessively prescribed opioids brought about unemployment and economic dislocation by converting the chronically injured into addicts. The authors conclude that there is no simple causal relationship between economic conditions and opioid abuse. Using quarterly county-level data from 2006 to 2014 and instrumenting opioid prescriptions for younger ages by opioid prescriptions to the elderly, the authors find a slightly positive but small effect of opioids on employment-to-population ratios for women, but no such effect for men. Further, the impact of employment-to-population ratios on opioid prescription rates appears to be ambiguous. These findings suggest that improving economic conditions is unlikely to limit the opioid epidemic.

Well-being in adulthood depends to a large extent on childhood health, which in turn is influenced by the quantity and quality of family resources. In the last article, Carl Lin and Yana van der Meulen Rodgers investigate the tradeoff between family income and time spent with children on child health outcomes by examining how parental migration decisions are associated with the nutritional status of children in rural and urban China. Using migrant household survey data from 2008 and 2009, the authors show a substantial adverse effect of children's exposure to parental migration on height-for-age Z scores of left-behind children relative to children who migrate with their parents. Children who are left behind in rural villages have poorer nutritional status than children who migrate with their parents, and the gaps are biggest at lower portions of the distribution.

We thank IZA for sponsoring the Health and Labor Market Workshop as well as conference participants for lively discussion and important insights on a particularly vital policy related topic.

Lastly, *Research in Labor Economics* mourns the passing of Editorial Board member Alan B. Krueger. Alan was a trail blazer in many areas of economics especially those linking individual welfare to public policy. As an empirically

minded pioneer in quasi-experimental research Alan instigated important new studies spanning such topics as minimum wage legislation, educational attainment, labor in the gig economy, occupational licensing, opioid's effects on work behavior, non-compete clauses in employment contracts, as well as technical issues regarding the strength of government statistical data. He authored well over a hundred academic papers and a number of books including one on terrorism and a soon to be published book on the music industry titled *Rockonomics*. In addition, Alan served two U.S. presidents, first under President Clinton as Chief Economist of the Department of Labor, and then under President Obama as Assistant Secretary for Economic Policy in the Department of the Treasury and Chairman of the President's Council of Economic Advisers. Finally, Alan wrote two important articles in *Research in Labor Economics*. One extended his previous Pennsylvania-New Jersey minimum wage work with David Card to the Puerto Rican economy (Volume 14) and the other a joint article with Lawrence Katz (Volume 12) examined changes in the structure of U.S. public sector wages.

HEALTH AND THE WAGE RATE: CAUSE, EFFECT, BOTH, OR NEITHER? NEW EVIDENCE ON AN OLD QUESTION ☆

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ABSTRACT

In this chapter, we investigate two-way causality between health and the hourly wage. We employ insights from the human capital and compensating wage differential models, a panel formed from the National Longitudinal Survey of Youth 1997, and dynamic panel estimation methods in this investigation. We adopt plausible specifications in which a change in health induces a change in the wage with a lag and a change in the wage induces a change in health, also with a lag. We uncover a causal relationship between two of the five measures of health and the wage in which a reduction in health leads to an increase in the wage rate in a panel of US young adults who had completed their formal schooling by 2006 and were continuously employed from that year through 2011. There is no evidence of a causal relationship running from the wage rate to health in this panel. The former result highlights the multidimensional nature of health. It is consistent with an extension of the compensating wage differential model in which a large amount of effort in one period is required to obtain

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promotions and the wage increases that accompany them in subsequent periods. That effort may cause reductions in health and to a negative effect of health in the previous period on the current period wage. In this framework, employees have imperfect information about the effort requirements of a particular job when they are hired, and employers have imperfect information about the amount of effort new hirers are willing to exert. The result is also consistent with a model in which investments in career advancement compete with investments in health for time – the ultimate scarce resource. The lack of a causal effect of the wage on health may suggest that forces that go in opposite directions in the human capital and compensating wage differential models offset each other.

Keywords: Health; wage; cause; effect; neither; both

JEL classifications: I10; J24

1. INTRODUCTION

Both the human capital model and the compensating wage differential model generate relationships between health and the wage rate. In Grossman's treatment of health as a form of human capital, he draws a sharp distinction between health capital and other forms of human capital, which he refers to as knowledge capital (Grossman, 1972a, 1972b, 2000, 2017). Investments in knowledge capital raise wage rates, while investments in health capital raise the total amount of time available for market and household production in a given year and prolong the length of life. That treatment suggests, however, important complementarities between the two forms of human capital. Returns to investments in knowledge are higher the more time that is available for market and household production, especially if productivity in both sectors is positively related to the stock of knowledge. Returns also are higher the longer are the number of periods that the investor lives. The larger the returns to investments in health are the greater is the monetary value of the increase in healthy time and length of life. The wage rate of the investor is the most direct measure of this monetary value. These complementarities suggest causality from knowledge capital to health capital and from health capital to knowledge capital.[1]

[1]Despite these complementarities and the two-way causality they suggest, Grossman (1972a, 1972b) treats knowledge capital as exogenous in his theoretical model of the demand for health. Galama and van Kippersluis (2016) construct a rich theoretical model in which both types of capital are endogenous. Their model allows for a complex and intriguing set of interactions and complementarities between health capital and knowledge capital. To date, it has not been used as the basis of empirical work. In our view, attempts to specify and estimate this model will be very rewarding.

The compensating wage differential model, which dates to Adam Smith (1937), was formalized in a seminal article by Rosen (1974).[2] This model emphasizes that wage offers may have to be adjusted upwards to compensate for health risks associated with specific jobs, occupations, and industries. Thus, in stark contrast to the human capital model, it generates a negative relationship between health and the wage rate.

In this chapter, we use the hourly wage rate – the most comprehensive measure of the stock of knowledge of investors who have completed training – and a number of measures of health to investigate two-way causality between health and the wage. We do this in a panel formed from the National Longitudinal Survey of Youth 1997. We employ dynamic panel models (e.g., Arellano, 2003, Baltagi, 2008) in this investigation. We employ plausible specifications in which a change in health induces a change in the wage with a lag and a change in the wage induces a change in health, also with a lag.

2. BACKGROUND

2.1. Human Capital Model

Grossman and others who conducted empirical tests of his 1972 model of the demand for health have not explored complementarities between health capital and knowledge capital just outlined in detail (see Grossman, 2000 for a discussion of empirical studies related to those in Grossman, 1972b). Instead, the approach in this empirical literature has been to treat both schooling and wage rates as exogenous or more formally as predetermined variables that are not correlated with the disturbance term in the health outcome equation. Separate estimates of the effect of each have been obtained to explore the hypothesis that an increase in schooling can increase the demand for health, with the wage rate held constant, because it raises the efficiency with which health is produced, or because it changes the mix of inputs selected by the investor. However, higher wage individuals demand more health, with schooling held constant, because their monetary rates of return to investments in health exceed those of individuals with lower wage rates.[3]

In general, the research just mentioned finds positive effects of schooling and the wage rate on a variety of correlates of good health. The question of whether some portion of these effects reflects causality from health capital to knowledge capital is left open. In addition, the possibility that an unobserved "third

[2]For comprehensive reviews of this literature, see the works of Rosen (1986) and Viscusi (1993, 2014). We use the term compensating wage differentials to distinguish the negative health–wage relationships in a model with health–wage tradeoffs from positive health–wage relationships due to complementarities in the human capital model. Of course, the higher wages offered to the more educated be viewed as compensating them for the earnings they forego for attending school for more years than their less educated colleagues. So our terminology is simply a "short-hand" way to distinguish between the two basic reasons for expecting relationships between health and the wage.

[3]See below for qualifications of these predictions.

variable" causes both types of capital to vary in the same direction is not addressed.

A rich empirical literature in health economics reviewed by Grossman (2006, 2015, 2017) addresses causality between correlates of knowledge capital and health capital in a thorough manner. Studies in this literature employ years of formal schooling completed as the measure of knowledge capital and a number of different correlates of better health. Much of the emphasis is on the estimation of causal effects of more schooling on the health of the investor or on her or his children. Some studies, however, seek to uncover causal effects of early investments in the health, cognitive, and noncognitive development of children on later outcomes.

Part of our contribution in this chapter is grounded in the literature just discussed but takes a somewhat different approach. Instead of measuring knowledge capital by completed schooling, we measure it by the hourly wage rate. This is a better measure of knowledge capital than schooling because it encompasses on-the-job training as well as schooling. In Ben-Porath's seminal contribution on investment in human capital over the life cycle (Ben-Porath, 1967), he defines earnings potential (the value of knowledge) as RK, where R is the rental price per unit of human capital and K is the amount of that capital. As opposed to the literature on the relationship between schooling and health, we employ an hourly version of RK.[4] And instead of estimating only a health equation or only a knowledge (proxied by schooling) equation, we estimate equations for both types of human capital.

Our approach is not an entirely new one. Grossman and Benham (1974), Grossman (1976), and Lee (1982) estimate simultaneous-equations health–wage models in cross-sectional data. These studies are motivated by considerations briefly mentioned in the introduction to this chapter (see Section 1). In that section, we pointed out that the larger the returns to investments in health are the greater is the marginal benefit of the increase in healthy time and length of life. The wage rate of the investor is the most direct measure of these benefits. One necessary condition for the marginal rate of return on the investment to rise is that the own time of the investor is not the only input in the production function of investment in health. In that case, the percentage increase in the marginal benefit of an investment exceeds the percentage increase in its marginal cost. A second necessary condition that underlies the prediction of a positive wage coefficient in the health demand function is that health is what Grossman (1972a, 1972b) terms a "pure investment commodity" because it does not enter the utility function. The prediction becomes complicated in a model in which health is both an investment commodity and a "consumption commodity" (a commodity that enters the utility function directly) because one has to take account of how

[4]If forces in the compensating wage differential model are present, the wage rate no longer is the most comprehensive measure of the stock of knowledge capital or more generally of the stock of human capital. See Section 2.2 for more details.

the marginal cost of investment changes relative to the marginal costs of other household commodities.[5] Even if the relative price of health rises, the resulting negative substitution effect may be offset or more than offset by a positive income or wealth effect.

Returns to investments in knowledge are higher the more time that is available for market and household production, especially if productivity in both sectors is related to the stock of knowledge. Returns also are higher the longer are the number of periods that the investor lives. While these factors typically are used to explain why better health may cause more schooling, they also are relevant to investments in knowledge made after the completion of school. Grossman (2006) summarizes evidence suggesting that students' health influences their productivity in school. Reasoning by analogy, should not adults' health influence their productivity in the labor market? For example, individuals who miss a significant amount of time at work due to illness may lose the opportunity to advance by undergoing intensive computer training. Ultimately, that may hinder their opportunities for promotion, result in lower wage rates, and less facility with the use of computers in home production. More generally, Mincer (1974) stresses that investment in on-the-job training, measured by the total amount of time spent in such an activity, plays a major role in the wage function in his seminal treatment of that function. That variable is imperfectly measured in most data sets. To the extent that poor health reduces the amount of time spent in the labor market and opportunities to invest in on-the-job training, past health may affect the current wage via its impact on past investment in that training.

There is, however, a factor associated with on-the-job training that may result in a negative effect of health on the wage, especially if lagged relationships are considered. Rosen (1972) argues that on-the-job training is a joint product of hours of work and the existing stock of human capital. In that case, investments in career advancement compete with investments in health for time – the ultimate scarce resource.[6]

To explore bidirectional causality between health and the wage, Grossman and Benham (1974) employ white males in the 1963 health interview survey conducted by the National Opinion Research Center (NORC) and the Center for Health Administration Studies of the University of Chicago. They measure health as an index formed from the first principal component of the number of symptoms reported from a checklist of 20 common symptoms and individuals'

[5]These necessary conditions also are required to justify the predications made by Grossman and Benham (1974), Grossman (1976), and Lee (1982) about the effects of an increase in years of formal schooling completed on health, with the wage rate held constant.

[6]Ben-Porath (1967) assumes that hours of work and hours allocated to investment in human capital are divisible inputs. In either case, investments in career advancement compete with investments in health for the own time of the investor. Rosen's assumption is more relevant to our extension of the compensating wage differential model in Section 2.2 in which an increase in work hours and effort in one period has direct negative effects on health but results in wage gains in subsequent periods.

self-evaluation of their general health as excellent, good, fair, or poor. Grossman (1976) employs the National Bureau of Economic Research − Thorndike sample, which contains data on high-ability white males in 1968 and additional data in 1971. He employs the self-rated health variable just defined and scaled so that it is proportional to the average number of work-loss weeks due to illness of men in poor health relative to the average number of work-loss weeks due to illness of men in each of the three other categories. Lee (1982) focuses on all males in the National Longitudinal Survey of Men 1966. He uses a multiple indicator model in which self-rated health and the presence of health conditions that affect the kind or amount of work are indicators of the unobserved stock of health. Grossman and Benham (1974) and Grossman (1976) obtain estimates by conventional two-stage least squares methods. Lee (1982) applies maximum likelihood methods to a specification that incorporates a multiple indicator model with measurement error and endogenous right-hand-side variables in each of the two structural equations.

All three studies report positive and significant effects of increases in better health in the wage equation. Grossman (1976) and Lee (1982) also find positive and significant wage coefficients in the health equation, but Grossman and Benham's (1974) coefficient is not significant. All three studies treat potentially endogenous variables as exogenous and impose questionable exclusion restrictions. For example, years of formal schooling is exogenous in the health and wage equations in all three studies. Grossman (1976) assumes that a correlation between obesity and an indicator of job satisfaction are exogenous in the health equation and do not enter the wage equation. He also excludes region and city size indicators from the health equation while including them in the wage equation. Grossman and Benham (1974) and Lee (1982) also employ this exclusion restriction. In addition, Lee includes an indicator variable for nonwhites in the wage equation, while excluding it from the health equation. Grossman and Benham assume that the length of time that has elapsed since the last physical examination is an exogenous regressor in the health equation, while Lee assumes that assets are an exogenous variable in that equation.

2.2. Compensating Wage Differential Model

In the compensating wage differential model, consumers trade off an increase in job risk, reflected by the probability of a fatal or nonfatal accident or injury, in return for a higher wage rate. Since the production of safety is costly, firms are willing to reduce the accident probability only if they can offer a lower wage rate. Market equilibrium is determined by the point of tangency between a given worker's expected utility function and a given firm's isoprofit curve. Since firms and consumers differ, the connection of these points of tangency generates an upward sloping function termed as the equilibrium market wage−risk function or the hedonic wage function. As discussed in detail by Rosen (1974, 1986) and Viscusi (1993, 2014), the complete model of this function consists of a demand function for safety by consumers and a supply function for safety by firms.

For our purposes, the market equilibrium function is the most relevant one. Typically, the wage is measured at the individual level, but the risks are injury or death rates at the occupation or industry level. Extensive reviews of this literature are contained in the study by Rosen (1986) and Viscusi (1993, 2014). The finding that an increase in job risk is associated with an increase in the wage is universal, once one controls for worker characteristics. Almost all of these studies treat job risk as exogenous because they are imbedded in a model that views the equation that is estimated as one that depicts market equilibrium.[7] The study by Kniesner, Viscusi, Woock, and Ziliak (2012) is one exception. They use panel data for men aged 18–65 in the Panel Study of Income Dynamics for the years 1993, 1995, 1997, 1999, and 2001. Since they employ a first-difference specification, most of the variation in fatality risk is due to job changes, which may be caused by wage changes. Hence, they instrument the first difference of the fatality risk with lagged levels and differences of that variable.

We modify the compensating wage differential framework because our health measures are specific to an individual rather than to an industry or occupation and because we examine the health–wage relationship in a relatively young panel in which job changes are rare. Hence, a person who accepts a relatively high-wage offer in one period may incur a reduction in health in a subsequent period because the offer he or she accepted was associated with health risks. That suggests a negative effect of the lagged wage on current health.

However, the acquisition of a chronic condition that shortens life expectancy may lead to an increase in effort in an attempt by the head of a household to provide for his or her family, which may be associated with promotions and higher wages in future periods.

Moreover, suppose there is imperfect information about the effort requirements of a particular job on the part of employees when they are hired and similar imperfect information about the amount of effort new hirers are willing to exert on the part of employers. Also assume that increases in effort have negative effects on health. Then employers have incentives to reward workers who are willing to exert more effort in one period in terms of promotions and the wage increases that accompany them in subsequent periods. Along the same lines, employees have incentives to exert more effort in order to earn these wage gains.

The metaphor of "working oneself to death" is relevant here. Indeed, Inoue and Specia (2017) describe the death of a 31-year-old female journalist for Japan's state-run TV network from congestive heart failure in July 2013. She

[7]Based on an estimation strategy proposed by Rosen (1974), a number of authors have estimated the demand function or the supply function that complete the model. These estimates first compute marginal prices from the market equilibrium equation and then treat it and safety as endogenous variables. For reviews of these studies and a new estimation procedure that has not yet been implemented at the empirical level, see Ekeland, Heckman, and Nesheim (2004) and Heckman, Matzkin, and Nesheim (2010).

died after working 159 hours of overtime during the previous month in order to cover two local elections in Tokyo. Her death, termed *karoshi* or "death from overwork" by the Japanese, has been widely recognized since the late 1980s in Japan. Cases first were reported among blue-collar workers, but they also have occurred among white-collar executives.

Schreier (2017) describes another example of the negative effect of overwork on health. Video game developers frequently experience what is termed a "crunch" or spike in work hours. During the spike, which can last for weeks, they are required to work as many as 20 hours per day and sleep at work. One such worker, who experienced the spike in order to fix bugs and add features to the role-playing game "The Elder Scrolls V: Skyrim," experienced severe stomach pains that required the individual to take a few weeks off from work. Another game developer who experienced a crunch was temporarily unable to step out of his car.

2.3. Summary

Both the human capital model and the compensating wage differential model generate relationships between health and the wage rate. In the pure investment component of the former model, an increase in the wage causes health to increase as long as the own time of the investor is not the only input in the health production function. This prediction becomes ambiguous in a mixed consumption–investment model because the relative price of health may increase substantially if its production is much more time intensive than the production of other household commodities. In addition, in the human capital model, an increase in health should increase investments in knowledge and hence the wage after the completion of formal schooling because more time is available for market and nonmarket production and because the number of periods over which returns can be collected grows. That prediction becomes ambiguous, however, if on-the-job training is a joint product of hours of work and competes for scarce time with investments in health. However, the compensating differential model generates negative causal effects from health to the wage and from the wage to health. Current period reductions in health might have been avoided if a lower initial wage offer had been accepted. Moreover, large amounts of effort in previous periods might result in reductions in health in that period and in raises and promotions in the current period.

By implementing dynamic panel data models that allow lagged levels of health and the wage to be specified as instruments for differences of right-hand-side measures of these variables on theoretical grounds, we relax the arbitrary identification assumptions in the studies by Grossman and Benham (1974), Grossman (1976), and Lee (1982). By incorporating insights from the compensating differential literature, we make a stronger case as to why there may be relationships between health and the wage rate. At the same time, we justify why we are somewhat agnostic about the signs of these relationships.