

## 別添 4

令和3年度厚生労働科学研究費補助金  
(循環器疾患・糖尿病等生活習慣病対策総合研究事業)  
(分担)研究報告書

職業・地域に着目した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(Update)

研究代表者	野口晴子	早稲田大学 政治経済学術院
研究分担者	川村顕	公立大学法人神奈川県立保健福祉大学・ 大学院ヘルスイノベーション研究科/ 早稲田大学 政治経済学術院(Joint Appointment)
研究分担者	朝日透	早稲田大学 理工学術院
研究分担者	阿波谷敏英	高知大学 教育研究部医療学系医学教育部門
研究分担者	玉置健一郎	早稲田大学 政治経済学術院
研究分担者	花岡智恵	東洋大学 経済学部
研究分担者	富蓉	早稲田大学 商学学術院

### 研究要旨

本研究は、昨年度から更に検索期間を1年間延伸し、2000-2022年の直近22年間に、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、産業、職業、及び、地理的な要因に重点を置いて、生活習慣病と労働生産性の関連性に関する定量的・定性的な検証を行った先行研究を要約・整理・更新することを目的とする。具体的には、PubMedとEconLitの2つの検索エンジンで、「生活習慣病(lifestyle diseases)」、「診断(diagnoses)」、「健康(health)」、「雇用(employment)」、「就労状況(working status)」、「退職(retirement)」、「職業分類(occupation group)」といったキーワードによる検索を行い、本研究プロジェクトの目的に適合した、産業、職業、及び、地理的な要因に重点を置く論文を抽出し、要約を行った。結果、英語で書かれた刊行物で、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41件、EconLitから36件、計77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。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、とりわけ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、概して、就労状況にネガティブな影響を与える傾向にあるが、その影響の大きさや統計学的有意性は、性別・人種・年齢・教育水準・疾患の種類や重症度等の個人属性のみならず、職業類型や国・地域によって異なり、そのメカニズムの解明にはいまだ至っていない。したがって、欧州以外での当該テーマに対する研究、及び、職業類型や国・地域による違いがどのようなメカニズムで発生するのかに対する研究が求められている。また、直近では、職業間での新型コロナウイルス感染状況の違いについて分析した研究も存在した。

## A. 研究目的

第1に、本年度の研究では、昨年度から検索期間を1年間延伸し、2000-2022年の直近22年間に、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、産業、職業、及び、地理的な要因に重点を置いて、生活習慣病と労働生産性の関連性に関する定量的・定性的な検証を行った先行研究を要約・整理・更新することを目的とする。

## B. 研究方法

具体的には、PubMedとEconLitの2つの検索エンジンで、「生活習慣病(lifestyle diseases)」、「診断(diagnoses)」、「健康(health)」に、「雇用(employment)」、「就労状況(working status)」、「退職(retirement)」、「職業分類(occupation group)」といったキーワードによる検索を行い、本研究プロジェクトの目的に適合した、産業、職業、及び、地理的な要因に重点を置く論文を抽出し、要約を行った。

## C. 研究結果

### C-1. 検索結果

結果、英語で書かれた刊行物で、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41件、EconLitから36件を抽出し、要約を行った。本研究が要約の対象とした計77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

<sup>1</sup> 欧州諸国については、PubMedで、EUを対象とした研究が17件、フィンランドが3件、オランダが2件、デンマークが2件、スウェーデンが4件、フランスが2件、アイルランドが1件、ノルウェーが1件、イギリスが1件、リトアニアが1件、Econlitで

照)。

### C-2. 分析対象とされた国

検索結果から、北米(PubMedで、米国が1件;EconLitでは、米国が7件、カナダが2件)、オーストラリア(PubMedで4件)、欧州諸国(PubMedで31件、EconLitで20件)<sup>1</sup>を対象とした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、韓国が1件、日本が1件、Hong Kongが1件EconLitでは、韓国が1件、日本が2件、台湾が1件、アルメニア・アゼルバイジャン・ジョージアが1件、インドが1件と、分析対象となった国や地域が、とりわけ欧州地域に偏っていることがわかった。また、世界中の国々を対象としたクロスカントリーによる分析が、PubMedで2件、EconLitで1件あり、複数の文献に基づくMeta-Analysisが、PubMedで3件、EconLitで2件あった。

### C-3. 分析データ

本研究で要約を行った77件の研究では、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た定量分析から、小規模の雇用者にインタビューを行った定性的な分析が存在した。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、最も文献数の多かった欧州地域を対象とした分析のほとんどで、The Survey of Health, Ageing and Retirement in Europe (SHARE)が用いられている。SHAREは、欧州27か国とイスラエルの50歳以上の住民約140,000人を対象に、健康・社会経済的地位・社会的ネットワーク・家族ネットワーク等は、EUが11件、デンマークが4件、イギリスが3件、ドイツが2件であった。尚、同一論文中での国の比較研究があるため、ここでの国数には重複が存在する。

に関するlongitudinal dataである。

ほとんど研究が、SHAREのような国や地域を対象とした調査であるのに対して、カナダやデンマーク等では、長期間にわたって、個人を追跡可能な複数の行政データ(人口動態統計, 住民基本台帳, 国勢調査, 確定申告台帳, hospital registration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用いられている。

#### C-4. 就労に関わる変数(被説明変数)

まず、職業類型として、ほとんどの研究で、①自営業・被雇用者;②フルタイム・パートタイム・日雇い・季節労働者, ③ホワイトカラー・ブルーカラー, あるいは, ④専門職・管理職・技術職(熟練・非熟練);⑤仕事のシフト類型等の別に分析が行われている。地域については、抽出した研究の中では、一国内でのバリエーションに着目した研究は存在せず、欧州、隣接地域、全世界を対象とした国別の比較検証を行っている。

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/work disability: 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/work disability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、Lund et al. (2008)とVirtanen, et al. (2015)の2件と数少ない。

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、就労・職場復帰・失業・退職・早期退職の確率とタイミング(期間)や労働に対する金銭的報酬として個人や家族の年収を用い

た研究が数多くみられる。また、少数ではあるが、仕事における個人の役割や責任、仕事内容の密度、職業上のリスク、職場におけるストレス等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, 等)や、生活習慣病の発症と相関の高いBody Mass Index (BMI)等の肥満を示す指標が用いられている他、主観的健康観(self-rated health status)や、そうした疾患から派生した何らかの障がい(disability)の有無、障害調整生命年(disability-adjusted life year: DALY)を用いた研究も存在する。

#### 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), 傾向スコア法(propensity score matching: PMS)等が用いられており、無作為抽出化試験(randomized controlled trial: RCT)も1件あった。

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、概して、就労状況にネガティブな影響を与える傾向にあるが、その影響の大きさや統計学的有意性は、性別・人種・年齢・教育水準・疾患の種類や重症度等の個人属性のみならず、職業類型や国・地域によって異なることがわかった。

### C-7-1. 職業類型による違い

第1に、職業類型による違いについて見てみよう。①自営業と非自営業(被雇用者)の別については、例えば、Torp, et al.(2019)では、欧州を対象とした研究で、特に、ベルギーとアイerlandにおける癌の生存者は自営業者で、就労時間も長い傾向にある可能性が高く、他

方、フランス・ノルウェー・イギリス等では、統計学的に有意な傾向は観察されないことがわかった。

次に、②フルタイム・パートタイム・日雇い・季節労働者については、デンマーク、フィンランド、スウェーデン、オーストリア、ベルギー等では、主観的健康観の悪化や障がいがあると、フルタイムでの雇用確率が低下する一方で、パートタイムでの雇用確率が上昇する傾向にあるが、フィンランドやエストニア等ではそうした影響が小さい(Roos, et al., 2005; Dianna C, 2013)。また、Ando E, et al. (2018)では、『国民生活基礎調査・国民健康・栄養調査(2007-2011)』を用い、パートタイム労働者の喫煙率は男性のフルタイム労働者よりも高く、糖尿病の有訴率は、フルタイム労働者よりも女性のパートタイム労働者で統計学的に有意に高い傾向にあることが明らかにされている。

③ホワイトカラー・ブルーカラーの類型では、Kajitani S(2015)が、Nihon University Japanese Longitudinal Study of Agingを用いて、男性のブルーカラー労働者の身体能力は、他の職業に比べて、特に55歳以降、年齢とともに急速に低下傾向にあること、対照的に、男性のホワイトカラー労働者では糖尿病になる確率が、男性のブルーカラー労働者よりも年齢とともに急速に増加傾向にあることを明らかにした。Dang A, et al.(2019)では、2004-2005と2011-2012のIndia Human Development Surveyを比較し、インドの都市部において、ホワイトカラーのBMIは、ブルーカラーに比較して、女性では約1.01kg/m<sup>2</sup>高く、男性では約1.18 kg/m<sup>2</sup>高い傾向にあることが示されている。そして、インド都市部におけるBMIの増加傾向は、職業構造が、肉体労働が求められるブルーカラー職から、座り仕事のホワイトカラーへと、全体的に移行傾向に

あることに起因していると結論づけている。

Ravesteijn B, et al.(2018)は、1984-2012 German Socioeconomic Panelを用いて、ブルーカラー労働者はホワイトカラー労働者よりも主観的健康観が悪い傾向にあり、両者の健康格差は29ヶ月分の老化に匹敵すると推定している。また、オーストラリアでは、交易・肉体労働・製造にかかわる職業に従事する高齢労働者は、大多数が男性であり、他の職業に比べ、主観的健康観が悪く、早期退職の確率が高い傾向にある(McPhedran S, 2012)。

Heinesen, et al. (2017)では、デンマークの乳がんと結腸癌の行政データに基づき、仕事復帰確率が、高学歴と相関が高い精神面での仕事に対する満足度、低学歴と相関が高い肉体面での仕事に対する満足度と、統計学的に有意な負の相関があることが示されている。最後に、本研究の基盤となった厚生労働科学研究費プロジェクト『費用対効果分析の観点からの生活習慣病予防の労働生産性及びマクロ経済に対する効果に関する実証研究(H29-循環器等一般-002)』に基づく2つの研究、Fu, et al.(2020)とKaneko, et al. (2020)では、循環器系疾患・癌と診断されることによって就労確率や就労時間に与える影響は、cognitive (white collar)よりも、non-cognitive(blue collar)の方が深刻であるという結論を得ている。

④専門職・管理職・技術職(熟練・非熟練)については、Llena-Nozal A, et al.(2004)が、イギリスの代表的なlongitudinal surveyである1958-2010 National Child Development Surveyを用いて、専門職に就いている人は、障がいを負った場合の就労や生活に与えるショックが大幅に低い傾向にあると結論づけている。そもそも、Kim, et al. (2017)では、韓国のデータを用いて、熟練の有無にかかわら

ず、肉体労働に就いている高齢者は、騒音・振動・高温および低温・溶剤・化学物質等の職種特有のリスクに加えて、疲労や痛みを伴う姿勢、重い荷物の持ち運びや移動、反復運動などの人間工学的リスクにも頻繁に晒されている確率が高いと報告している。Heinesen, et al. (2018)でも、癌に罹患する以前に、肉体労働で認知スキルがあまり必要でないような職業に就いている場合、罹患後の雇用確率を悪化される可能性が高いことを、2000-2005 Danish cancer and hospitalization registersに基づき示している。

③と④両者の観点を有する研究として、Väisänen D, et al. (2020)が、2014-2019にスウェーデンで収集された72,855人の労働者を対象として、一般的な慢性疾患に対する健康リスク指標を特定し、それを異職種間で比較した研究がある。結果、ブルーカラー労働者はホワイトカラー労働者と比較して、健康リスクのクラスタリングが有意に高いことがわかった(OR: 1.80; 95% CI 1.71-1.90)。また、高技能ホワイトカラー労働者と比較して、低技能ホワイトカラー労働者は、高技能ブルーカラー労働者(1.98; 1.86-2.12)と同様のOR(2.00; 1.88-2.13)、そして、低技能ブルーカラー労働者が最もクラスター化リスクが高い(2.32; 2.17-2.48)ことが示された。

⑤仕事のシフト類型については、Rivera-Izquierdo, et al. (2020)がMeta-analysisを行い、シフト勤務や夜勤勤務と前立腺がんの間に統計学的に有意な相関は確認されなかったと報告している。

本研究の趣旨とは若干異なるが、直近の研究には、2020年以降、感染が世界的に拡大した新型コロナウイルス(COVID-19)の重症化や死亡等に職業分類がどのような影響を与えるのかについて分析を行った研究が存在する。

例えば, Mutambudzi et al. (2020)では, 英国の複数のデータを突合し, 120,075人の労働者に対して, 非エッセンシャル・ワーカーと比較して, 医療従事者(RR 7.43, 95% CI 5.52-10.00), 社会・教育従事者(RR 1.84, 95% CI 1.21-2.82), 及び, その他のエッセンシャル・ワーカー(RR 1.60, 95% CI 1.05-2.45)は, COVID-19の重症化リスクが高いことを明らかにした. こうした結果に基づき, 本研究では, エッセンシャル・ワーカーは, COVID-19に代表されるような公衆衛生学上の外生ショックに際し, 重症化リスクが高く, こうした労働者を保護し支援する政策の重要性を強調している.

#### C-7-2. 国・地域による違い

SHAREを用い欧州全体を分析対象とした研究から, 国・地域によって, 生活習慣病の罹患に代表される「負」の健康ショックが就労状況に与える影響の大きさや統計学的有意性は異なる.

Flores and Kalwij (2014)では, スウェーデンでは, 慢性疾患が就労確率を大幅に引き下げるのに対し, デンマークでは統計学的に有意な影響が観察出来なかったとしている. 他方, 主観的健康観についての影響については, 効果の規模の若干の大小はあるが, 全ての欧州諸国で統計学的に有意な影響があったと報告している. Bambra and Eikemo (2009)では, 貧困層の助成については, 健康状態が失業に与える影響がAnglo-Saxon地域の住民で最も大きく, 男性については, Bismarckian地域で最も大きい傾向にあることがわかった. さらに, 大陸ヨーロッパと地中海地方の国々では, 健康ショックは就労確率に統計学的に有意な影響はないが, 北欧諸国では就労確率を11.9%ポイント引き下げ, 東欧諸国では6割近くと, さらに大きな影響が確認

されている明らかにされた(Trevisan and Zantomio, 2018). Kelly, et al. (2019)では, 全世界を対象として, 集計パネルデータによる動学パネル分析を行った結果, BMIの増加に伴い, 中所得国の上位の国ではGPDの成長が大幅に低下し, 人口が1%増加すると, BMIはGDP成長率を11.5%減少させる傾向にあると報告している. こうした影響は, 低所得国, 低中所得国, 高所得国では観察されないへの影響は観察されていない. 先行研究の中では数少ない研究の1つであるが, 従属変数に病気による欠勤を用いたLund et al.(2009)では, スウェーデンとデンマークを対象とした研究を行い, 過剰体重や肥満傾向にある人は欠勤の確率高く, また, 慢性的な健康状態が欠勤確率高める傾向にあることが示され, その影響は両国で統計学的に有意に違わないとしている.

#### 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や当該データに対する研究者のaccessibility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、概して、就労状況にネガティブな影響を与える傾向にあるが、その影響の大きさや統計学的有意性は、性別・人種・年齢・教育水準・疾患の種類や重症度等の個人属性のみならず、職業類型や国・地域によって異なることがわかった。

したがって、日本や東アジアでの研究からは、特に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、産業や職業類型の違い、そして、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。

また、これらの先行研究では、職業類型や国や地域による違いがどういったメカニズムに起因するのかまではいまだ分析がなされていない。そこで本研究では、そのメカニズムに着目して分析を行うこととする。

## E. 結論

本研究は、2000-2022年の直近22年間に、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、産業、職業、及び、地理的な要因に重点を置いて、生活習慣病と労働生産性の関連性に関する定量的・定性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。

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、とりわけ、欧州に偏っている。

生活習慣病の罹患に代表される「負」の健康ショックは、概して、就労状況にネガティブな影響を与える傾向にあるが、その影響の大きさや統計学的有意性は、性別・人種・年齢・教育水準・疾患の種類や重症度等の個人属性のみならず、職業類型や国・地域によって異なり、そのメカニズムの解明にはいまだ至っていない。したがって、欧州以外での当該テーマに対する研究、及び、職業類型や国・地域による違いがどのようなメカニズムで発生するのかに対する研究が求められている。

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	Brenner, H., & Ahern, W.	Occupational and environmental medicine (2000)	Ireland	Records of sickness absence since 1981 to 1996	Sickness absence and early retirement of construction workers	Diagnosis classification according to ICD9	Descriptive statistics	Cardiovascular disease and musculoskeletal disorders each accounted for nearly one third of the conditions leading to permanent disability on the grounds of which early retirement was granted.
2	Karjalainen, A., Kurppa, K., Martikainen, R., Karjalainen, J., & Klaukka, T.	Scandinavian journal of work, environment & health (2002)	Finland	Three national registers, and all 25-59-year-old employed Finns were followed for asthma incidence in 1986–1998	Detailed level of occupational classification	Persistent asthma	Log-linear model	A significantly increased risk was found for either men or women in 125 occupations. For the men, the risk was highest among bakers, laundry workers, shoemakers and repairers, tanners, felt mongers and pelt dressers, and metal plating and coating workers. For the women, the risk was highest among shoemakers and repairers, railway and station personnel, jewelry engravers, engine room crew, molders, round-timber workers, and bakers.
3	Gambin	Unpublished (2005)	European Countries	1994-2001 ECHP and SOEP	Continuous: log hourly wage	Dummies: Health status from very good health to poor health status, chronic disease	OLS and Random-effects, and Fixed-effects	Generally, health status and chronic disease affect the wage of men across European countries but has no consistent effects for women of European countries. For instance, men in Austria indicate that good health improves wage but for women the effect is small to insignificant. Furthermore, effect varies by country. For instance, good health increases wage by 9.8% in Austria but 12.34% in Greece for men.

4	Roos et al.	Scandinavian Journal of Public Health (2005)	3 Nordic Countries (Denmark, Finland, and Sweden)	The Nordic Data bank	Dummy: unemployed or not	Dummies: Self-reported poor health and any limiting longstanding illness	Logistic	Overall, poor self-reported health reduces the probability of being a full-time employed and increases the probability of unemployed and being housewife for women across Denmark, Finland, and Sweden, though the effect is small in Finland. Similar to women, men also experience the same unemployment effect of poor health and pattern is similar to women across three Nordic Countries.
5	Schuring et al.	Journal of Epidemiology & Community Health (2007)	11 European Countries (same as above)	1994–1998 European Community Household Panel (First Five Waves)	Dummies: Employed, unemployed, and retired	Dummies: Poor health and chronic health problem	Logistics Regression	By countries, authors find that poor health and chronic health significantly increases the probability of being unemployed and retired. For example, individuals with poor health are 30% less likely to be employed and those with a chronic health problem are 10% less likely to be employed in Germany. Similarly, those with poor health are 2.6 times more likely to be unemployed and retired while 2.2 to 2.4 times more likely to be unemployed and retired in Germany. Similar pattern can be found across other 10 countries but the effect of poor health on employment, unemployment, and retirement is strongest on Demark, Netherlands, and the United Kingdoms.
6	Alavinia and Burdorf	International Archives of Occupational Environmental Health (2008)	11 European Countries (Denmark, Sweden, Austria, France,	2004 SHARE	Dummies: Retire, Unemployed, and Homemaker	Dummies: self-reported good health	Logistics	Significant heterogeneity exists across country and dependent variables. For retirement, poorer health increases the probability of retired in Sweden, Denmark, Germany, Austria, Italy, Spain, and



		Germany, Switzerland, Belgium, the Netherlands, Spain, Italy and Greece)					Greece. Poor health has no effect on retirement in the Netherlands, Switzerland, and France. Similar to unemployment, poor health increases unemployment in Denmark, Germany, and etc. It has no effect in France.	
7	Bambra and Eikemo	Journal of Epidemiology & Community Health (2009)	23 European Countries	2002 and 2004 European Social Survey	Dummy: unemployed or not	Dummies: Self-reported poor health and any limiting longstanding illness	Logistics Regression	By region and gender, limiting longstanding illness and self-reported poor health increases odds of being unemployed across all gender and regions: Scandinavian, Bismarckian, Anglo-Saxon, Southern, and Eastern Europe. As an example, limiting longstanding illness increases the odds of unemployed by 96% than those without in Scandinavian and those with limiting longstanding illness increases the odds of being unemployed by 121% than those without for men. To summarize, the effect of poor health and illness on unemployment status is greatest for those who lived in Anglo-Saxon region for women and Bismarckian for men.
8	Lund et al.	European Journal of Public Health (2009)	Sweden and Denmark	Danish Work Environment Study and HaKuL	Dummy: Absent due to sickness at work in > 7 Days or not	Dummies: Overweight, obese, neck, lower back, knee symptoms, Categorical: Self-reported health	Logistics	Being obese and overweight increases the odds of being absent for sickness in both Sweden and Denmark. The effect are relatively similar across these two countries. Furthermore, various of different symptoms of chronic health symptoms are associated with higher odds of being absent for sickness in both Sweden and Denmark. The effects do not vary by countries.

9	Herquelot, E., Guéguen, A., Bonenfant, S., & Dray-Spira, R.	Diabetes Care (2011)	France	GAZEL prospective cohort of 20,625 employees of the French national gas and electricity company “EDF-GDF.”	Transition from employment to disability	Diabetes	Multistate Cox model	Employment rate decreased more rapidly in participants with diabetes (51.9 and 10.1% at 55 and 60 years, respectively) compared with nondiabetic participants (66.5 and 13.4%, respectively).
10	McPhedran, S.	Journal of aging and health (2012)	Australia	Waves 2 (2002) to 6 (2008) of the Household, Income and Labor Dynamics in Australia	Labor force participation =1 if consistently in the labor force between Waves 2 and 6; =0 if in the labor force at Wave 2 but left the workforce and did not reenter it between Wave 2 and Wave 6. Three broad categories of occupations: professional, clerical/sales/services	General health and well-being assessed using the Short Form-36 (SF-36)	logistic regression model	Older workers in trades, labor, and production occupations, the majority of whom are men, have poorer general health than their counterparts in other occupations and are also the most likely to exit the workforce.
11	Olesen, S. C., Butterworth, P., & Rodgers, B.	Social psychiatry and psychiatric epidemiology (2012)	Australia	2001-2006 Household, Income and Labour Dynamics in Australia (HILDA) Survey	Early retirement	Mental Health Inventory (MHI-5)	log-log regression model	Poor mental health was associated with higher rates of retirement in men (hazard rate ratio, HRR 1.19), and workforce exit more generally in women (HRR 1.14).
12	Deiana C.	Unpublished (2013)	26 European Countries	2007 and 2009 European Union Statistics on Income and Living Conditions	Dummies: Full-time, Part-time, Retired, Unemployed, and Inactive	Dummy: daily activities limited due to physical or mental problems or not	OLS and PSM	Having a limitation on activities reduces the probability of full-time employment and increase part-time employment, though the effect varies across countries. That is, effect is stronger in countries such as Austria, Belgium, and the effect is weaker in countries such as, Estonia and Finland.

13	De Wind, A., Geuskens, G. A., Reeuwijk, K. G., Westerman, M. J., Ybema, J. F., Burdorf, A., ... & Van der Beek, A. J.	BMC Public Health (2013)	Netherlands	Interviews conducted with 30 employees (60–64 years) who retired before the official retirement age of 65	Early retirement	Health problems	Qualitative method	Both poor and good health influenced early retirement. For poor health, four pathways were identified. A good health also influenced early retirement, since persons wanted to enjoy life while their health still allowed to do so.
14	Robroek, S. J., Reeuwijk, K. G., Hillier, F. C., Bamba, C. L., van Rijn, R. M., & Burdorf, A.	Scandinavian journal of work, environment & health (2013)	N/A	PubMed and Embase for English language, longitudinal, quantitative studies	Exit from paid employment through disability pension, unemployment, and early retirement	Overweight, obesity, and lack of physical activity	Meta-analysis	Obese (relative risk (RR)=1.53) and overweight (RR=1.16) individuals had an increased likelihood of exit from paid employment through disability pension, but were not at statistically significant increased risk for unemployment or early retirement.
15	Schuring, M., Robroek, S. J., Otten, F. W., Arts, C. H., & Burdorf, A.	Scandinavian journal of work, environment & health (2013)	Netherlands	1999-2002 Permanent Quality of Life Survey	Unemployment, early retirement, disability pension, or becoming economically inactive	Self-reported health with five categories. Those reporting less than “good health” were defined as having a poor health	Cox proportional hazards analyses	Poor health increased the likelihood of labor force exit into unemployment [hazard ratio (HR) 1.89], disability pension (HR 6.39), and early retirement (HR 1.20), but was not a determinant of becoming economically inactive (HR 1.07).
16	Bonauto, D. K., Lu, D., & Fan, Z. J.	Preventing chronic disease (2014)	USA	A landline telephone survey in Washington state Prevention’s Behavioral Risk Factor Surveillance System from 2003 to 2009	Occupation codes using the Standardized Occupation and Industry Coding	Obesity by Body Mass Index	Multivariate regression analyses	Workers in protective services were 2.46 times as likely to be obese as workers in health diagnosing occupations. Workers with physically demanding occupational physical activity had a lower PR of obesity (PR = 0.83) than those with non-physically demanding occupational physical activity.

17	Rumball-Smith, J., Barthold, D., Nandi, A., & Heymann, J.	Health Affairs (2014)	16 high income countries	SHARE (2004-07), ELSA (2002, 2004, and 2006), and HRS (2004)	Early retirement	Self-reported doctor's diagnosis of diabetes	Cox proportional hazards models	Across the sixteen countries, people diagnosed with diabetes had a 30 percent increase in the rate of labor-force exit, compared to people without the disease.
18	Virtanen, M., Kivimäki, M., Zins, M., Dray-Spira, R., Oksanen, T., Ferrie, J. E., ... & Vahtera, J.	Diabetic Medicine (2015)	Finland France	Finnish Public Sector Study (1102 cases; 2204 controls) and the French GAZEL study (500 cases; 1000 controls), followed up for 5 years.	Work disability	Obesity, physical activity, smoking and alcohol consumption	Group-based trajectory modelling	Diabetes was associated with a 'high-increasing' trajectory only (OR 1.90). Obesity and low physical activity were similarly associated with high work disability in people with and without diabetes. Smoking was associated with 'high-increasing' trajectory in employees with diabetes (OR 1.88) but not in those without diabetes (OR 1.32).
19	Kaspersen, S. L., Pape, K., Vie, G. Å., Ose, S. O., Krokstad, S., Gunnell, D., & Bjørngaard, J. H.	The European Journal of Public Health (2016)	Norway	Self-reported health data (1995-1997) linked to the National Insurance Database (1992-2008).	Unemployment	Chronic somatic conditions, high symptom levels of anxiety and depression, poor self-rated health, insomnia	Cox proportional hazard models	Compared to reporting no conditions/symptoms, having $\geq 3$ chronic somatic conditions (HR 1.78) or high symptom levels of anxiety and depression (HR 1.57) increased the risk of subsequent unemployment substantially. Poor self-rated health (HR 1.36), insomnia (HR 1.19) were also associated with increased risk of unemployment.
20	GBD 2016 Occupational Carcinogens Collaborators	The Lancet (2017)	Global	Global Burden of Diseases Studies Data	Occupational risks	deaths and disability-adjusted life years (DALYs)	Comparative risk assessment framework	Occupational risk factor accounted for the fewest number of deaths and DALYs among all risks (metabolic, environmental, occupational, and behavior risks), and there was a significant decline in it since 2006.
21	Heggebo	Ethnicity & Health (2017)	18 European Countries	2005-2014 European Union Statistics on Income and Living Conditions	Dummy: Unemployed or not	Dummy: LLSI: limiting long-standing illness	OLS	Having a limiting long-standing illness increases the probability of unemployment for some countries, such as Austria, Belgium, Czech Republic, and more. No effects are

							found on Croatia, Hungary, and more.	
22	Majeed, T., Forder, P. M., Mishra, G., Kendig, H., & Byles, J. E.	Journal of aging and health (2017)	Australia	2011 Australian Life Histories and Health (LHH) Survey	Workforce participation	Diabetes, asthma, depression, and arthritis	Multinomial regression	Diabetes, asthma, depression, and arthritis were less prevalent in men and women in class “mostly full-time work,” compared with other workforce patterns. The odds of “mostly full-time work” were lower for men reporting depression or arthritis, whereas among women, depression was associated with “increasing part-time work” after adjusting early and adult life factors.
23	Park, J., Kim, S. G., Park, J. S., Han, B., Kim, K. B., & Kim, Y.	Annals of occupational and environmental medicine (2017)	Korea	The fourth Working Conditions Survey of 2014	20 occupations in South Korea that employ the most aged workers (at least 55 years-old) by the Korean Standard Classification of Occupations	Hazards of health problems	chi-squared test for the differences between aged workers and young workers	Aged workers in elementary and skilled manual occupations reported frequent exposure to job-specific hazards, such as noise, vibrations, high and low temperatures, solvents, and chemicals. In addition, aged workers also reported more frequent exposure to ergonomic hazards, such as tiring or painful positions, carrying or moving heavy loads, and repetitive movements.
24	Reeuwijk et al.	Scandinavian Journal of Work, Environment, & Health (2017)	11 European Countries (Denmark, Sweden, Austria, France, Germany, Switzerland, Belgium, the	2004–2012 Survey of Health, Aging, Retirement in Europe or SHARE (First Four Waves)	One categorical variable, five categories: 1) Paid employment, 2) disability benefit, 3) unemployed, 4) early retirement, and 5) economically inactive (stopped working for reasons	Good or poor self-reported health status (a dummy)	Cox Proportional Hazards Model and F&G’s Proportional Subdistribution Hazards Model	Stratified by three regions (Bismarckian, Scandinavian, and Southern European), poor health is generally associated with a higher probability of being in disability benefit and unemployed across the three regions. For Bismarckian region, those with poor health are 2.89 times more likely to be in disability benefit group than paid

		Netherlands, Spain, Italy and Greece)		not listed above such as homemaking)			employment (baseline) and 1.71 times more likely to be unemployed than be in paid employment. For Scandinavian region, poor health increases the probability of being in disability benefits than in paid employment by 3.69 times. Finally, individuals are 7.34 times more likely to be in disability benefit than paid employment if they are in poor health and in Southern Europe region.	
25	Ando, E., Kachi, Y., Kawakami, N., Fukuda, Y., & Kawada, T.	Industrial health (2018)	Japan	2007–2011 Comprehensive Survey of Living Conditions and National Health and Nutritional Survey	Type of employment contract: standard (full-time and permanent) or non-standard (part-time job)	Cardiovascular risk: obesity, abdominal obesity, hypertension, diabetes, dyslipidemia, current smoking, excessive alcohol consumption, and metabolic syndrome	logistic regression model	Non-standard employees had a statistically significant higher OR for current smoking than the male standard employees (OR 1.39; 95% CI, 1.13–1.86). The prevalence of diabetes was significantly higher among female non-standard employees than standard employees (OR 1.83; 95% CI, 1.10–3.09)
26	Leonardi et al.	International Journal of Environment Research and Public Health (2018)	3 European Countries (Finland, Poland, and Spain)	Collaborative Research on Ageing in Europe	Dummy: Unemployed or not	Dummy: Self-reported poor health Continuous: Handgrip in kg and walking test at 4m in meter	Logistics	Higher handgrip decreases unemployment in all three countries. The effect is relatively similar across three countries. That is, 1kg increases in handgrip strength leads to 0.1 – 0.2 times decreases in unemployment. For self-reported poor health, poor health increases the odds of unemployment by 3.14 times in Poland and 1.27 times in Spain.

27	Scharn, M., Sewdas, R., Boot, C. R., Huisman, M., Lindeboom, M., & Van Der Beek, A. J.	BMC public health (2018)	N/A	20 research articles	Retirement timing	Multiple domains of the determinants, including health	Meta-analyses	Health limitation is one of the eight domains (demographic factors, health, social factors, social participation, work characteristics, financial factors, retirement preferences, and macro effects) that determine the timing of retirement.
28	Heggebo and Buffel	Interantional Journal of Health Services (2019)	4 European Countries	2013 European Union Statistics on Income and Living Conditions	Dummy: Unemployed or not	Dummy: LLSI: limiting long-standing illness	OLS	Having a limiting long-standing illness increase the probability of being unemployed in Norway, Netherlands, and Belgium but has no effect in Denmark. The effect varies by education level, marital status, age, and gender across these countries.
29	Porru et al.	European Journal of Public Health (2019)	11 European Countries	2004 SHARE	Dummy: Unemployed or not	Dummy: depress or not using a scale of EURO-D scale (1: >4 score and 0 otherwise)	Cox proportional hazard model	Depression is more likely to increase the risk of unemployment in European countries, though the risk varies. For instance, Northern European countries only have 1.03 risk ratio compared to Southern European countries which have 1.68 RR.
30	Fu, R., Noguchi, H., Kaneko, S., Kawamura, A., Kang, C., Takahashi, H., Tamiya, N.	PLoS ONE (2019)	Japan	the Comprehensive Survey of Living Conditions (CSLC) from 1995 to 2013	Working status by gender and cognitive (white-color)/non-cognitive (blue-color) workers	Diagnosed cardiovascular diseases	OLS, 2SLS with IV	Cardiovascular diseases significantly and remarkably reduced the probability of working by 15.4% (95% CI: -30.6% to -0.2%). The reduction in working probability was detected for women only. Respondents aged $\geq 40$ years were less likely to work once diagnosed and the reduction was enlarged for those aged $\geq 65$ years, while those aged $< 40$ years appeared to be unaffected. Probability of engaging in manual labor significantly decreased once

							diagnosed; however, no impact was found for cognitive occupations. Among employed respondents, the adverse effects of cardiovascular diseases decreased working hours by five hours per week. Validity of the biomarker instrumental variables was generally verified.	
31	Schuring et al.	Scandinavian Journal of Work, Environment, & Health (2019)	25 European Countries	2005-2014 European Union Statistics on Income and Living Conditions	Dummy: Unemployed or not	Dummy: Self-reported poor health	Cox proportional hazards models	Poor health increases the odds of unemployment across Europe. Specifically, the effect is strongest among Anglo-Saxon region while the effect is weakest among Eastern region.
32	Torp et al.	Journal of Occupational Rehabilitation (2019)	6 European Countries	EU COST Cancer and Work Network Dataset	Dummy: Employed or self-employed, reduced work hours Continuous: hours of work, mean reduced work hours	Dummy: Cancer survivor or not	Proportion test	Cancer survivors are more likely to be self-employed. In particular, cancer survivors in Belgium and Ireland are more likely to be self-employed than being employed as a salaried worker. No effect is found on France, Norway, and UK. Similar patterns can be observed for work hours.
33	D'edel'ė A., Miškinytė A., Andrušaitytė S., Bartkutė Z.	International Journal of Environmental Research and Public Health (2019)	Kaunas city, Lithuania	Cross-sectional survey which was conducted in 2017 by a research market agency and designed based on telephone interviews	the International Standard Classification of Occupations (ISCO) and grouped into white-collar (ISCO-88 major occupational groups 1–5) and blue-collar (ISCO-88 major occupational groups 6–9) workers	Perceived Stress and Sedentary Behaviour	Binary logistic regression	Multivariate logistic regression was used to assess the impact of sedentary behaviour on perceived stress among different occupational groups. The prevalence of high sedentary behaviour was 21.7 and 16.8 % among white-collar and blue-collar workers, respectively. Blue-collar workers had a higher risk of high perceived stress (OR 1.55, 95% CI 1.05–2.29) compared to white-collar workers; however, sedentary time did not have any impact on high perceived stress level. Meanwhile, white-collar male



							(OR 4.34, 95% CI 1.46–12.95) and white-collar female (OR 3.26, 95% CI 1.23–8.65) workers who spend more than three hours per day sedentary had a greater risk of high levels of perceived stress. These findings indicate sedentary behaviour effect on perceived stress among two occupational groups—white-collar and blue-collar workers—and other important factors associated with perceived stress	
34	GBD 2016 Occupational Carcinogens Collaborators	Occupational and Environmental Medicine (2020)	Global	Global Burden of Diseases Studies Data (sociodemographic index, employment data)	Occupational carcinogens	Cancer attributable deaths and disability-adjusted life years (DALYs)	Comparative risk assessment framework	An estimated 349,000 deaths and 7.2 million DALYs in 2016 due to exposure to the included occupational carcinogens—3.9% of all cancer deaths and 3.4% all cancer DALYs; 79% of deaths were of males and 88% were of people aged 55–79 years.
35	Kaneko, S., Noguchi, H., Fu R., Kang, C, Kawamura, A.,Amano S., Miyawaki A.	PLOS ONE (2020)	Japan	Longitudinal Survey of Middle-aged and Elderly Persons (2005-2016)	Working status by gender and cognitive (white-color)/non-cognitive (blue-color) workers	Diagnosed cancer	Logistic regression with propensity score matching	Cognitive workers are more prone to quit their job in the year of diagnosis by 11.6 percentage points, and this effect remains significant, 3.8 percentage points, in the following year. On the other hand, for manual workers the effect during the year of diagnosis is huge. It amounts to 18.7 percentage points; however, the effect almost disappears in the following year.
36	Rivera-Izquierdo, M., Martínez-Ruiz, V., Castillo-Ruiz, E. M.,	International Journal of Environmental Research and Public Health (2020)	N/A	18 studies	Shift work	Prostate cancer	Meta analyses	No association was found between rotating/night-shift work and prostate cancer, pooled OR 1.07 (95%CI 0.99 to 1.15)

	Manzaneda-Navío, M., Pérez-Gómez, B., & Jiménez-Moleón, J. J.							
37	Mahumud R.A., Alam K., Dunn, J. & Gow J.	BMC Public Health (2020)	Australia	The Household, Income and Labour Dynamics in Australia survey	work disability	Cancer Survivor	unadjusted and adjusted fixed-effect multinomial logistic regression model	Cancer survivors who faced a severe health burden were at 5.32 times significantly higher risk of having work disability compared with patients who had no health burden. Other potential predictors, such as older patients (relative risk ratio, RRR = 1.82; 95% CI: 1.57, 5.87), those engaged in lower levels of physical activities (RRR = 1.91; 95%CI: 1.07, 3.40), those who drink alcohol (RRR = 1.29; 95% CI: 1.15, 1.49), and poor socioeconomic status (RRR = 1.28; 95% CI: 1.16, 2.23) were all significantly associated with extreme work disability.
38	Sun Y., Wang A., Yu S., Hagger M.S., Chen X., Fong S.S.M.F, Zhang C., Huang W.Y., Baker J.S., Dutheil F., Gao Y.	BMC Public Health (2020)	Hong Kong	cluster-randomized control trial	Likert scale	Physical/mental related health outcomes, health-related quality of care	A generalized linear mixed model (GLMM)	On-going study
39	Väisänen D., Kallings LV., Andersson G., Wallin P., Hemmingsson	BMC Public Health (2020)	Sweden	the HPI Health Profile Institute cohort (HPI, Stockholm, Sweden. www.hpihealth.se)	physical activity pattern, physical examination indicators, perceived health and other	Occupation group (a Swedish Standard Classification of	Chi-square test & multivariable adjusted analyses	The greatest variation in OR across sub-major and major occupational groups were seen for daily smoking (OR = 0.68 to OR = 5.12), physically demanding work (OR = 0.55 to

E., Ekblom-Bak E.				lifestyle-related indicators	Occupation: SSYK)		OR = 45.74) and high sitting at work (OR = 0.04 to OR = 1.86). For clustering of health risk indicators, blue-collar workers had significantly higher clustering of health risks (OR: 1.80; 95% CI 1.71–1.90) compared to white-collar workers (reference). Compared to high-skilled white-collar workers, low-skilled white-collar workers had similar OR (2.00; 1.88–2.13) as high-skilled blue-collar workers (1.98; 1.86–2.12), with low-skilled blue-collar workers having the highest clustered risk (2.32; 2.17–2.48). There were large differences in health risk indicators across occupational groups, mainly between high-skilled white-collar occupations and the other occupations, with important variations also between major and sub-major occupational groups. Future health interventions should target the occupational groups identified with the highest risk for effective disease prevention.
Carlsson S., Andersson T., Talbäck M., Feychting M.	Diabetologia (2020)	Sweden	This nationwide study included all Swedish citizens born between 1937 and 1979 and gainfully employed between 2001 and 2013 (N = 4,550,892), and followed for a diagnosis of diabetes from 2006 to 2015	the Swedish Standard Classification of Occupations 1996 (SSYK96)	type 2 diabetes	Descriptive statistics	Prevalence of type 2 diabetes was 5.2% in men and 3.2% in women; in men it was highest among motor vehicle drivers (8.8%) and in women it was highest among manufacturing workers (6.4%). Incidence varied dramatically across occupational groups. In men, it was highest among manufacturing workers (9.41) and professional drivers (9.32) and lowest among

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			(n = 201,717) through national registers				university teachers (3.44). In women, incidence was highest in manufacturing workers (7.20) and cleaners (6.18) and lowest in physiotherapists (2.20). We found major differences in the prevalence of being overweight and smoking and in the level of physical fitness across these occupational groups even at young ages.	
41	Mutambudzi M., Niedzwiedz C., Macdonald E.B., Leyland A., Mair F., Anderson J., Celis-Morales C.C., Cleland J., Forbes J., Gill J., Hastie C., Ho F., Jani B., Mackay D.F., Nicholl B., O'Donnell C., Sattar N., Welsh P., Pell J.P., Katikireddi S.V., Demou E.	Occupational & Environmental Medicine (2021)	United Kingdom	Methods Baseline UK Biobank data (2006–10) for England were linked to SARS-CoV-2 test results from Public Health England (16 March to 26 July 2020)	three occupational classification schemes (including Standard Occupation Classification (SOC) 2000).	positive in hospital or death due to COVID-19	Poisson regression models	Results Of 120 075 participants, 271 had severe COVID-19. Relative to non-essential workers, healthcare workers (RR 7.43, 95% CI 5.52 to 10.00), social and education workers (RR 1.84, 95% CI 1.21 to 2.82) and other essential workers (RR 1.60, 95% CI 1.05 to 2.45) had a higher risk of severe COVID-19. Using more detailed groupings, medical support staff (RR 8.70, 95% CI 4.87 to 15.55), social care (RR 2.46, 95% CI 1.47 to 4.14) and transport workers (RR 2.20, 95% CI 1.21 to 4.00) had the highest risk within the broader groups. Compared with white non-essential workers, non-white non-essential workers had a higher risk (RR 3.27, 95% CI 1.90 to 5.62) and non-white essential workers had the highest risk (RR 8.34, 95% CI 5.17 to 13.47). Using SOC 2000 major groups, associate professional and technical occupations, personal service occupations and plant and machine operatives had a higher risk,

compared with managers and senior officials.

表 2: EconLit による検索結果

	Authors	Journal (Year)	Country	Data	Measurements		Method	Results
					Work	Health		
1	Pelkowski, J. M., & Berger, M. C.	Growth and Change (2003)	USA	1992-93 Health and Retirement Study	Transitions between employers according to HRS occupational coding scheme	Diagnosed with health problems	Multinomial logit regression	Workers with health problems are more likely than healthy workers to remain with their current employer than to switch employers. But among those who switch employers, those with health problems are more likely to change broad occupational categories than are healthy workers.
2	Llena-Nozal A., Lindeboom, M., & Portrait, F.	Health Economics (2004)	UK	1958-2010 National Child Development Survey	Occupation types: professional, managerial and technical, skilled non-manual, skilled manual, partly skilled and unskilled	Mental health by Malaise Inventory	Ordinary least square with fixed effect, selection model	Employment status, occupation and lifestyle variables are important for the probability of experiencing a disability shock. Individuals who participate in the labour market and who hold a professional occupation have substantially lower disability shock probabilities.
3	Steiner, J. F., Cavender, T. A., Main, D. S., & Bradley, C. J.	Cancer (2004)	Review	Literature review from 1966-2003 by searching the MEDLINE, CancerLit, EMBASE, HealthSTAR, PsychoINFO, ERIC, and Social SciSearch electronic data bases	Work return and work function, economic status, work intensity, role, and content	Cancer survivor or not	A conceptual model of work after cancer	Because the ability to work integrates so many physical, mental/cognitive, social, and economic considerations, observational studies of the impact of cancer on work and interventions to improve work function are a particularly important component of cancer survivorship research.

4	Cawley et al.	Schmoller Jahrbuch (2005)	US and Germany	1986-2001 Panel Study of Income Dynamic and 2002 German Socio-Economic Panel	Continuous: log wage	Continuous: weight, height, and BMI Dummies: Underweight, overweight, and overweight	IV (parental BMI)	For men in both the US and Germany, having higher BMI has no effect on log wage. For women in the US, higher BMI reduces log wage by 1.32%. For women in Germany, higher BMI has no effect on log wage.
5	Garcia and Quintana-Domeque	Unpublished (2006)	European countries	1998 – 2001 European Community Household Panel	Dummy: Employed or not Continuous: Hourly wage	Continuous: BMI and weight Dummy: Obese or not	Logit	The effect of weight-related variables on employment and wage differed across countries and gender. We only highlight an example as too many heterogeneities to summarize everything. For instance, Higher obesity, BMI, and weight increases unemployment in Greece, Italy, and Spain for women, whereas they have no effects on unemployment in Demark, Finland, Ireland, and Portugal. For men, higher weight-related variables increase unemployment for Belgium, Finland, and Spain.
6	Kim, I. H., Muntaner, C., Khang, Y. H., Paek, D., & Cho, S. I.	Social science & medicine (2006)	Korea	1998 Korean National Health and Nutrition Examination Survey	Nonstandard employment: part-time work, temporary work, and daily work	Self-reported depression and suicidal ideation	Logistic regression	Nonstandard employees were more likely to be mentally ill compared to standard employees. Nonstandard work status was associated with poor mental health after adjusting for socioeconomic position (education, occupational class, and income) and health behaviors (smoking, alcohol consumption, and exercise).

7	Lundborg et al.	The Economics of Obesity (2006)	European countries	2004 SHARE	Dummy: Employed or not Continuous: Hours worked and wage	Dummies: Obese	OLS	For Nordic and Central European countries, BMI has no effect of employment for either men and women. For Southern European countries, higher BMI reduces employment for men but has no effect on women. Generally, BMI has no effect on hours of worked except for women of Central European countries. Interestingly, higher BMI increases the probability of employment by 10.1 percentage points for women of this region. For wage, BMI only has effect on wage for women living in central European countries.
8	Brunello and D'Hombres	Economics and Human Biology (2007)	European countries	1998 – 2001 European Community Household Panel	Continuous: Hourly wage	Continuous: BMI	Instrumental variable (BMI of relative)	Higher BMI is no effect on wage in Greece, Spain, Austria, Denmark, and Ireland for women. Higher BMI reduces on wage in Italy, Portugal, and Finland for women. For instance, one point increases in BMI reduces wage by 1.4% in Italy; reduces wage by 3.5% in Portugal; and reduces wage by 3.6% in Finland. For men, the effect differs across countries as well.
9	Atella et al.	EHB (2008)	European countries	1998 – 2001 European Community Household Panel	Continuous: Wage	Dummies: Obese, Overweight, and Underweight	OLS and quantile regression	For women, the obesity has no effect on wage in Austria, Greece, Ireland, and Portugal. For Belgium, Denmark, Finland, Italy, Spain, being obese significantly decreases wage for women. Generally, weight has no effect on wage across countries, except for Austria, Belgium, Ireland, and Italy. Significant heterogeneity exists

across different distribution of wags for both gender.

10	Case and Paxon	Journal of Political Economy (2008)	UK and US	1958 National Child Development Study, 1970 British Cohort Study, 1986-1994 National Health Interview Survey, 1988 – 1997 Panel Study of Income Dynamic	Continuous: log annual earning	Continuous: Height	OLS and multinomial logistics	For men and women in UK, higher height is associated with higher log annual earning. For men in the US, being higher is associated with higher probability of being in an executive position. For women in the US, the effect is much smaller.
11	Villar and Quintana-Domeque	EHB (2009)	European countries	1994-2001 European Community Household Panel	Continuous: Household income	Continuous: BMI	OLS and logit	For men, higher BMI is associated with higher household income but the effect varies across countries. In particular, higher BMI increases household income in Finland, Greece, and Denmark but has no effect in Austria, Belgium, Ireland, Italy, Portugal, and Spain. For women, higher has no effect on household income, except for Denmark where higher BMI increases household income for women.
12	Hildebrand and Kerm	Unpublished (2010)	European countries	1994 – 2001 European Community Household Panel	Continuous: Wage	Continuous: BMI	Partial linear model (non-parametric model)	For Northern and Southern European countries, BMI has no effect on wage for men. For women, BMI reduces employment by approximately 0.4 percentage points for both Northern and Southern European countries.



13	Garcia-Gomez	Journal of Health Economics (2011)	European countries	1994-2001 The European Community Household Panel	Dummies: unemployed, retired, and inactive	Dummies: Self-reported bad health (SAH) and chronic disorder	Propensity score matching (or PSM)	Significant heterogeneity exists on the effect of health and chronic disorder on employment outcomes across European countries. For instance, being poor health reduces the probability of being employed by 6.89 percentage-points in Denmark while the effect in Belgium is only 2.30 percentage-points. Similar pattern can be observed for having a chronic disorder. Stratified the effect by age groups, authors find that older workers have stronger effect of poor health and employment than younger workers. The pattern is consistent across countries.
14	Moran, J. R., Short, P. F., & Hollenbeak, C. S.	Journal of health economics (2011)	USA	1997-1999 Penn State Cancer Survivor Survey	Prime-age cancer survivors' probability of working, probability of working full time, working hours per week	Diagnosis of all types of cancer	Propensity score matching difference in difference	As long as two to six years after diagnosis, cancer survivors have lower employment rates and work fewer hours than other similarly aged adults.
15	Sotnyk	Unpublished (2011)	European countries	2004 – 2009 SHARE	Dummy: Employed or not Continuous: Hours worked	Dummies: Obese and overweight	OLS with lagged dependent variable	Regardless whatever it is Northern or Southern European countries, being overweight or obese has no effect on employment and hours worked.
16	Wandel, M., Kjøllestad, M. K. R., & Roos, G.	Handbook of Stress in the Occupations (2011)	N/A	Literature review and interpretation of potential mechanism	Job stress	Weight	Job demand/control model	Psychological demand and decision latitude are comprised in the model. When an employee experiences high psychological demands and his decision latitude is low, job strain is high and leads adverse stress reactions such as having unhealthy diet and being at risks of obesity.

17	Christensen, B. J., & Kallestrup-Lamb, M.	Health Economics (2012)	Denmark	1985–2001 Merged register data on individual objective medical diagnosis codes and early retirement behavior	Early retirement	Diagnoses defined by ICD-10	Duration analyses	Individual obtaining a diagnosis from musculoskeletal system and connective tissue, or from diseases of the circulatory system, experiences a more than 50 % increase in retirement probability.
18	Flores and Kalwij	Empirical Economics (2014)	European countries	2004 – 2012SHARE	Dummy: Employed or not	Categorical: Self-reported health (3 categories: fair, good, and excellent) Dummy: Chronic condition	Probit	Significant difference exists across European countries in term of effects of chronic conditions on employment. Generally, having chronic condition reduces employment regardless of countries but the significance varies. For instance, chronic condition significantly reduces employment in Sweden but the effect of chronic condition on employment is negative and insignificant in Demark. For self-reported good health, coefficient size of the effect of good health varies but significance is consistent across ALL countries.
19	Candon, D.	Economics & Human Biology (2015)	UK	2000-2006 English Longitudinal Study of Ageing	Labor force participation and working hours	Diagnosis of all types of cancer	Propensity score matching	Cancer have a negative impact in both the first 6-month period following diagnosis and the second 6-month period. In the second 6-month period after diagnosis, respondents with cancer are 12.2% points less likely to work and work 4.2 fewer hours a week when compared to matched, healthy controls.
20	Gimenez-Nadal and Molina	Economic Modelling (2015)	European countries	Multinational Time Use Survey	Continuous: Hours devoted to market work	Dummy: Self-reported good health	Seemingly Unrelated Regression	Overall, better self-reported health is associated with more hours devoted to market work regardless of countries and gender, though the effect varies across countries and

							gender. For instance, good health is associated with 33.7% more hours in market work for men in France while good health is associated with only 12.0% increase in hours of market work for men in Germany. Similar pattern can be observed in women as well.	
21	Kajitani, S.	Journal of the Japanese and International Economies (2015)	Japan	1999-2001 Nihon University Japanese Longitudinal Study of Aging	Type of occupation: white-collar and blue-collar	Number of chronic diseases, high blood pressure, diabetes	Discrete time-duration model	Physical abilities of male blue-collar workers decline more rapidly with age, especially after 55 years of age, compared to those in other occupations. By contrast, the probabilities of being diabetic among male white-collar workers increase more rapidly with age than they do for male blue-collar workers.
22	Kolodziejczyk, C., & Heinesen, E.	Economics & Human Biology (2016)	Denmark	Danish Cancer Registry linked to hospitalization registry	Non-participation of labor market and eligibility to disable pension, three years after the year of diagnosis	Breast cancer	Propensity score weighting methods	There is a significant educational gradient in the effect of cancer in the public sector, where the estimated effects are 11.5 and 3.8 percentage points, respectively, for the low- and high-educated. The corresponding estimates for the private sector are 6.2 and 3.2 percentage points and here the educational gradient is only marginally significant.
23	Lin, S. J.	The Journal of Developing Areas (2016)	Taiwan	2008 Panel Study of Family Dynamics	Wage	Obesity	Two stage least square	Individuals with excess bodyweight are paid much less than their normal weight counterparts, in particular for female workers and those who are aged 50 and above. Being overweight and obese also penalizes the wages of those who are engaged in the managerial, sales, and services occupations.

24	Trevisan and Zantomio	Labour Economics (2016)	European countries	2001-2013 SHARE and 2002 – 2013 English Longitudinal Study of Ageing	Dummy: Worked last week or four months or not	Dummy: has a heart attack, cancer, or stroke or not	PSM	For Nordic countries, negative health shock reduces the probability of being employed by 11.9 percentage-points. For continental and Mediterranean countries, health shock has no effect on the probability of being employed. For Eastern countries, negative health shock results in a significant negative effect on the probability of being employed. That is, the effect is approximately -0.595.
25	Heinesen, E., Kolodziejczyk, C., Ladenburg, J., Andersen, I., & Thielen, K.	Applied Economics (2017)	Denmark	2010 administrative data and a survey to breast and colon cancer survivors	Return-to-work probability three years after the year of diagnosis	Breast, colon or melanoma skin cancer diagnoses	Linear probability models	Return-to-work probability has a negative correlation with pre-cancer job dissatisfaction with mental demands (where the correlation is driven by the high-educated) and with physical demands and the superior (where the correlation is driven by the low-educated).
26	Jeon, S. H.	Health economics (2017)	Canada	Canadian 1991 Census link to Vital Statistics Registry and longitudinal personal income tax records	Individuals' working status and total annual earnings	Cancer types that are restricted to people surviving for more than three years or not	Coarsened exact matching and regression models	Over 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.
27	Jeon, S. H., & Pohl, R. V.	Journal of health economics (2017)	Canada	Canadian 1991 Census link to Vital Statistics Registry and longitudinal personal income tax records	Individuals' working status, annual earnings, and family income	Treatment: spouses were diagnosed with cancer for the first time between 1992 and 2003	Difference in difference with coarsened exact matching	There is a strong evidence for a decline in employment and earnings of individuals whose spouses are diagnosed with cancer. Individuals reducing their labor supply to provide care to their sick spouses and to enjoy joint leisure. Family income substantially declines after spouses' cancer diagnoses, suggesting that the financial

							consequences of such health shocks are considerable.	
28	Heinesen, E., Imai, S., & Maruyama, S.	Journal of health economics (2018)	Denmark	2000-2005 Danish cancer and hospitalization registers	Labor market outcomes four years after diagnosed cancer over different job characteristics measurement: skill and ability requirements in each specific occupation.	Diagnosis of all types of cancer based on ICD-10	OLS, robustness checks with ATT with inverse probability weighting	The negative effect of cancer on employment is stronger if the pre-cancer occupation requires high levels of manual skills or low levels of cognitive skills. Cancer is not associated with occupational mobility.
29	Mavisakalyan	EHB (2018)	Armenia, Azerbaijan, and Georgia	2008 Caucasus Research Resource Centers Data	Dummy: Employed or not	Dummy: Attractive or not	Probit	Across three countries, the effect of attractiveness on employment is relatively similar for men. That is, attractiveness increases the probability of employment by approximately 13 to 14 percentage points. For women, the attractiveness has no effect on employment.
30	Ravesteijn, B., Kippersluis, H. V., & Doorslaer, E. V.	Health economics (2018)	Germany	1984-2012 German Socioeconomic Panel	Occupational titles according to International Standard Classification of Occupations	Health satisfaction, Self-assessed health, SF12 for physical and mental health	Dynamic panel data model	Blue-collar workers report worse health than white-collar workers, and that the size of this health gap is comparable to the effect of ageing 29 months. However, because of various sources of selection into occupation, the association does not necessarily reflect the causal effect of occupation on health.
31	Stephens Jr, M., & Toohey, D. J.	National Bureau of Economic Research	USA	Multiple risks factor intervention trail	Earning and family income	Coronary heart disease related risks and interventions such as cholesterol,	Randomized controlled trail	The health interventions significantly increase earning by three percent and family income by four percent with no concurrent effect on labor force participation.

	working paper (2018)					smoking, and blood pressure.		
32	Dang, A., Maitra, P., & Menon, N. (2019)	Economics & Human Biology	India	2004-05 and 2011-12 India Human Development Survey	Working or not and white-collar or not	BMI	Ordinary least square	BMI is positively and significantly associated with labor market inactivity. Women in white-collar work have about 1.01 kg/m <sup>2</sup> higher BMI than women in blue-collar work. For working men, the comparable estimate is approximately 1.18 kg/m <sup>2</sup> .
33	Kelly et al. EHB (2019)		Entire world (116 Countries)	1984 – 2008 Multiple data sources: WHO data, The World Development Indicators, International Country Risk Guide, and UN Conference on Trade and Development	Continuous: GDP growth	Continuous: Mean BMI	OLS and dynamic panel estimation	Across different income level of countries, authors find that upper middle income countries experience a significant reduction in GDP growth as BMI increases. That is, 1% increase in population BMI decreases GDP growth by 11.5%. No effects were found on low- income, lower middle-income, and high-income countries.
34	Osmani, A. R., & Okunade, A. A. (2019)	Economic Modelling	USA	2008–2015 Medical Expenditure Panel Survey	Employment status, weekly work hours, hourly rate of pay and total number of missed workdays due to illness	Cancer survivor or not	Correlated random effects model	Male and female cancer types adversely affect short- and long- run employment prospects, and male- specific cancers increase weekly hours of work and decrease short- and long- run annual labor incomes. Moreover, gender-specific cancers increasingly limit long run family incomes and raise total health expenditures in the short- and intermediate- runs but not in the long-run.

35	White-Means, S. I., & Osmani, A. R.	Journal of Family and Economic Issues (2019)	USA	2008–2014 Medical Expenditure Panel Survey	Labor force participation and working hours	Self-reported cancer status	hurdle negative binomial model	Hispanic and Black breast cancer survivors were less likely to be employed by 4% and 7.5%, respectively, compared with Whites. Black prostate cancer survivors were 8% less likely to work than Whites. Once employed, Black and Hispanic breast cancer survivors worked an extra 4 and 6 h than Whites, while Hispanic prostate cancer survivors worked 5 fewer weekly hours than Whites.
36	Hamaaki, J & Noguchi, H.	Journal of International Economic Studies	Japan	2008–2010 Survey on Health and Retirement conducted by National Institute of Population and Social Security Research	Labor force participation and working hours	Number of illnesses/lifestyle disease/at least one of the three killer diseases in preceding three years	IV probit and recursive bivariate probit models	A deterioration in health increases the probability of not working and being retired and, moreover, tends to decrease individuals' average working hours per week. Compared with males under 60 years of age, the work status of males aged 60 or over is significantly more likely to be affected by having one additional illness and suffering from a lifestyle disease than that of under 60s.