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分担研究報告書

生活習慣病と労働生産性との関連性について:先行研究レビュー

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研究要旨

本研究は、1990-2018年の直近約30年間に、主として、公衆衛生・社会疫学、及び、経済学の領域における国際的学術誌に掲載された英文による論文の中から、生活習慣病と労働生産性の関連性について定量的な検証を行った先行研究を要約・整理することを目的とする。

検索方法と選択基準は、公表済みの学術著作物の定量データを用いて、当該期間中に公表された調査研究について、「健康(health)」、「生活習慣病(lifestyle disease)」、「診断(diagnose)」、「労働生産性(labor productivity)」、「賃金(wage)」, または、「労働力の参加(labor force participation)」というキーワードの組み合わせにより、PubMed及びEconlitで検索を行った。さらに、Econlitによる検索については、2000年以降の刊行物に対し、「賃金水準と構造(wage level and structure)」、「賃金格差(wage differentials)」, または、「人的資本(human capital)」、「技能(skill)」, または、「職業選択(occupational choice)」をキーワードとして追加した。結果、英語で書かれた刊行物は、PubMedが269件、Econlitが298件存在したが、本研究プロジェクトとの関連性を1件ずつ判定し、PubMedから30件、Econlitから31件を抽出し、要約を行った。本研究が要約の対象とした61本の論文について、著者・公刊雑誌・公刊年・分析対象とされた国・分析データ・就労と健康に関する変数・分析手法・結果について要約・整理を行った。

要約の結果、国際学術誌に掲載された英文論文では、代表性の高いデータに洗練された計量経済学的手法を用いた分析が数多く存在するが、分析対象となった国や地域が北米や欧州に偏っていることが分かった。また、生活習慣病の罹患に代表される「負」の健康ショックは、就労確率を低下させる傾向にあり、賃金や年収を引き下げる可能性が高いという整合的な結果が得られている。他方、生活習慣病の罹患の就労確率や労働生産性に対する影響の大きさは、性別、人種、年齢、教育水準、疾患の種類や重症度によって異なる傾向にあることから、米国や欧州以外での当該テーマに対する研究の必要性が問われている。

A. 研究目的

本研究は、1990-2018年の直近約30年間に、主として、公衆衛生・社会疫学、及び、経済学の領域における国際的学術誌に掲載された英文による論文の中から、生活習慣病と労働生産性の関連性について定量的な検証を行った先行研究を要約・整理することを目的とする。

B. 研究方法

検索方法と選択基準は、公表済みの学術著作物の定量データを用いて、当該期間中に公表された調査研究について、「健康(health)」、「生活習慣病(lifestyle disease)」、「診断(diagnose)」、「労働生産性(labor productivity)」、「賃金(wage)」、または、「労働力の参加(labor force participation)」というキーワードの組み合わせにより、PubMed及びEconlitで検索を行った。さらに、Econlitによる検索については、2000年以降の刊行物に対し、「賃金水準と構造(wage level and structure)」、「賃金格差(wage differentials)」、または、「人的資本(human capital)」、「技能(skill)」、または、「職業選択(occupational choice)」をキーワードとして追加した。

C. 研究結果

C-1 検索結果

結果、英語で書かれた刊行物は、PubMedが269件、Econlitが298件存在したが、本研究プロジェクトとの関連性を1件ずつ判定し、PubMedから30件、Econlitから31件を抽出し、要約を行った。本研究が要約の対象とした計61本の論文について、著者・公刊雑誌・公刊

年・分析対象国・分析に用いられたデータ・就労と健康に関する変数・分析手法・結果について要約・整理を行った(表1と表2を参照)。

C-2 分析対象とされた国

本研究における検索結果から、北米(PubMedで、米国が18件、カナダが3件; Econlitでは、米国が8件、カナダが4件)、オーストラリア(PubMedで2件、Econlitで5件)、欧州諸国(PubMedで6件、Econlitで13件)¹を対象とした生活習慣病と労働生産性に関連する研究が数多く存在する一方、その他の地域に関しては、少数の研究が散見されるだけで、PubMedで、シンガポールが1件、Econlitでは、台湾が1件、中国が1件、コロンビアが1件、ブラジルが1件、そして、南アフリカが1件と、分析対象となった国や地域に偏在があることがわかった。

C-3 分析データ

本研究で要約を行った61件の研究の分析では、各国・地域のpopulationに対する代表性が極めて高いデータが用いられており、さらに、同一個人を複数期間にわたって追跡可能なlongitudinal data (panel data)を用いた研究も少なからず存在した。例えば、カナダやスウェーデン等では、長期間にわたって、個人を追跡可能な複数の行政データ(Medical claim, 人口動態統計, 住民基本台帳, 国勢調査, 確定申告台帳, 身体障がい登録台帳, 兵籍台帳, 等)を照合させる等、政策のpure effectを導出するために必要不可欠な因果推論を行うためのデータが整備されている。

¹ 欧州諸国については、PubMedで、EU11か国を対象とした研究が2件、オランダが2件、デンマークが1件、フランスが1件、Econlitでは、EU1

1か国が1件、イギリスが1件、オランダが1件、ギリシアが1件、スウェーデンが1件、デンマークが1件、ドイツが1件であった。

C-4 就労に関わる変数(被説明変数)

就労状況に関する指標として、労働参加(就労の有無)、欠勤(absenteeism)、疾病就業(presenteeism: 出勤しているが、精神的・身体的な健康上の問題を抱えているため、本来発揮されるべき職務遂行能力が低下している状態)が用いられている。労働生産性を検討する際、absenteeismやpresenteeismという概念は重要であるが、当該変数を被説明変数として用いた研究は、PubMedでは、Dibonaventura, Wagner, Yuan, et al. (2011), Gates, Succop, Brehm, et al. (2008), 及び、Pransky, Conti et al. (2004)の3件、Econlitでは、Bubonya, Cobb-Clark, Wooden (2017)の1件と数少ない。また、経済学分野で一般的に労働生産性の指標として、時間当たりの賃金が用いられることが多いが、労働に対する金銭的報酬として年収を用いた研究も散見された。

C-5 健康に関わる変数(説明変数)

本研究が焦点を当てる生活習慣病を中心とする健康に関わる変数としては、特定の疾患(がん、糖尿病、循環器系疾患、精神疾患、HIV、等)や、生活習慣病の発症と関連の高いBody Mass Index (BMI)等の肥満を示す指標が用いられている。

C-6 分析手法

生活習慣病の罹患と労働生産性の関連性に関する研究において、最大の課題は、両者に内生性(causality/endogeneity)が存在するため、因果推論を行うことが極めて困難である点である。とりわけ、因果推論に対して厳格な経済学分野では、内生性による推定値の偏りを回避するため、一時点での横断面データ(cross-section data)の場合、操作変数法(instrumental variable method: IV)による、二

段階最小二乗法(two-stage least squares:

2SLS)やRecursive Bivariate Probit等が用いられている。

最近の研究では、複数期間にわたって個人を追跡可能なlongitudinal data (panel data)が利用可能になったため、生涯にわたる賃金に対する健康資本の動学的効果を推定するdynamic panel modelや構造推定(structural estimation)を用いた分析が散見されるようになった。また、longitudinal data (panel data)では、時間によって変化しない特定個人の属性を固定効果(fixed effect)として統御することが可能となる。したがって、たとえそうした属性に関する情報が存在しなくとも、誤差項との相関によるバイアスを回避することが可能となる。

また、カナダやスウェーデン等の研究が用いている、行政上の目的のために収集される全数調査(行政データ)は、標本抽出の過程で発生する選択バイアスを回避することが出来、窓口業務での入力ミスや申請者による記載ミス等、事務処理上の過誤を除けば、回答者自身による主観が入り込む余地が少なく、回答バイアスによる測定誤差が小さいといった長所があると考えられる(野口, 2018)。こうした特性を有する複数の行政データをし、国内での政策変更を自然実験として活用した、propensity scoring matchingと差の差分析(difference-in-difference)を応用した因果推論も増えつつある。

C-7 分析結果

本研究でレビューを行った研究では、代表性の極めて高いデータに、多様な尺度と分析手法が応用されていた。分析の結果、生活習慣病の罹患に代表される「負」の健康ショックは、就労確率を低下させる傾向にあること、また、労働生産性の1つの指標である時間当た

りの賃金、ひいては年収を引き下げる可能性が高いことがわかった。他方、生活習慣病の罹患の就労確率や労働生産性に対する影響の大きさは、性別、人種、年齢、教育水準、疾患の種類や重症度によって異なる傾向にある。

D. 考察

第1に、本研究における検索結果から、分析対象となった国や地域に偏在があることがわかった。当該地域における国際学術誌による査読プロセスに耐えうる代表性の高いデータの存在、当該データに対する研究者の *accessibility*、また、処置群(制度変更によって影響を受ける地域・人口)と対照群(制度変更によって影響を受けない地域・人口)との識別に対する国内における制度変更の利用のしやすさ、つまり、国内における「自然実験 (*natural experiment*)」の設定のしやすさ等が、分析対象国に偏りがあることの原因の1つと考えられる。

第2に、本研究のテーマについては、現在、北米や欧州を中心に、信頼性の高い行政データに精緻な計量経済学的手法を応用することによって、因果推論のための最大の課題である内生性(*causality/endogeneity*)による推定バイアスを克服しようと試み数多くの研究が遂行されつつある。他方、行政データには短所もある。特定の行政データから得られる情報は極めて限定的であるという点、また、行政データには、直接住民の利害に影響する個人情報が含まれるため、照合等により情報量が増えれば増えるほど、個人が識別されるリスクが高まり、研究者に課される倫理上の責任が重くなるという点である。日本では、情報が漏えいした場合、情報の提供を受ける研究者よりも、国や地方自治体など情報を提供

する側に対する法的・社会的制裁の方が大きい制度設計になっていることから、情報提供者に、あまり多くの情報を提供したくないというインセンティブが働く可能性がある。したがって、日本では、情報を提供する側と提供される側との間に、ある種の緊張関係があることも事実である(野口, 2018)。

生活習慣病の罹患と労働生産性の関連性に関する科学的エビデンスは、超高齢社会となっている日本や、同じく人口の高齢化が深刻になりつつある東アジア諸国における厚生労働施策にとって必要不可欠な基礎資料となるであろう。にもかかわらず、当該テーマに関する国際的な業績が、当該地域において数少ないのは、代表性の高い質の良いデータが未だ構築されていないことが要因の1つであるといえよう。

本研究でレビューを行った先行研究から、生活習慣病の罹患の就労確率や労働生産性に対する影響の大きさは、性別、人種、年齢、教育水準、疾患の種類や重症度によって異なる傾向にあることがわかった。したがって、日本や東アジアでの研究からは、これまでの北米や欧州を中心とした分析とは、異なる結果が得られる可能性が高い。また、医療や介護施策は、生活習慣病の罹患確率に直接影響を及ぼす可能性が高く、ひいては、こうした施策が異なる国や地域における両者の関連性の統計学的な有意性とその影響の大きさについては、さらに検証の余地が残されている。

E. 結論

本研究は、1990-2018年の直近約30年間に、主として、公衆衛生・社会疫学、及び、経済学の領域における国際学術誌に掲載された英文による論文の中から、生活習慣病と労働生産性の関連性について定量的な検証

を行った先行研究(計 61 件)の要約・整理を行った。

国際学術誌に掲載された英文論文では、代表性の高いデータに洗練された計量経済学の手法を用いた分析が数多く存在するが、分析対象となった国や地域が北米や欧州に偏っている。生活習慣病の罹患をはじめとする「負」の健康ショックは、就労確率を低下させる傾向にあり、賃金や年収を引き下げる可能性が高いという整合的な結果が得られている。他方、生活習慣病の罹患の就労確率や労働生産性に対する影響の大きさは、性別、人種、年齢、教育水準、疾患の種類や重症度によって異なる傾向にあることから、米国や欧州以外での当該テーマに対する研究の必要性が問われている。

F. 健康危険情報

特に無し。

G. 研究発表

1. 論文発表

特に無し。

2. 学会発表

特に無し。

H. 知的財産権の出願・登録状況(予定を含む)

1. 特許取得

特に無し。

2. 実用新案登録

特に無し。

3. その他

特に無し。

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表 1: PubMed による検索結果

	Authors	Journal (Year)	Country	Data	Measurements		Method	Results
					Work	Health		
1	Abdulkarim M. Meraya and Usha Sambamoorthi	Journal of Occupational and Environmental Medicine (2017)	U.S.	2004 - 2012 Medical Expenditure Panel Survey	Missed work days (continuous)	Chronic condition combinations such as arthritis with heart diseases (dummies; reference group is arthritis with diabetes)	Negative binomial regression	Compared to those with arthritis and diabetes, people with diabetes and heart diseases, arthritis with diabetes and heart diseases, arthritis with heart disease and hypertension have higher missing work days. On the contrary, those with diabetes and hypertension have lesser missing work days than those with arthritis and diabetes. All disease combinations have similar level of missing work days as people with arthritis and diabetes.
2	J. Knebelmann and C. Prinz	OECD Social, Employment, and Migration Working Papers (2016)	Europe (11 countries in total)	2004 - 2013 Survey of Health, Ageing and Retirement	Employed (dummy), retirement (dummy), and number of days missed from work because of health reasons (continuous)	Depression (dummy), moderate depression (dummy), severe depression (dummy), mobility limitations (dummy), and 2+ chronic diseases (dummy)	Probit, bivariate probit (existence of past depressive episodes), OLS, fixed effect, IV-fixed effect (Euro-D regional scores), fixed effect logistic, and negative binomial regression	Using bivariate probit, depression reduces the probability of employment by 20%. Also, it reduces the probability of employment by 22% for women and 26% for men. On the contrary, the effect of depression gets stronger for total sample using fixed effect ols which is 31% reduction in probability of employment. For men, the association becomes insignificant. The increase in the effect of depression on employment chance is even stronger in women with 51% reduction in employment chance for those with depression using fixed effect. Moreover, using logistics regression the authors found that depression increases the odds of early exit from workforce

								for elder population in particular those with severe depression. Finally, depression increases the work miss days by 7.2 days per day and there are no difference between men and women.
3	Brian W. Ward	American Journal of Industrial Medicine (2015)	U.S.	2011 National Health Interview Survey	Dummies: Employment status Continuous: Hours worked in previous week, days of work missed due to injury/illness in the past 12 months, and gross personal earning	The number of chronic conditions (range from 0 to 3; categories are 0, 1, 2-3 and >=4) and specific chronic conditions (cancer, diabetes, coronary heart diseases, and more; dummies)	OLS and probit	Higher number of chronic conditions lead to poorer labor outcomes. In the case of employment status, relative to an adult with 1 chronic condition there was a 11% reduction in probability of being employed for an adult with 2-3 chronic conditions. Moreover, the chronic conditions associated with highest reduction of the labor outcomes are stroke, coronary heart disease, and cancer.
4	Jennifer C. Samp, Richard Perry, James Piercy, Robert Wood, Robert w. Baran	Clinics and Research in Hepatology and Gastroenterology (2015)	France	HCV-specific work productivity and activity impairment questionnaire	work time loss (dummy)	Hepatitis C virus severity	Logistic regression	Patients with more severe HCV diseases report significantly larger amount of missing hours lost at work.
5	Souvik Banerjee, Pinka Chatterji, and Kajal Lahiri	Medical Care (2014)	U.S.	National Comorbidity Survey Replication and National Latino and Asian American Study	Dummies: Employment status and labor force participation Continuous: Number of weeks worked and number of days missing full day of works in last 30 days	Dummies: Major depressive episode (MDE), social phobia, panic attack, generalized social anxiety (GAD)	Multiple indicator and multiple cause model	Across gender, poor mental health is associated with worse labor outcomes. For example, higher MDE score lowers the probability of being employed. Furthermore, the effect of reduced labor outcomes are much more severe in MDE and GAD.

6	Jeffrey T. Howard and Llyod B. Potter	Obesity Research & Clinical Practice (2014)	U.S.	2000 and 2010 National Health Interview Survey	Work absentee (dummy; 0 if 0 days of work missed and 1 if missed ≥ 1 day)	Obesity dummies: overweight ($25 \leq \text{BMI} < 30$), obese class I ($30 \leq \text{BMI} < 35$), obese class II ($35 \leq \text{BMI} < 40$) and obese class III ($\text{BMI} \geq 40$) and five obesity-related chronic conditions (dummies): hypertension, diabetes, coronary heart disease, other heart disease, and stroke, and interaction terms between obesity dummies and chronic condition dummies	Logistic regression	The impact of obesity on work absentee is positive which means being overweight or obese increases the likelihood of work absence. Moreover, hypertension and stroke are two most significant chronic conditions which associates with higher work absentee. Finally, the interaction between obesity and diabetes is significant indicating that diabetes is the moderator between obesity and work absentee.
7	Lauren Churcher, Chritina H. Chan, and Elizabeth M. Bradley	BMC Public Health (2013)	Canada	2007/2008 Canadian Community Health Survey	Not employed and out of labor force (dummies; reference: currently employed)	Chronic conditions (range from 0 to 4; categories are no chronic conditions, back problem only, arthritis only, both back problem and arthritis, and other chronic conditions)	Log-Poisson regression	After stratified by sex, the respondents having both back problem and arthritis have highest risk of being current unemployed and the effect is greater in men than women. Similarly, the respondents with both back problem and arthritis have greatest likelihood of being out of labor force and the effect is still greater in men than women.
8	Deborah J. Schofield, Emiley J. Callander, Rupendra N. Shrestha, Megan E.	PLOS ONE (2013)	Australia	2009 Survey of Disability, Ageing, and Carers	In labor force (dummy)	The number of health conditions (range from 0 to 5)	Logistic regression	Higher number of chronic conditions reduce the likelihood of being in labor force. For example, those with one health condition have 0.59 odds of being in labor force than those without. Even worse, those with four or more health

Passey,
Richard
Percival, and
Simon J. Kelly

conditions have only 0.14 odds of
being in labor force.

9	Siow Ann Chong, Janhavi, Ajit Vaingankar, Edimansyah Abdin, and Mythily Subramaniam	Social Psychiatry and Psychiatric Epidemiology (2013)	Singapore	2009-2010 Singapore Mental Health Study	Work-lost days (continuous) and Work cut days (continuous)	Mental disorders such as major depression, dysthymia, bipolar (dummies), only physical disorder (dummy), only mental disorder (dummy), and comorbid physical and mental (dummy)	Negative binomial regression	Only physical illness and comorbidity of mental and physical caused significant increase in work lost days and work cut days. In addition, only type of mental disorder which increased work lost days is bipolar disorder. For work cut days, bipolar, general anxiety disorder, any mental disorder, and physical illness have any significant influence on it.
10	Jason M. Fletcher and Michael R. Richards	Health Affairs (2012)	U.S.	1994 - 2008 National Longitudinal Study of Adolescent Health	Employment status (dummy), annual earning (continuous), welfare or social assistance participation (dummy), and any health related absences from work (dummy)	Diabetes (dummy)	OLS	Generally, people with diabetes have 8-11% reduction in employment chance. Also, diabetes is associated with 8-13% increase in participation in social program; 10% increase in reporting absences as a results of health related problem; and approximately 1500-6000 dollars reduction in annual wage. Finally, only those with private insurance are more likely to report absences from work compared to those without insurance and Medicaid after stratifying the sample by insurance types.

11	Macro deCosta DiBonaventura, Jan-Samuel Wagner, Yong Yuan, Gilber L'Italien, Paul Langley, and W. Ray Kim	Journal of Medical Economics (2011)	U.S.	2009 National Health and Wellness Survey	Employed (dummy), work absenteeism, work presentism, work impairment, and activity impairment (continuous)	Hepatitis C virus (dummy)	Generalized linear model (and propensity score matching)	People with Hepatitis C virus are less likely to participate in labor market. In addition, Hepatitis C virus is also associated with increasingly level of absenteeism, presentism, work impairment, and activity limitations for those who are employed. (Note: as a robustness check, the authors use propensity score matching. The findings are relative unchanged except for labor force participation using propensity score matching. In other words, Hepatitis C virus is found not to be associated with labor force participation using propensity score matching.)
12	Swenne G. van den Heuvel, Goedele A. Geuskens, Wendela E. Hooftman, Lando L. J. Koppes, and Seth N. J. van den Bossche	Journal of Occupation Rehabilitation (2010)	Netherlands	2007 The Netherlands Working Conditions Survey	Work performance and sick absence (dummies)	Poor general health status (dummy), types of health conditions (dummies), and the number of chronic health conditions (categorical range from 0 to 2)	Logistic regression	Poor general health status and having two or more health chronic conditions are associated with 21% and 54% of low work performance. Of all the types, psychological complaints or disorder increase the likelihood of low work performance by 54%. For sick leave, having one, two or more health conditions, and poor general health are associated with sick absence with 77%, 147%, and 162% increased odds respectively.
13	Chau-Sa Ho and Diane Hite	Journal of Community Health (2009)	U.S.	2002 National Health Interview Survey merged with county-level data from Toxics Release	Working status (dummy) and the number of work-loss days (continuous)	Self-rated health status (dummy)	Heckman selection	Good health increases the probability of working in past 12 months. Moreover, good health reduces the number of work-loss days by 7.4 days per year.

Inventory
Program

14	Seyed Mohammad Alavinia and Alex Burdorf	International Achieves of Occupational and Environmental Health (2008)	Europe (11 countries in total)	2004 Survey of Health, Ageing and Retirement	Employed (dummy), early retirement (dummy), and homemaker (dummy)	Self-perceived poor health (dummy), long term illness (dummy), and specific types of chronic diseases such as arthritis and depression (dummies)	Logistic regression	Self-perceived poor health reduces the labor force participation (eg. Increased retirement chance and unemployment). Specifically, poor health increased the odds of unemployment by 2.14. Moreover, having a long term illness increases the odds of being unemployed by 1.34. Of all the chronic diseases, depression is the most significant diseases in reducing the labor force participation. Finally, the association between poor health and labor force participation differs among countries. For example, poor health is associated with early retirement in Sweden but not in Netherlands and vice versa for the unemployment.
15	Deborah J. Schofield, Rupendra N. Shrestha, Megan E. Passey, Arul Earnest, and Susan L. Fletcher	The Medical Journal of Australia (2008)	Australia	2003 Survey of Disability, Ageing and Carers	In labor force (dummy)	The types of long term condition such as diabetes or arthritis (dummies) and the number of conditions (categorical range 0 to 5)	Logistic regression	Most of long term conditions such as diabetes, arthritis, or hypertension are associated with increasing odds of being out of labor force except for diseases associated with ear and mastoid, other endocrine, national and metabolic disorders, deafness or hearing loss, and high cholesterol. In addition, higher number of long term conditions reduce the chance of being in labor force. For example,

having one long term condition increase the probability of being out of labor force by 63% compared to no long term condition.

16	Kathrine Carlsen, Susanne Oksbjerg Dalton, Finn Diderichsen, and Christoffer Johansen	European Journal of Cancer (2008)	Denmark	Danish Cancer Registry and Central Population Register linked with Hospital-Discharge Register and Danish Psychiatric Central Register	Unemployed (dummy)	Presence of cancer (dummy), types of cancer such as bladder cancer (dummies), and the extent of the spread of cancer (dummy)	Cox's proportional hazard regression	Having cancer increases the risk of unemployment for women and men but the risk is greater in women than men. For instance, women with cancer are 1.12 times more likely to be unemployed versus men with cancer that are 1.06 times more likely to be unemployed than those without cancer. Also, the risk of unemployment varied by types for women whereas for men it is relatively similar. After stratified by age, women at age 50-60 years have the highest risk of unemployment which is 1.18 times to be unemployed than those without cancer. The extent of spread have no statistical effect on risk of unemployed.
17	D.M. Gates, P. Succop, B.J. Brehm, G.L. Gillespie, and B.D. Sommers	Journal of Occupational and Environmental Medicine (2008)	U.S.	2008 Survey conducted by authors	Work Limitations Questionnaire (WLQ) scores (continuous; measuring the degree of interference of the health problems on the respondent's ability to perform	Obesity dummies (underweight/normal weight, BMI < 25; overweight, BMI 25-29.9; mildly obese, BMI 30-34.9; moderately or extremely obese, BMI >= 35)	ANOVAs and Student-Newman-Keuls (SNK) tests	Moderately or extremely obese people have more difficulty in completing the work on time compared to other obesity groups. Similarly, Moderately or extremely obese people have more difficulty in completing works associated with more physical requirements. In contrast, mental and output for work are not influenced by the obesity levels among the groups. Also,

				job in 2 weeks), productivity loss percentage (continuous; calculated using WLQ scores based on Lerner et al), and work absenteeism in hour (continuous)			moderately or extremely obese suffers higher productivity loss compared to other groups. In terms of absenteeism, four obesity groups have relatively similar level of absenteeism except for mildly obese people which have fewer absent hours than the rest. Finally, mildly obese and moderately or extremely obese people have relatively high percentage of high absenteeism of all groups (unfortunately, nothing was done to test if they are different from each other).	
18	Scott Klarenbach, Raj Padwal, Anderson Chuck, and Philip Jacobs	Obesity (2006)	Canada	2000 - 2001 Canadian Community Health Survey	Employed (dummy) and absenteeism (dummy)	Obesity dummies (normal weight BMI 18.5-24.9; class I 30-24.9; class II 35-39.9; class III >= 40)	Logistic regression	For all three classes of obesity, obesity diminishes the odds of employment (eg. 0.94 OR for class I; 0.85 OR for class II; and 0.66 for class III). Moreover, higher obesity classes are also associated with increasing odds of absenteeism than the normal weight counterpart.
19	Judith A. Ricci and Elsbeth Chee	Journal of Occupational and Environmental Medicine (2005)	U.S.	Caremark American Productivity Audit	Loss productive time (dummy; no lost time as reference group and > 0 as one group)	Obese (dummy) and the number of health conditions (categorical range from 0 to)	Logistic regression	Being obese increases the odds of loss productive time at work by 1.4. With addition of the number of health conditions, the association of obesity and loss productive time is no longer statistically significant. Furthermore, increasing number of health conditions is associated with higher odds of loss productive time (eg. one condition OR, 4.7; two to three conditions OR, 10.2 an more). In other words, the mediation channel between obesity and loss productive time is through the health condition.

20	Kaan Tunceli, Cathy J. Bradley, David Nerenz, L. Keoki Williams, Manel Pladevali, and Jennifer Elston Lafata	Diabetes Care (2005)	U.S.	1992 and 1994 Health and Retirement Study	Employed (dummy), work- loss days (continuous), work limitations (dummy), hours of works (continuous)	Diabetes (dummy)	Probit and OLS	The presence of diabetes reduces the probability of being employed for both men and women. The effect is greater in men than women. For work limitations, people with diabetes are more likely to report having work limitations than those without. Furthermore, diabetes was associated with increasing work loss days but only in women.
21	Cathy J. Bradley, David Neumark, Zhehui Luo, Heather Bednarek, and Maryjean Schenk	Journal of National Cancer Institute (2005)	U.S.	Survey conducted by authors merged with Current Population Survey	Employed at 6 months (dummy), employed at 12 months (dummy), work hours (continuous), work hours at 6 months (continuous) and work hours at 12 months (continuous)	Prostate cancer (dummy) and stages of prostate cancer (categorical range from 0 to 3; local, regional or distant, and invasion or unknown)	Propensity score nearest neighbor method	Having prostate cancer reduces the probability of remaining employed by 10% for men at 6 months. More advanced stages of prostate cancer reduce the probability of employment from 10% to 16% (local to distant) at 6 months. At 12 months after the prostate cancer diagnosis, the effect of prostate cancer on employment are no longer significant. In other words, most recover from the cancer and go back to work.
22	Nicholas P. Emptage, Roland Sturm, and Rebecca L. Robinson	Psychiatric Services (2005)	U.S.	1992 to 2000 Health and Retirement Study	Employed (dummy)	Depression and pain (categorical range from 0 to 5)	Logistic	Depression or mild or moderate pain alone does not reduce the probability of being employed. Only depression with severe pain or severe pain has a negative impact on the probability of being employed.
23	M.A. Buist- Bouwman, R. de Graaf, W. A. M. Vollebergh, and J. Ormel	Acta Psychiatrica Scandinavica (2005)	Netherlands	1996 Netherlands Mental Health Survey and Incidence Study	Excess impairment days (continuous; total working days minus work days loss due to mental disorders and physical disorders)	Physical disorders such as arthritis, asthma, and more (dummies) and mental disorders such as depression (dummies)	OLS	Both physical and mental disorders are associated with increasing level of excess impairment days (EID). For example, chronic back trouble increases the excess impairment days at work by 25.1 days per year. Also, the joint comorbidity of physical and mental disorders further increase the excess impairment days. For instance,

hypertension increases the EID by 5.6 days per year but in the presence of mental disorders the effect increases to 28.3 days per year.

24	Wayne N. Burton, Glenn Pransky, Daniel J. Conti, Chin-Yu Chen, and Dee W. Edington	Journal of Occupational and Environmental Medicine (2004)	U.S.	2002 Health Risk Assessment questionnaire from Midwestern U.S.	Work Limitations Questionnaire (WLQ) scores (continuous; four subcategories: time, physical, mental and output)	Types of medical conditions such as allergy, arthritis, asthma etc (dummies) and total number of medical conditions (categorical range from 0 to 6)	Logistic regression	Overall, having one type of medical conditions increase the odd ratios on four categories from WLQ. In other words, medical conditions reduce the worker overall workers' productivity. Moreover, depression has the strongest effect on WLQ. For example, depression increases the odds of difficulty in completing the tasks on time by 2.05 times.
25	Cathy J. Bradley, Heather L. Bednarek, and David Neumark	Heath Service Research (2002)	U.S.	1992 Health and Retirement Study	Employed (dummy), hours worked (continuous)	Breast cancer (dummy) and years since diagnosed with breast cancer (categorical range from 0 to 2)	OLS	Breast cancer reduces the likelihood of women being employed by 9%. Furthermore, the impact is largest when breast cancer is diagnosed one to two years ago compared to those who were diagnosed with it three year ago. Also, breast cancer seem to increase the hour worked in women especially among those who were diagnosed with it three years ago.

26	Ronald C. Kessler, Paul E. Greenberg, Kristin D. Mickelson, Laurie M. Meneades, and Philip S. Wang	Journal of Occupational and Environmental Medicine (2001)	U.S.	1995 - 1996 Midlife Development in the U.S.	Work impairment (continuous; sum of work loss days and one-half times of work cutback days)	Types of conditions such as arthritis, asthma, etc (dummies) and the number of conditions (categorical range from 0 to 5 and dummies: zero to two as one dummy and three or more as another dummy)	OLS	Overall, arthritis, asthma, ulcers, and mental disorders are positively associated with work impairment. Moreover, six disorders were interacted with the number of conditions dummies. Arthritis, ulcer, and depression increased the work impairment when interacted with zero to two conditions dummy. The impacts of interactions are even greater when the types of conditions interacted with three or more conditions dummy.
27	Ying Chu Ng, Philip Jacobs, and J.A. Johnson	Diabetes Care (2001)	U.S.	1989 National Health Interview Survey	In labor force (dummy) and work-loss days (continuous)	Any diabetes (dummy), diabetes complications (dummy), type 1 diabetes (dummy), and health status (categorical range from 0 to 3)	Probit and tobit	Poor health is associated with lower probability of being in labor force. In other words, poor health reduces the probability of being in labor force by 45%. Also, individuals with diabetes are 4% less likely to be in labor force. Furthermore, having type I diabetes increases the probability of not being in labor force by 11%. Using only sample of diabetic people, individuals with diabetic complications are approximately 12% less likely to be in labor force. Similar to labor status, poor health is associated with increasing level of work days loss. Only diabetic complications are found to be significant effect on reducing the work days loss.

28	Allen Kraut, Robert Tate, Randy Walld, and Cam Mustard	Diabetes Care (2001)	Canada	1986 Longitude healthcare system database linked with provincial census database about demographic information of the individuals	In labor force (dummy), unemployed (dummy) and income (continuous)	Diabetes (dummy), diabetes without complications (dummy), and diabetes with complications (dummy)	Logistic and tobit	Diabetic people with complications are twice as likely to not being in labor force. For those in labor force, diabetes increases the chance of unemployment. Stratified by presence of diabetic complications, those with complications have higher probability of being unemployed than those without (69% versus 35%). The income level of people are only affected by the presence of diabetic complications.
29	Susan L. Ettner, Richard G. Frank, and Ronald C. Kessler	Industrial and Labor Relations Review (1997)	U.S.	1990 and 1992 National Comorbidity Survey	Employment status (dummy), work hours (continuous), personal income (continuous)	Psychiatric disorder (dummy)	IV (number of psychiatric disorders exhibited and the number of psychiatric disorders experienced before 18 and parental history of psychiatric disorders)	For both men and women, having any form of psychiatric disorders reduces the likelihood of being employed. Moreover, it also reduces the hours worked and the personal income level.

30	Robert A. McLean and Marilyn Moon	American Journal of Public Health (1980)	U.S.	1973 National Longitude Survey	Hourly earnings (continuous)	Weight ratio from ideal weight (continuous) and weight dummies	OLS	Ironically, the wage raises when the weight increases with 35 cent increase for every 100% increase in the ratio of actual to ideal weight. Also, those whose weights fall into the category of slender and heavy builds have reduced wage compared to those who aren't. Finally, those whose weights exceed the cutoff of heavy builds actually receive wage premium.
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表 2: Econlit による検索結果

	Authors	Journal (Year)	Country	Data	Measurements		Method	Results
					Work	Health		
1	Beatriz Rodríguez-Sánchez, David Cantarero-Prieto	Economics and Human Biology (2017)	Spain	2011-12 Spanish National Health Survey	Labor force participation, length of unemployment (category), earnings (category)	Diabetes (dummy)	Probit model (for LFP), ordered probit model (for length of unemployment and earnings)	People suffering from diabetes have poorer labor outcomes in terms of longer length of unemployment and lower income. However, diabetes is not significantly associated with probability of labor force participation.
2	Peter Slade	Economics and Human Biology (2017)	U.S.	National Longitudinal Survey of Youth 1979 cohort	Wage	Body mass index	Quantile regression	At 0.9 quantile of the wage distribution, a two standard deviation increase in BMI reduces wages by 8% for white males, 13% for white females, 9% for Hispanic males, and 16% for Hispanic females. In contrast, at 0.1 quantile. A two standard deviation increase in BMI affects by less than 2% for all the groups. For black males, the effect of increase in BMI is positive in wages, and the magnitude increases with wage quantile. For black females, the effect tends to be moderate and uniform across wage quantile.
3	Melisa Bubonya, Deborah A. Clark, Mark Wodden	Labour Economics (2017)	Australia	2001-13 Household, income, and labor dynamics in Australia	Absenteeism (number of paid sick leaves), presenteeism (dummy with	Dummy that taking 1 for poor mental health, i.e., mental health inventory score lower than 60	Fixed effect logistic for presenteeism, random effect negative	Men in poor mental health report diminished productivity at work is 6.17 times higher than those of otherwise similar men in good mental health. Worse still, the odds of

				longitudinal survey	1 for attending 13work with low productivity)	(range from 0 to 100)	binomial model for absenteeism	presenteeism for women is 6.91. The absence rate of men (women) who report being in poor mental health is 4.9 (5.3) percent higher than otherwise similar men (women) in good mental health.
4	Sung-hee Jeon	Health Economics (2017)	Canada	Linkage of 1991 census with cancer registry, vital statistics registry, longitudinal personal income tax records	Earnings and labor force participation (out of labor force if earnings=0)	25 types of cancer	Coarsened exact matching for weighted probit regression and difference in difference	Ove the 3-year period following the year of the diagnosis, the probability of working is 5 percentage points lower for cancer survivors than for the comparison group, and their earnings are 10% lower. The effects differ across the survival rate of cancers. The lower the survival rate, the larger the impacts.
5	Donna B. Gilleskie, Euna Han, Edward C. Norton	Review of Economic Dynamics (2017)	U.S.	National Longitudinal Survey of Youth 1979 cohort (women aged 18-26 in 1983)	Wage in time t	Body mass history (e.g., ever obese prior to time t)	Dynamic panel model	Body mass has significant influences on wage, while the findings are inconclusive by race. White women generally experience positive dynamic wage impacts with body mass improvement. Black women, however, report wage premium only if their body mass improved from obese to overweight. Improvement from overweight to normal weight reduces wages for black women.

6	Sung-Hee Jeon, R. Vincent Pohl	Journal of Health Economics (2017)	Canada	Five administrative sources: the Canadian 1991 census of population, the Canadian cancer database, the Canadian mortality database, the longitudinal worker file, and the T1 family file	Employment, earnings, and family earnings	<i>Spouses'</i> cancer diagnoses by survival level. High survival group contains thyroid, prostate, etc. Medium survival category has chronic lymphocytic leukemia, kidney, etc. Low survival group includes ovary, leukemia, brain, etc.	Coarsened exact matching with difference in difference	Men whose wives were diagnosed with cancer encounter 2.2-2.4 percentage points decline in working probability, 3.4% reduction in earnings, and 3.8-4.8% reduction in family income in the first three years after the diagnosis compare with men whose wives have never been diagnose with cancer. As of 5 th year of diagnose shock, the negative impacts become insignificant. Women reduce their labor force commitment by about 2.5 percentage points and 2.54 face 2.7-5.9% reduction in earnings during the five years after their husbands diagnosed with cancer.
7	Souvik Banerjee, Pinka Chatterji, and Kajal Lahiri	Health Economics (2017)	U.S.	National Comorbidity Survey Replication and National Latino and Asian American Study, 2001-2003	Employment status (dummy), labor force participation (dummy), number of weeks worked (continuous) and number of days missing full day of works in last 30 days (continuous)	A mental illness score (or index) generated from four psychiatric disorders: Major Depressive Episodes, social phobia, panic disorder and generalized anxiety disorder (range unknown)	Structural equation modelling similar to IV (the number of psychiatric disorders with onset prior to age 18 such as anxiety disorder and a set of "demeaned" exogenous covariates as internal	Men's mental health are more likely to reduce their labor outcomes (eg. Employment status) versus women. Based on authors estimates, one standard deviation increase in mental illness score reduce the probability of employment for men by 19% and 10% for women.

						instruments based on Lewbel (2012))		
8	Ana María Iregui-Bohórquez, Ligia Alba Melo-Becerra, and María Teresa Ramírez-Giraldo	Portuguese Journal of Economics (2016)	Columbia	2010 Colombian Longitudinal Survey of the Universidad de los Andes	Labor force participation (dummy) and hour of works (continuous)	Subjective self-assessed health (range from 0 to 3). Also, constructed an objective self-assessed health (0 to 3) from a scale of 100 on person's current health status	IV (socioeconomic stratum, chronic diseases father and mother, contributory health regime, and dwellings near risky places or affected by natural disasters) and probit	Overall, better health is associated with higher probability of labor participation. Using alternative labor outcome (work hours) or objective health status, the conclusion remains unchanged. The association between labor force participation and health is the same across gender age cohorts except younger men (age 13 - 40) which good health does not influence their labor participation.
9	Lizhong Peng, Samuel H. Zuvekas, and Chad D. Meyerhoefer	Health Economics (2016)	U.S.	2004-2009 Medical Expenditure Panel Survey	Employed (dummy), hourly wage (continuous), hours worked (categorical range from 0 to 2), and work loss days (continuous)	Major depression (dummy)	Fixed effect and correlated random effects	Major depression reduces the likelihood of the individual being employed by approximately 3-4%. In contrast, hours worked and hourly wage are not associated with major depression. Finally, the presence of major depression increases the work loss days by 1.4 days per year.
10	Danel I. Rees and Joseph J. Sabia	Health Economics (2015)	U.S.	1995 - 2008 National Longitude Survey of Adolescent Health (1st wave: 1995,	Any earning (dummy), hours, and hourly wages (logged and continuous)	Migraine Headache (dummy)	OLS and IV (mother has migraine or not)	Significant evidences of lower labor outcomes associated with migraine headache are found for women but not for men using OLS. After accounting for endogeneity, migraine reduces the wage of women but

			2nd: 1996, 3rd: 2001, final: 2007)				not other labor outcomes (eg. Work hours). The conclusion for men remains unchanged.	
11	Lijian Qin and Zhen Wang	Journal of Labor Research (2015)	China	2008 Medical Services of Chinese Urban Residents survey	Employment status: unemployed, retired, and homemaker (dummies)	Self-assessed health status (range from 0 to 2)	Logistic regression	Poor or fair health is associated with higher probability of being unemployed and retired. For instance, being in poor health status increase the chance of being unemployed by 105% and fair health status increases the chance by 33% compared to healthy status.
12	Petter Lundborg, Anton Nilsson, Dan-Olof Rooth	Journal of Health Economics (2014)	Sweden	Linkage of military enlistment records on health, cognitive ability from 1969 to 1997, to administrative records on education, occupation, earnings from 2003 for Swedish men.	Annual earnings	In addition to specific conditions (e.g., mental illness) and diagnoses (e.g., diabetes), a unique health measure “global health” is used. The global health is defined to determine a man’s suitability regarding type of military services. It is expressed with letters from A to M. The closer to the start of the alphabet assigned, the better general health a man has.	Sibling fixed effects model	Global health at age 18 (military enlistment) is a strong predictor of adult earnings, e.g., difference between perfect health and a health just somewhat better than required for military services implies a 25% reduction in earnings. Results on specific conditions reveal that mental problems have more server effects than any other types of conditions, whereas effects of injuries and congenital anomalies are much less important for adult earnings. Results on specific diagnoses show that alcoholism and drug dependence, diabetes, and personality disorder are the top three factors that have negative impacts on adult earnings.

Thus A represents the perfect health.

13	Donna Gilleskie, Denise Hoffman	Journal of Human Capital (2014)	U.S.	1996 panel of the Survey of Income and Participation (male workers)	Wage, change in occupation and employer	Self-reported disability severity, i.e. having a physical, mental, or other health condition that limits the kind or amount of work (non, moderated, severe), and Length of disability	Dynamic panel model	Male workers with a disability are more likely to change occupations or employers, e.g., those with a moderate disability are 23 percent more likely to change occupations compared to nondisabled workers. In addition, at onset of a moderate (severe) disability, wages decline by 0.57 USD (1.36 USD), which corresponds to a loss of 23 USD (54 USD) per week on average.
14	Eskil Heinesen, Christophe Kolodziejczyk	Journal of Health Economics (2013)	Denmark	2000-2004 longitudinal administrative register Danish data contains every possible aspect of personal information	Labor force participation, total income, wage, and earnings	Breast and colorectal cancer (two forms of cancer with high survival rates and strike many people of working age)	Propensity score weighting method	People with breast and colorectal cancers have 5-8 percentage points (pp) higher risk of leaving labor force 1-3 years after the diagnosis. There is a significant social gradient. For those with no education beyond compulsory school the effect is 8-11 pp whereas it is 1-5 pp for those with a further education. The negative effects on total income, wage, and earnings are small.

15	Pilar Garcia-Gomez, Hans can Kippersluis, Owen O'Donnell, Eddy van Doorslaer	Journal of Human Resources (2013)	Netherlands	1998-2005 Dutch administrative records: tax records, hospital discharge register, cause-of-death register, municipality register	Labor force participation, personal income, household income	Unscheduled hospitalizations	Propensity score matching difference in difference	Two years after hospitalization, the probability of remaining at work is 7 percentage points lower for the treatment group, and the difference remains over the remainder of the observations period. Annual personal income is reduced by around 250 euro in the year of hospitalization; reaches 1,100 euro two years later, after which it broadly levels out.
16	James Levinsohn, Zoe M. McLaren, Olive Shisana, and Khangelani Zuma	The Review of Economics and Statistics (2013)	South Africa	2005 South African National HIV Prevalence, HIV Incidence, Behavior and Communication Survey	Unemployed (dummy)	Human Immunodeficiency Virus (HIV) positive or negative (dummy)	Propensity score matching	HIV positive increases the probability of being unemployed. The employment status for those with higher education (> high school) do not get impacted by the HIV positive status whereas the less educated are (< high school).
17	Juan Oliva-Moreno	European Journal of Health Economics (2012)	Spain	2005 Wage structure survey, labor force survey, disability records, and registry of death	Expected gross lifetime wages	Years of potential productive life lost by cause of death (there is life year loss if a person dies at an age outside of the normal range established for the diagnose group. If the death occurs under 65, the lost years are referred to be productive life lost)	No econometric method. Annual discount rate is 0%, 3% or 6% for the loss of lifetime wages	There is significant non-medical costs of diseases and accidents in Spain. In 2005, the loss of labor productivity is expected to be over 37,969 million euros, of which 9,136 million euros are due to premature deaths, 18,577 millions to permanent disability and 10,255 millions to temporary disability. The loss in labor productivity corresponds to nearly 4.2% of the GPD of Spain in 2005.

18	Wen-jen Hsieh, Po-Jen Hsiao, Jenq-Daw Lee	Journal of International and Global Economic Studies (2012)	Taiwan	2006 Panel Study of Family Dynamic	Wage	Five rank self-rated health status (reference: very poor)	Heckman model and quantile regression	Self-rated health (SRH) overall has positive impacts on wage. The higher the rank of SRH, the larger the wage premium. The magnitude also varies across wage quantiles. The higher the wage quantile, the larger the premium; and the largest appears to be in the highest quantile group (q=0.9)
19	Nick Drydakis	Applied Economics Letters (2012)	Greek	2008 Athens Area Study	Wage	Self-reported illness (dummy) and self-reported limitation on work (dummy) based on illness	Conditional logit model	Lower wage is confirmed among people having work limitation based on their illness, compared to those healthy (i.e. productivity penalty). Interestingly, lower wage is also confirmed among people without work limitation on the basis of illness, compared to those healthy (i.e. wage discrimination).
20	Travis Minor	Health Economics (2011)	U.S.	2006 National Health Interview Survey	Labor force participation, days out of work, average hours worked, earnings	Diabetes Type I and Type II	IV (diabetic condition of biological mother)	Diabetes as a whole negatively impacts most work outcomes. When separate the types, it appears that much of the penalty can be attributed to the type II diabetics. Although type I is regarded as a more debilitating condition, it generates lower wage and productivity losses.

21	Lixin Cai	Labor Economics (2010)	Australia	2001 - 2004 Household, Income, Labor Dynamics in Australia Survey	Labor force participation (dummy)	Self-assessed health status (range from 0 to 4)	IV (Health condition and physical functioning)	Higher self-assessed health status is associated with higher probability of labor force participation for men and women. In the case of men, one-unit increase in health status increases the probability of participation by 41%. For women, it increases by 23%. The effect of health on labor participation is stronger in men.
22	Robert Jäckle, Oliver Himmler	Journal of Human Resources (2010)	Germany	1995-2006 German socio-economic panel	Wage	Self-assessed health satisfaction (range from 0 to 10)	Evolved 2SLS by Semykina and Woodridge (2006), where predicted values of a set of time series probit models in the labor force participation equation serve as their own instruments	Good health raises wages for men, while for women there appears to be no significant effect. (Comments from Natalie: the emphasis of this research is an extension of 2SLS regression that could drive out selection bias, measurement error, and time varying heterogeneity simultaneously. On the other hand, the measurements for wage and health are pretty simple and interpretations are not closely related to policy implications.)

23	Anthony Harris	Economic Record (2009)	Australia	1999 AusDiab Survey	Labor force participation (dummy)	Diabetes and Cardiovascular disease (dummies)	Multivariate probit (exclusion restrictions: obesity, exercise, hypertension, lipid treatment, smoking history, family history of diabetes)	Both diabetes and cardiovascular disease lower the labor force participation for men and women directly. Moreover, the obesity indirectly contributes to lower labor force participation through diabetes instead of cardiovascular disease.
24	Lixin Cai and Changxin Chong	Australian Economic Papers (2009)	Australia	2003 Household, Income, Labor Dynamics in Australia Survey	Labor force participation (dummy)	Self-assessed health status (range from 0 to 4)	IV (Chronic condition such as arthritis, asthma, cancer, and more)	Higher self-assessed increases the probability of labor force participation for men and women. The effect is stronger in men than women. Different chronic conditions are associated with different probability (lower) of labor participation. For men, the largest effect is found in bronchitis and other circulatory. For women, they are coronary and other circulatory diseases.
25	Ehsan Latif	Health Economics (2009)	Canada	1998 National Population Health Survey	Labor force participation	Diabetes (dummy)	Recursive bivariate probit (IV: family history of diabetes)	Diabetes has a significant negative impact on white female employment probability, but has no significant impact on that of non-white counterparts. For males, there is no significant impact from diabetes.

26	Xiaohui Zhang, Xueyan Zhao, Anthony Harris	Journal of Health Economics (2009)	Australia	2001 and 2004/5 Australian National Health Survey	Labor force participation	Chronic conditions (diabetes, cardiovascular, mental illness, and other)	Endogenous multivariate probit model (extension made the authors)	Estimations are separately done by gender and age (aged 18-49 versus 50-65). Older workers above 50 years of age for both sexes are more likely to respond to chronic illnesses by dropping out of the labor force. Specifically, suffering from diabetes reduces probability of working by 3.91% for prime aged men, and 11.47% for older men.
27	Adriaan Kalwij and Frederic Vermeulen	Health Economics (2008)	Europe (11 countries in total)	2004 Survey of Health, Ageing and Retirement	Labor force participation (dummy)	subjective self-reported health (dummy) and objective health status: severe condition such as diabetes and more (dummy), mild condition such as hypertension (dummy), activity of daily living (dummy), grip strength (continuous), overweight and obese (dummies), mental illness (dummy)	Probit regression	Higher subjective self-reported health is positively associated with higher probability of being in labor force for men and women across 11 European countries. (Notes from Josh: It seems that the main purpose of the paper is to demonstrate the endogeneity issue in self-reported health status by adding objective health status into the labor equation and determining the significance of the subjective and objective health.)

28	Stephen Morris	Labour Economics (2007)	England, U.K.	1997 and 1998 of the Health Survey for England (HSE)	Paid employment (dummy)	BMI>30kg/m2 (dummy)	A univariate probit model; propensity score matching; and IV regression using a recursive bivariate probit model	Obesity has a statistically significant and negative effect on employment in both males and females. In males the endogeneity of obesity does not significantly affect the estimates, and the magnitude of effect is similar across the three methods. In females, failure to account for endogeneity leads to underestimation of the negative impact of obesity on employment.
29	Mireia Jofre-Bonet, Susan H. Busch, Tracy A. Falba, Jody L. Sindelar	The journal of mental health policy and Economics (2005)	U.S.	1996, 1998, and 2000 Community tracking survey	Wage	Dummy that taking 1 for poor mental health, i.e., SF-12 mental component summary score is letter than 39	Heckman model	The impact of poor mental health is associated with an almost 8% reduction in wages for males and a more than 4% decline for women. Further, taking potential interactive effect of poor mental health and smoking into account, men who with poor mental health and smoking have the largest reduction at 16.3%, while the interaction is insignificant for women.
30	Michele Campolieti	Health Economics (2002)	Canada	1994/1995 National Population Health Survey	Labor force participation (dummy)	Disability status (dummy)	OLS and IV (alternative specifications: 1st specification - a set of dummies for chronic conditions such	Disability status has a negative impact on the labor participation across different specification of instruments sets in older men. The estimates from Canada and U.S. (estimated using HRS) are compared by authors. They found the disability status has

						arthritis; 2nd to 7th specifications: BMI dummies and chronic dummies)	larger negative impact on labor participation in Canada than the U.S. for older men.	
31	Duncan Thomas, John Strauss	Journal of Econometrics (1997)	Brazil	1974/75 household budget survey	Wage	Height, body mass index, per capita calorie intake, and per capita protein intake	IV (relative food prices, nonlabor income of the worker and nonlabor income of all other household members)	Height has a particularly large impact among male and female workers: taller men and women earn more. Body mass index has a positive effect on wage only for men. More calorie intakes are associated with higher wages, but only at very low intake levels. In contrast, additional protein has the greatest wage return at high levels of intakes.