

か、その実現可能性や効果の範囲・大きさ、費用対効果、さらには予期せぬ（悪）影響なども評価する必要がある。また対策を担う主体あるいは対象として、いろいろなものが想定できる。コミュニティレベル⁴⁶⁾で言えば、地域・職域・学校・NPO・中小企業などがあり、全国レベルで言えば大企業における雇用政策や商品開発、マーケティング戦略の影響は小さくない。例えば、後述するように、塩分の多くは加工食品由来になっており、製造段階で減塩すれば、それを口にする消費者は大きな努力をせずとも減塩が可能となる。さらには所得再分配や教育政策、貧困児童対策、労働政策などを国でないとできない政策群^{16),47)}など多様なものが想定できる。また、政策プロセスに関する研究も必要である⁴⁸⁾。

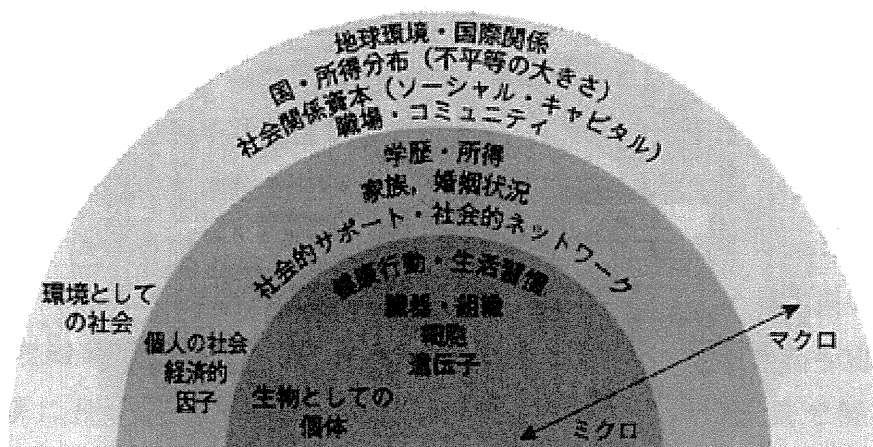
2) 研究対象・領域

健康の社会的決定要因は、個人レベル、コミュニティレベル、国レベルなど、重層構造を持っている（図3）²²⁾。またライフコースの影響も受ける。分析にあたっては、これらのマルチレベルの要因間の関係やライフコースの影響についても考慮する必要がある。

個人レベルには所得^{49),50)}や、相対的剥奪^{51),52)}、教育年数^{53),54)}、職業階層⁵⁵⁾⁻⁵⁸⁾、それらによって影響を受けると思われる選好、さらにソーシャル・ネットワークやソーシャル・サポートなどの人間関係⁵⁹⁾などと健康との関連は以前から報告されている。

コミュニティレベルで着目されているものとしてソーシャル・キャピタルがある^{34),60)-62)}。経済学では、当初、資本の性格を備えていないことなどが批判の対象となったが、開発経済学などでは、ソーシャル・キャピタルの重要性を裏付ける研究が報告されている。国内では、経済学、社会学、経営学、社会疫学など学際的なソーシャル・キャピタル研究として稲葉ら^{62),63)}と医療科学研究所の自主研究グループの研究がある³⁴⁾。健康との関連では地域レベルのソーシャル・キャピタルについてはJAGES（Japan Gerontological Evaluation Study、日本老年学的評価研究）プロジェクト⁶⁴⁾⁻⁶⁶⁾、島根大学^{67),68)}、上述した川上ら^{69),70)}、東京都長寿医療センターのグループ⁷¹⁾などが取り組んでいる。職域のソーシャル・キャピタルについては岡山大学のグループ^{72),73)}や藤野⁷⁴⁾ら、子ども

図3



については藤原ら^{75),76)}、自殺については本橋ら⁷⁷⁾が研究を発表している。ソーシャル・キャピタルを個人レベルの資源と捉える定義と、地域や集団の特性として捉える定義とがあるが³⁴⁾、総じて、個人レベルのソーシャル・キャピタルとの関連はほぼ安定して見られるが、地域レベルのそれについては関連が見られなかったとするものもあり、今後さらに研究の蓄積が必要である⁷⁸⁾。

次に、Gini 係数などで評価される所得分配の不平等が大きい国や県^{79),80)}、旧村⁸¹⁾ほど、主観的健康感や幸福度が低い者が多いとする報告が増えているが、関連が見られなかったとする報告もある⁸²⁾。集計単位とする地域の大きさ（県、市町村、近隣など）の違い、あるいは悪影響がでる閾値の存在などが、知見のバラツキを説明するという仮説がある。この閾値仮説を裏付けるように、Gini 係数が大きな国での研究で、死亡率が高いことがメタアナリシスで示されている⁸³⁾。その機序として、まわりと比べることによる心理社会的なストレスがあるとの仮説があり、それを支持するように客観的（絶対的な）所得水準は同等でも、まわりの者よりも（相対）所得が低い状態に置かれた者で要介護認定を受ける確率が高かったとの報告がある⁸⁴⁾。

ライフコースの影響を裏付ける報告も増えており、数十年という時間軸を考慮する必要もある^{85),86)}。日本の高齢者においても、15 歳児の経済的な状態を 5 段階で自己評価してもらい、3 群に分けて比較した結果、低い層ほど、高齢期の活動能力指標の低下者が多かった。また、興味深いことに太平洋戦争当時 5-9 歳であった世代でのみ、栄養状態が良かったと推定される身長が高い者では活動能力指標の低下が少なかったという報告がある⁸⁷⁾。また日本の高齢者約 2.3 万人に最長職を尋ね、高齢期の残歯数など口腔の健康状態と保健行動との関連を調べたところ、農林漁業や販

売職などで、歯間清掃具未使用など保健行動を取っていない者や残歯数が少ない者などが最大で 2 割多いという結果が得られている⁸⁸⁾。

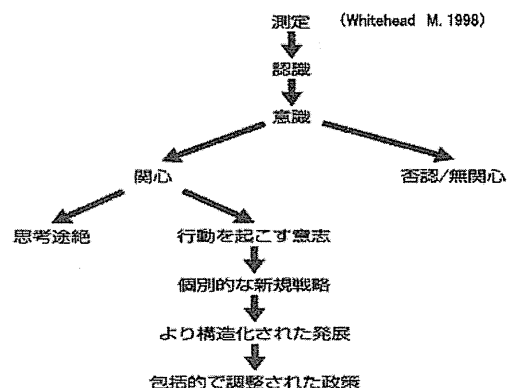
つまり医療にかかる前にすでに健康を損なう要因が蓄積されている。低所得層が窓口費用負担を理由に医療受診を控えているアクセスも問題であるが、かつてフェックスが指摘し、アチェソン報告でも確認されたように、NHS（National Health Service, 国民保健サービス）など受診時原則無料にして医療へのアクセスを改善してもそれだけでは健康格差はなくなるのである。

4. 健康格差の縮小に向けた対策の国内外の動向

Whitehead⁸⁹⁾は、多くの国々の対応をもとに、健康格差対策の発展段階について下図のようなモデルを示している。

これに当てはめてみると、2000 年代までに日本における健康格差の「測定」がなされ「認識」されるようになった、まずは一部の研究者の間などで「意識」され、学会のシンポジウムや書籍などを通じて「関心」を持つ層が広がった。日本学術会議や日本公衆衛生学会の委員会の提言がださ

健康の不平等に対する様々な行動



れるようになり、厚生労働省も健康日本 21（第 2 次）で「健康格差の縮小」をめざすことを明示するなど「行動を起こす意志」を表明した。

今後も、因果関係の解明など科学的なエビデンスの蓄積は必要だが、エビデンスは政策形成に必要なものの一つに過ぎない。「個別的な新規戦略」や「より構造化された発展」のためには、緻密な分析とは異なる種類の開発的な研究や政策化の努力が必要である。そのようなものとして国内外でどのような動きがあるのかを見ておこう。

1) 海外における動向

(1) 海外における「見える化」と政策マネジメントに関わる動向

WHO「健康の社会的決定要因に関する委員会」の最終報告書（2008）¹⁸⁾で、3つの勧告が示された。第1は、保健医療政策だけでなく子供の頃からの日常生活に関わる諸条件の改善を図ること。第2に、権力、金銭、資源の不公正な分布を是正すること。第3の勧告は、健康格差を測定し、より深く理解し、政策の健康へのインパクトを評価する Health Impact Assessment (HIA)^{90),91)}に取り組むことである。

WHOは、第3の勧告にあたる健康格差の評価と対応のためのツールとして Urban HEART (Urban Health Equity Assessment and Response Tool, 都市における健康の公平性評価・対応ツール)⁹²⁾を2010までに開発した。これは、健康格差対策に取り組むチーム形成に始まり、評価指標を定め、データを収集し、健康格差の実態を「見える化」し、優先課題を決め、対応を特定する、という一連の流れを支援するマネジメント・ツールとして開発された。イギリスでも同様な取り組みがされ⁹³⁾、10年間の取り組みを評価し^{94),95)}、明らかになった課題に対する対応策を検討するマネジメントが行われてきた。

米国でも、1990に始まった Healthy people

2000の頃から、健康指標の人種間、社会経済的階層間の比較データを公表してきた⁹⁶⁾。2011年と2013年には疾病対策予防センター (Centers for Disease Control and Prevention, CDC) が健康格差に特化した「健康格差と不平等報告 (CDC Health Disparities and Inequalities Report, CHDIR)⁹⁷⁾を発表している。そこには、健康の社会的決定要因 (教育や所得、健康に良い食料品店へのアクセス、失業率)、労災事故 (死) など環境上の危険 (hazard)、医療や予防サービスへのアクセス (医療保険加入率や大腸がん検診受診率、インフルエンザワクチンの接種率)、健康行動 (10代の妊娠、大量飲酒、喫煙)、各種疾患の有病率と死亡率などが187ページにまとめられている。変化が見られなかったり、むしろ差が拡大したりしている指標もある一方で、例えば、平均寿命の推移をみると、1999年には、白人77.3歳に対し黒人では71.4歳と5.9歳短く、白人の92.4%だったが、2008年までの10年間で、白人78.5歳に対し黒人で74.0歳と、その差は4.5歳まで縮小し、白人の94.3%にまで格差が縮小してきていることがわかる⁹⁸⁾。

(2) 環境に着目した介入政策の動向

従来なら健康政策は保健・医療政策を所轄する省庁の政策を通じて行うのが常識であった。しかし、それだけでは健康格差はなくなる。

そこで政策介入の面では、保健・医療政策担当省の枠を超えるような、環境や集団に介入する新しい試みが行われている。例えば、ジャンクフードやソフトドリンクによる脂肪やカロリーの過剰摂取、問題飲酒、喫煙などが低所得層に多いことに着目して、脂肪税やソフトドリンク税、アルコールやタバコの最低価格引き上げなどが検討され、一部では実際に導入された。その背景には、低所得層ほど課税による価格引き上げに敏感に反応することがある。

食塩についても、摂取経路を分析してみると、加工食品由来のものが多いことがわかり、加工食品業者を巻き込んだ減塩政策をイギリスは2003年に導入した⁹⁹⁾。

またニューヨークでは、低所得層が多い地域には生鮮食料品を扱う店自体が少ないことが明らかになり、小売業への補助金も使って健康に良い食料品を手に入れやすくしたり、自ずと歩行量が増えるようなまちの作り方、子ども達がファストフード店にアクセスしにくくなるように学校周辺への出店規制など建造環境 (built environment) に着目した取り組みも進められている。

(3) 政策インパクト評価の事例

このような政策介入には、企業や社会からの反発も大きいため、そのインパクトについて、経済的な側面も含めた評価が盛んに行われている。

例えば、イギリスでは減塩政策の効果が認めら

れ、その経済評価も相次いで報告されている¹⁰⁰⁾⁻¹⁰²⁾。ソフトドリンク税についても英国で20%課税した場合に、どれくらいの効果が、どの所得層に見られる可能性があるのかを検討し、肥満が18万人、過体重の人が28.5万人減少すると推計されるが、所得水準による有意差は認められないという研究などが報告されている¹⁰³⁾。酒類の最低価格を引き上げる制度が導入された場合のシミュレーション研究なども見られる¹⁰⁴⁾。

2) 日本における動向

我が国でも、「健康日本21 (第2次)」の開始前後から、十分とは言いがたい「個別的な新規戦略」段階だが、新しい動きが出てきている。

(1) 「見える化」を巡る動き

民主党への政権交代後に、貧困率が公表されるようになった。また栄養調査などの分析結果でも社会経済階層間の比較がされるようになり、低所

地域診断支援のための「見える化」システム



- ✓ 指標は「前期高齢者」「後期高齢者」「高齢者全体」の中から、いずれかを選択します。
- ✓ 評価したい指標が、他の参加市町村や小地域と比較して、どれ位多い(少ない)のか、相対的位置もわかります。

得層に喫煙や肥満が多いことが政府統計でも公表されるようになった。

厚生労働科学研究費補助金による複数の研究班（研究代表者：尾島俊之、近藤克則）も組織され、WHO 神戸センターとの協同で、Urban HEART の枠組みも参考にした JAGES HEART（前頁図）がインターネット上で公表されている^{105),106)}。これにより、市町村間に多くの指標で2倍以上の地域間較差があることが容易に把握できるようになった。市町村がこれを用いて、課題を抱えた地域への介入を始めた例も生まれ始めている¹⁰⁷⁾。

地域毎の実情に応じた地域包括ケアシステムを構築する上でも、地域の実情が見えることは有用として、厚生労働省も介護・医療関連情報の「見える化」を2013年度には試行を、2014年度から3ヵ年計画で本格的な開発に着手している。

健康インパクト評価（Health Impact Assessment）については、日本公衆衛生学会の委員会がガイドンスを公表³¹⁾している。

（2）新しい政策の動き

健康格差の縮小をめざした取り組みとして位置づけられているわけではないが、厚生労働省以外の省庁による政策でも、健康格差の縮小につながるものが期待できる政策がいくつか出てきている。例えば、内閣府が所轄する「自殺対策基本法」や「子どもの貧困対策の推進に関する法律」（平成26年施行）、国土交通省の「健康・医療福祉のためのまちづくり推進ガイドライン」の策定などである。

5. 今後の課題

既に国の政策課題に載ったにもかかわらず、「健康格差の縮小」や健康の社会的決定要因に関する研究は、他の先進諸国に比べると日本では遅れており、残されている課題は多い。その中には、

医療経済学（者）に関わり合いが大きい課題と、より普遍的な政策研究に関わるものがある。

1) 医療経済学（者）に期待される課題

フュックスが「医療経済学の将来」^{6),108)}という章で、医療経済学（者）が持つ二つの強みをあげている。それは、体系的理論の枠組み（概念と研究上の問い）を持っていること、および、不完全なデータから推論を行う統計学的手法を持っていることである。この二つが、健康格差や健康の社会的決定要因の研究においても有用なことは、この領域の研究が、すでに多くの経済学者の手で行われていることから明らかである。

第1に、健康の社会的決定要因の研究にはGini係数などによる所得の不平等や貧困、非正規雇用、選好など、経済学で発展し膨大な蓄積のある概念や測定法が良く登場する。

第2に、複数ある健康格差の対策の中から、いずれかを選択して、その効果だけでなく、費用対効果や効率、公平・公正（equity）の視点から評価をする必要があるが、このような研究上の問いは、少なくとも生物医学的な問いではない。経済学的な枠組みを必要としている。

第3に、健康の社会的決定要因と健康は相互に複雑に絡み合っており（経済学者の言う「内生性」があり）、計量経済学的手法は、厳密な意味での因果関係や政策評価をする上で有用である。例えば、操作変数（Instrumental variable）法を用いて、介入群とコントロール群の背景要因の違いを考慮して効果を検証した分析¹⁰⁹⁾などの例が出てきている。行動経済学的な実験手法を用いてソーシャル・キャピタルを測定する試みも始まっている。

一方、フュックスが、医療経済学者の弱点（と同時に他から学ぶべきこと）としてあげているものもある^{6),108)}。質の高いデータを実験や調査を通じて自ら集めてこなかったこと、制度や歴史、使

用言語への注意をあまり払わないことである。

健康格差対策でも今後は政策介入やコミュニティへの介入をした評価研究が求められるが、それが期待された成果をあげた場合には、費用対効果の検証などが求められる。そのために必要な社会的費用を含む費用データは、事後的でなく、介入前から収集されることが望ましい。そのような研究デザインやデータ収集の段階から、一緒に取り組む経済学者が求められている。

2) 政策研究としての課題

政策は、単純で、短期に成果が上がり、利害関係者が明確でかつ少ない時にまとまりやすく、動きが生まれやすい。

これに対し、健康の社会的決定要因に着目して健康格差の縮小を図る政策は、Exworthy⁴⁸⁾が指摘しているように、逆の性格を持っており、その形成や実現には多くの困難が予想される(表)。

まず、健康の社会的決定要因は、多くの原因が

多面的に関わっているので、政策として形成するのも達成も困難である。

またライフコースの影響があると言うことは、効果がある政策がとられても、そのライフコースに渡り累積された成果を確認するには30年はかかるだろう。これがWHOの委員会報告書のタイトルに「一世代かけて」とあるゆえんである。しかし、政策も研究(費)も数年間で成果が上がらなければ、継続が困難になることが珍しくない。

対策には多くのセクターが関わるが、パートナーシップは問題を抱えやすい。政治家は他にも課題を多く抱えており、そちらの方が「単純で、短期間に成果が上がり、利害関係者が明確で・・・」あれば、健康格差よりも優先される可能性は高い。さらに因果の特定や妥当性のあるプロセス指標の開発、データをルチーンに集める仕組みづくりも必要であるが、いずれも簡単ではない。利害関係者が多いという特徴も、政策形成や実施に有利な

表

SDHの特徴と政策形成への影響

Exworthy 2008

SDHの特徴	政策形成への影響
多くの原因を伴う多面的な現象	調整された戦略は達成が困難
ライフコースに渡る視点	長期的なアプローチは政策のタイムテーブルにはそぐわない
セクター間の協同やパートナーシップ	パートナーシップは問題を抱えやすい
他の優先事項による支配	SDHはしばしば無視される
原因と効果の関連が複雑、帰属させることが困難	帰属問題は政策を阻害、プロセス指標への信頼
データ	質が高く、タイムリーで利用可能なルチーンデータはしばしば欠如
グローバリゼーションと地方分権	政府の動きを阻む多様なレベルの多くの利害関係者を政策形成に巻き込む

<http://heapol.oxfordjournals.org/content/23/5/318.full.pdf>

条件とは言いがたい。

これら多くの課題を乗り越えるには困難が予想されるが、前例はある。1930年代の大恐慌やアジア通貨危機、リーマンショック後の不況などに、自殺をはじめアルコールやストレス関連死が増えた国があった一方で、不況下であるにもかかわらず自殺率が減り続け、死亡率の上昇抑制に成功した国々が実際にある¹¹⁰⁾。それらの国々では、経済政策から失業対策、成人教育から予防接種まで、多くの利害関係者や他部局が関わる多くの政策が組み合わされてきた¹¹⁰⁾。政策形成に関わる(経済・政策学者にとどまらない)学識経験者の間で、これらについての学術基盤や認識を共有していくことも課題である。

おわりに

健康格差とその背景にある「健康の社会的決定要因」をテーマに取り上げ、いくつかの面から論じてきた。第1に、医療経済学の枠組みの中で、このテーマは重要なものの一つとして位置づけることができる。第2に、保健医療政策における課題としてそれが浮上してきた経過と背景として、海外での取り組みという外的要因だけでなく、我が国における「健康日本21」の最終評価や社会経済環境の変化という内発的な要因、健康教育の長期効果における限界などが指摘されていることなどを紹介した。第3に、健康の社会的決定要因に関わる研究課題・対象の枠組みには、実態、メカニズム、対策という軸と個人・コミュニティ・国などマルチレベルな重層性があり、さらにはライフコースという時間軸も考慮した立体的な枠組みが必要である。その主要な課題や対象について、我が国でも研究の蓄積が進んできていることを概観した。今後、いっそうの努力が必要とされているのが、4番目に検討した健康格差の縮小に向け

た対策である。海外では、10年以上の時間をかけて、総合的な対策へと発展させてきたこと、その中で多くの経済学(者)による貢献があったことを紹介した。我が国でも取り組みは始まっているが、まだまだやるべきことは多い。最後に、今後の課題として、医療経済学(者)への期待として、経済学が蓄積してきた概念や測定法、評価分析の枠組み、そして計量経済学的な分析手法をあげた。それ以外にも、政策研究としての課題は多いが、乗り越えた前例はあることも述べた。

以上を踏まえて、はじめに紹介した、私に投げかけられた3つの質問に答えておこう。1つ目の「健康格差をなくすのをめざすことには無理がある」は、論点のすり替えである。めざしているのは格差の解消でなく縮小である。2つ目「日本は他国に比べ健康格差は小さいのではないか」については、今までは他の国に比べればそうだったかもしれない。一つの日安として、一票の格差は2倍を超えれば違憲状態との最高裁判所の判断がある。自記式調査データでは、この水準を下回っていたが、行政データを用いると現状でも、死亡率で3倍の格差があったと言う報告がある。私がどちらか一つを選べと言われたら、一票よりは、いのちが欲しい。この3倍の「いのちの格差」を人権上許される「小さな格差」と考えて良いのだろうか。また貧困児童や非正規雇用が増えている。今から対策を打たなければ、健康格差は将来拡大する恐れは高い。3つ目「健康格差の縮小の理念は立派だが、現実的にできることはあるのか」については、国内外の動向を紹介した。また日本は世界一の長寿国であり、今まで諸外国に比べ健康格差が小さかったのであれば、日本社会の中にこそ、そのヒントがある。それを明らかにするのも研究者の役割だろう。

小論が「健康格差の縮小」に向けた「医療経済・医療政策研究の発展を図り、医療政策立案及び評

価に学術的基盤を与える」ことに寄与することを願う。

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Social Determinants of health in Health Economics and Policy

Katsunori Kondo*

Abstract

"Reducing health disparity" was a basic goal of the Ministry of Health, Labor and Welfare's public notice "Basic Plans to Comprehensively Promote Citizen's Health" (Health Japan 21 (2nd edition)). These plans are based on the re-recognition of the importance of social determinants of health (SDH). This paper discusses health disparities and the SDH behind them from various perspectives related to Health Economics and Policy.

First, SDH are identified as an important research field in the Health Economics and Policy framework. Second, the reasons behind the identification of SDH as an issue in the health policy are discussed. These are the limitations of the long-term effects of health education, changes in socio-economic environments, and the final evaluations of "Health Japan 21 (1st edition)" for internal and external reasons that include the fact that initiatives on SDH have been pursued in other countries.

Third, the framework for studying issues and topics in SDH research require a three-dimensional framework including a multilayered perspective that involves individuals, communities, national governments, an axis of mechanism and countermeasure, and a life-course approach. A general outline of the studies accumulated in Japan regarding these main issues and topics is provided in this paper. Fourth, it is necessary to take countermeasures for reducing health disparities that will require considerable effort in the future. This paper introduces how other countries have spent more than 10 years developing comprehensive policies and describes the contributions of economics. Our country has started addressing these issues, but there remains much to accomplish.

Concluding discussions are issues for the future and expectations for Health Economics and Policy including concepts and methods of measurement developed through economics, analytical frameworks, and econometric analytical methods. Furthermore, a few examples of how to overcome issues related to policy science are presented.

As described above, this paper reveals that it is possible to reduce health disparity. Moreover, if we fail to take immediate action, health disparity is expected to worsen due to growing poverty and unstable employment; however, we can undertake measures to reduce it.

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Social Participation and the Prevention of Functional Disability in Older Japanese: The JAGES Cohort Study

Satoru Kanamori^{1,2*}, Yuko Kai³, Jun Aida⁴, Katsunori Kondo^{5,6}, Ichiro Kawachi⁷, Hiroshi Hirai⁸, Kokoro Shirai⁹, Yoshiki Ishikawa¹⁰, Kayo Suzuki¹¹ and The JAGES Group[†]

1 Tokyo Medical University, Department of Preventive Medicine and Public Health, Tokyo, Japan, **2** Human Resource Management Department, ITOCHU Techno-Solutions Corporation, Tokyo, Japan, **3** Physical Fitness Research Institute, Meiji Yasuda Life Foundation of Health and Welfare, Tokyo, Japan, **4** Department of International and Community Oral Health, Tohoku University Graduate School of Dentistry, Miyagi, Japan, **5** Center for Preventive Medical Science, Chiba University, Chiba, Japan, **6** Center for Well-being and Society, Nihon Fukushi University, Aichi, Japan, **7** Department of Social and Behavioral Sciences, Harvard School of Public Health, Boston, Massachusetts, United States of America, **8** Faculty of Engineering, Department of Civil and Environmental Engineering, Iwate University, Iwate, Japan, **9** Department of Human Sciences, School of Law and Letters, University of the Ryukyus, Okinawa, Japan, **10** Department of Health and Social Behavior, School of Public Health, The University of Tokyo, Tokyo, Japan, **11** Department of Social Policies, Aichi Gakuin University, Aichi, Japan

Abstract

Background: We examined the relationship between incident functional disability and social participation from the perspective of number of types of organizations participated in and type of social participation in a prospective cohort study.

Method: The study was based on the Aichi Gerontological Evaluation Study (AGES) Cohort Study data. We followed 13,310 individuals aged 65 years or older for 4 years. Analysis was carried out on 12,951 subjects, excluding 359 people whose information on age or sex was missing. Social participation was categorized into 8 types.

Results: Compared to those that did not participate in any organizations, the hazard ratio (HR) was 0.83 (95% CI: 0.73–0.95) for participation in one, 0.72 (0.61–0.85) for participation in two, and 0.57 (0.46–0.70) for participation in three or more different types of organizations. In multivariable adjusted models, participation in the following types of organization was protective for incident disability: local community organizations (HR=0.85, 95% CI: 0.76–0.96), hobby organizations (HR=0.75, 95% CI: 0.64–0.87), and sports organizations (HR=0.64, 95% CI: 0.54–0.81).

Conclusion: Social participation may decrease the risk of incident functional disability in older people in Japan. This effect may be strengthened by participation in a variety of different types of organizations. Participating in a local community, hobby, or sports group or organization may be especially effective for decreasing the risk of disability.

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* E-mail: satoru_kanamori@hotmail.com

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Background

Determining factors for preventing incident functional disability is a critical goal for societies confronting in rapid population aging, including Japan. Social relationships have been suggested as one factor that helps lower the risk of functional disability, [1]. Conversely, poor social relationships have been shown by meta-analysis to raise mortality risk, [2]. Social relationships encompass social network ties, the exchange of social support, as well as social participation, i.e. participation in civic groups that an individual can join, regardless of occupation or family situation. Promoting

social participation is one of the key proposals of 'Active Aging' (the World Health Organization's policy framework), [3].

Previous studies have suggested that social participation may lower the risk of all-cause mortality, [4]–[8], cardiovascular mortality, [7], all circulatory system disease mortality, [8], non-cancer and non-circulatory system disease mortality, [8], acute myocardial infarction, [9], incident disability, [10], [11], motor decline, [12], cognitive decline, [7], [13], and depressive symptoms, [14], [15]. Social participation may thus be health promoting across a wide range of outcomes. When creating policies for promoting social participation, it is necessary to determine what forms of participation are effective. However,

most of the above studies only examined broad social participation in any sort of organization or they lumped participation in various types of organizations together, and very few were able to look at the relationships with intensity of involvement or types of organizations.

Studies that did examine the effects of participation according to different types of organizations showed that participation in multiple organizations may have a protective effect on depression, [15], well-being, [16] and oral health status, [17]. In addition, people who maintain a role in social organizations (e.g. secretary, treasurer, etc) experience a lower risk of depression, [18]. It is possible that participation in a diversity of organizations increases the number of roles, thereby reducing the risk of incident functional disability, but this theory has yet to be examined.

One study was conducted on participation in a sports organization to examine the effect on risk of incident functional disability, [19]. Those that participated in a sports organization were less likely to require long-term care than those who exercised individually (i.e. on their own), even if they did so once a week or more. Moreover, as long as they participated in a sports organization, the frequency of exercise appeared to make little difference to the risk of incident disability. In other words, the mere act of social participation appeared to capture most of the health benefits.

However, other studies examining the effects of participation in civic organizations on all-cause mortality, [4], [5], cognitive function, [5], and oral health status, [17] have not always shown a reduction in risk with participation. This suggests that the relationship between incident functional disability and social participation may vary depending on the type of organization, a possibility that has yet to be studied.

To our knowledge, no studies have been conducted on the relationship between incident functional disability in older individuals and participation in organizations by type of organization or number of types of organizations. Clarifying whether or not participation in a diversity of groups reduces the risk of incident functional disability for example, can provide important hints for health promotion. For example, should health promotion agencies encourage participation in any and all types of organizations, or particular types? We therefore set out to examine the relationship between incident functional disability and social participation from the perspective of number of types of organizations and type of social participation in a prospective cohort study.

Methods

Study sample

The present study is based on the Aichi Gerontological Evaluation Study (AGES) Cohort Study data, [20], [21]. AGES is a part of Japan Gerontological Evaluation Study (JAGES). This study involves investigating factors associated with incident functional disability among non-institutionalized individuals aged 65 years and older. The region studied covers 6 municipalities in the Chita Peninsula of Aichi Prefecture, Japan (Handa city, Tokoname city, Agui town, Taketoyo town, Minamichita town and Mihama town). In October 2003, self-reported questionnaires were mailed to 29,374 community-dwelling individuals aged 65 years and older who were not eligible to receive benefits from public long-term care insurance (LTCI) services. The survey was conducted using a random sampling method stratified by region, age, and sex in the 2 larger municipalities (Handa city and Tokoname city) and a complete census (complete enumeration) of the 4 smaller municipalities (Agui town, Mihama town, Minami-

Chita town, and Taketoyo town). For Handa and Tokoname city, we obtained a list of randomly selected eligible residents from the each municipal administration. Random sampling was stratified by three variables: by school district as a regional variable, by five-year age block (with 95 and older as the final block) and by sex. The official residential registries were maintained by the municipal administrations, and the Japanese registries included information such as age and sex. Questionnaires were sent to 5,000 people each in Handa city and Tokoname city and to all eligible people in the other municipalities (total questionnaires mailed = 28,152; men 45.8%). Response rates were as follows: Handa city 55.5%, Tokoname city 52.4%, Agui town 55.6%, Mihama town 49.8%, Minami-Chita town 51.1% and Taketoyo town 51.4%. Of those, 13,310 individuals (6,508 men; 6,802 women) agreed to participate, and thus formed the baseline of the AGES Cohort. They were followed for a 4-year period starting in November 2003 (observation period: November 2003 to October 2007). Analysis was carried out on 12,951 subjects, excluding 359 people whose information on age or sex was missing. The subjects that were excluded were those whose response on age in the questionnaire was 4 or more years off from the age recorded in the LTCI database maintained by the municipalities or whose response on sex in the questionnaire was different from that in the database, possibly because a family member or other person had completed the questionnaire on the subject's behalf. For analysis, the age and sex recorded in the LTCI database maintained by the municipalities were used. Subjects consisted of 6,320 men (48.8%) and 6,631 women (51.2%), with a mean age of 72.7 ± 5.9 years.

Incident functional disability

Incident functional disability was defined based on medical certification. Certification of disability is based on formal evaluation of the need for long-term care according to uniform criteria applied throughout Japan and based on both a home-visit interview as well as a written opinion from a primary physician, [22]. We obtained information on certification of needed long-term care, death, and moving out of the study area from the long-term care insurance database maintained by the municipalities.

Social participation

For the purposes of this study, social participation was classified into eight types: neighborhood associations/senior citizen clubs/fire-fighting teams (local community), hobby groups (hobby), sports groups or clubs (sports), political organizations or groups (politics), industrial or trade associations (industry), religious organizations or groups (religion), volunteer groups (volunteer), and citizen or consumer groups (citizen). Subjects were given a choice between 'currently participate' or 'do not participate' for each type of organization. The total number of types of organizations in which each subject participated was tallied and participation was categorized as 0 (no participation), 1, 2 or ≥ 3 organizations or missing. No response for even one organization was deemed as missing. The 8 types of organizations were chosen on the basis of those used in the Japan General Social Survey (JGSS), [23], but the AGES Cohort Study added local community organizations as a type of local community organization, [20]. Organizations that are especially characteristic of Japan among the above types are senior citizen clubs and religious organizations. Japanese senior citizen clubs conduct wide-ranging activities, including group activities, such as sports, hobbies, cultural activities and performing arts, [20]. These clubs have conducted their activities in cooperation with local government welfare departments and/or similar public agencies. The majority of Japanese religious organizations are Shinto (39.3%) or Buddhist

(38.6%). Other religious organizations include Christian and other faith communities (22.1%).

Covariates

Based on previous studies, [19], age, sex, annual equivalized income, educational attainment, marital status, occupational status and self-reported medical conditions were used as covariates that may correlate with social participation and incident functional disability. Since behavioral, psychosocial, and physiological pathways may be potential mechanisms for social participation to influence health, [24], these factors were used to test which aspect of social participation accounts for the prevention of incident functional disability. Smoking, alcohol consumption, walking time, and frequency of going outdoors were used as behavioral factors. Depression (Geriatric Depression Scale: GDS), [25], emotional support, instrumental support and frequency of meeting friends were used as psychosocial factors. IADL, [26] was used as a physiological factor. All variables were set as dummy variables. A “missing” category was used in analysis to account for missing values in response to questions.

Statistical analysis

Cox proportional hazards model was used to calculate the hazard ratio (HR) of incident functional disability over 4 years. Respondents who were lost to follow-up by moving or who died without incident functional disability were censored. In each model, non-participation in a organization was set as the referent category. Regression analysis was performed with simultaneous forced entry of age, sex, annual equivalized income, educational attainment, marital status, occupational status, and self-reported medical conditions as covariates (Model 1). In addition, participation in all 8 organizations was added only for “type of social participation.”

To test which aspect of social participation accounted for the prevention of incident functional disability, we added behavioral, psychosocial, or physiological factors sequentially to each model from Model 2 to Model 4 and inspected the change in the HR estimate associated with social participation. In Model 2, smoking, alcohol consumption, walking time, and frequency of going outdoors were added to the variables in Model 1. In Model 3, depression, emotional support, instrumental support, and frequency of meeting friends were added to the variables in Model 1. In Model 4, IADL was added to the variables in Model 1. We added all three classes of mediators in the final Model 5.

SPSS 21.0J was used for statistical analysis with a significance level of 5%.

Ethical approval for the study was obtained from the Nihon Fukushi University Ethics Committee.

Results

Baseline characteristics are shown in Table 1. Younger ages and males tend to participate in more organizations. For type of social participation, over half of all respondents participated in a local community organization. The next commonest form of participation was in hobby groups, followed by sports organizations. The age of participants was lower than the mean for all respondents (72.7 years) for most types of organizations, except for local community and religion organizations. The ratio of men to women was roughly fifty-fifty for most types of organizations, but was over 70% for industry and politics organizations. The “missing” category was characterized by a higher mean age and smaller male-to-female ratio than the other categories.

Of the 12,951 respondents analyzed, 1,009 died, 1,528 became eligible for long-term care (i.e. became functionally disabled, according to our definition), and 140 moved out of the study area during the four year follow-up period. The incident rates of functional disability found by dividing the number of new cases by the number of follow-up years are shown in Table 2. The incident rate of functional disability decreased as the number of types of organizations increased, and was smallest for sports organizations, followed by volunteer, then hobby organizations.

The results of Cox proportional-hazards model analysis of social participation and incident functional disability are shown in Table 3. In the crude model, participation was strongly protective of incident disability. Moreover, a “dose-response” relationship was seen, with progressively lower HRs as the number of different types of organizations increased. Regarding type of social participation, religion organizations was associated with an increased risk of disability without any covariate adjustment. In Model 1, where the data was adjusted for age, sex, annual equivalized income, educational attainment, marital status, occupational status, self-reported medical conditions, and participation in all 8 organizations (only for “type of social participation”), the hazard ratios became statistically significant for one or more different types of organizations HRs, and local community, hobby, and sports organizations HRs. Trend analysis of the data set omitting the missing categories for number of types of organizations yielded a *p* for liner trend of <0.01.

In sub-analysis, we sought to check for the possibility of reverse causation (i.e. the possibility that people who were feeling unwell selectively participated). We did this by excluding the 366 subjects who became certified for long-term care within the first year of follow-up. The HRs in this sensitivity analysis were 0.86 (0.73–1.00) for participation in one, 0.74 (0.60–0.89) for participation in two, and 0.53 (0.42–0.68) for participation in three or more different types of organizations, with the significant difference disappearing only for participation in one type of organization. In addition, the HR for participation in a local community organization was 0.84 (0.73–0.96), in a hobby organization was 0.76 (0.63–0.90) and in a sports organization was 0.72 (0.57–0.90).

We also stratified the HRs by gender. For men, the HRs were 0.84 (0.67–1.05) for participation in one, 0.80 (0.62–1.04) for participation in two, and 0.66 (0.50–0.87) for participation in three or more different types of organizations. The HR for participation in a local community organization was 0.87 (0.72–1.05), in a hobby organization was 0.74 (0.58–0.94) and in a sports organization was 0.64 (0.48–0.85). For women, the HRs were 0.85 (0.71–1.01) for participation in one, 0.67 (0.52–0.83) for participation in two, and 0.50 (0.37–0.68) for participation in three or more different types of organizations. The HR for participation in a local community organization was 0.86 (0.74–1.01), in a hobby organization was 0.73 (0.60–0.90) and in a sports organization was 0.66 (0.49–0.88). No significant differences were seen in either men or women in any other types of participation in organizations.

Next, to test which aspect of social participation accounts for the prevention of incident functional disability, we added behavioral, psychosocial, or physiological factors to each model from Model 2 to Model 4. For each model, the HRs for types of participation that were significantly different in Model 1 tended towards 1.00. In Model 5 adjusted for these behavioral, psychosocial, or physiological factors, there were no differences between non-participation and participation in one or two types of organizations or in a local community organization.

Table 1. Baseline characteristics.

	N	%	Age	Men (%)
Total	12,951	100.0	72.7±5.9	48.8
Equivalized income				
Low	4,291	33.1	72.2±5.7	50.9
Middle	4,708	36.4	71.9±5.6	57.7
High	1,218	9.4	72.7±6.2	53.0
Missing	2,734	21.1	74.5±6.1	28.3
Educational attainment				
< 6 yrs	541	4.2	78.7±6.8	26.2
6–9 yrs	6,810	52.6	72.5±5.8	47.2
10–12 yrs	3,623	28.0	72.1±5.5	47.1
≥ 13 yrs	1,194	9.2	71.5±5.6	72.6
Missing	783	6.0	73.8±6.1	49.7
Marital status				
Married	8,659	66.9	71.5±5.1	60.8
Single	3,462	26.7	75.4±6.6	18.9
Missing	830	6.4	73.6±6.0	48.4
Occupational status				
Employed	3,198	24.7	70.3±4.8	63.6
Not employed	9,493	73.3	73.4±6.0	44.0
Missing	260	2.0	73.8±6.3	41.5
Self-reported medical conditions				
No illness or disability	2,155	16.6	71.0±5.6	52.3
Illness or disability that does not require treatment	1,249	9.6	72.2±5.9	57.6
Decided to discontinue treatment	826	6.4	72.5±5.9	47.3
In treatment	8,081	62.4	73.1±5.8	47.6
Missing	640	4.9	73.8±6.3	37.3
Smoking				
Never smoked	7,602	58.7	72.9±6.1	21.9
Past smoker	3,169	24.5	72.5±5.5	93.1
Current smoker	1,619	12.5	71.6±5.4	91.2
Missing	561	4.3	73.8±5.4	41.2
Alcohol consumption				
Non-drinker	8,340	64.4	73.3±6.1	31.8
Non-daily drinker	1,710	13.2	71.3±5.3	66.5
Daily drinker	2,640	20.4	71.3±5.1	92.1
Missing	261	2.0	75.1±6.5	39.1
Walking time (per day)				
< 30 min	4,191	32.4	73.1±6.0	49.1
30–60 min	4,222	32.6	72.5±5.8	51.5
60–90 min	1,616	12.5	72.5±5.7	54.5
> 90 min	1,529	11.8	71.8±5.9	50.1
Missing	1,393	10.8	73.0±6.2	31.6
Frequency of going outdoors				
Almost daily	5,760	44.5	71.6±5.4	49.5
2–3 times/week	4,033	31.1	73.0±5.8	46.1
About once/week	2,244	17.3	73.8±6.2	50.0
Rarely	417	3.2	75.9±7.5	57.1
Missing	497	3.8	74.1±6.4	50.1
Depression				

Table 1. Cont.

		N	%	Age	Men (%)
No depression		7,325	56.6	72.1±5.7	52.0
Depressive tendency		2,410	18.6	73.0±6.0	48.3
Depression		718	5.5	72.9±6.0	49.0
Missing		2,498	19.3	73.9±6.2	39.8
Emotional support					
Available		10,966	84.7	72.5±5.8	46.6
Not available		1,263	9.8	73.2±6.0	67.8
Missing		722	5.6	74.5±6.2	48.5
Instrumental support					
Available		11,630	89.8	72.6±5.9	49.9
Not available		726	5.6	72.4±5.5	34.2
Missing		595	4.6	73.7±5.8	45.7
Frequency of meeting friends					
Almost daily		2,434	18.8	72.6±5.6	39.2
2–3 times/week		3,198	24.7	72.3±5.6	40.9
About once/week		1,946	15.0	72.3±5.7	47.9
1–2 times/month		1,822	14.1	72.3±5.8	56.6
A few times a year or less		3,159	24.4	73.2±6.3	61.2
Missing		392	3.0	74.7±6.7	41.3
IADL					
High		5,378	41.5	71.5±5.0	45.3
Middle		2,633	20.3	72.0±5.5	53.9
Low		3,897	30.1	74.9±6.7	52.4
Missing		1,043	8.1	75.0±6.2	40.4
Number of types of organizations					
0		3,190	24.6	72.7±6.2	48.2
1		3,184	24.6	72.9±6.0	48.5
2		2,135	16.5	72.1±5.5	52.0
≥3		2,102	16.2	71.1±5.0	54.9
missing		2,340	18.1	74.1±6.2	41.7
Type of social participation					
Local community	participation	6,851	52.9	72.8±5.7	48.9
	non-participation	4,948	38.2	72.1±6.0	49.7
	missing	1,152	8.9	74.5±6.3	44.4
Hobby	participation	3,557	27.5	71.6±5.1	43.4
	non-participation	7,799	60.2	72.7±6.0	52.3
	missing	1,595	12.3	74.6±6.2	43.5
Sports	participation	2,373	18.3	70.8±4.9	52.6
	non-participation	8,860	68.4	72.8±6.0	48.9
	missing	1,718	13.3	74.5±6.1	43.0
Religion	participation	1,394	10.8	73.3±5.9	51.4
	non-participation	9,913	76.5	72.3±5.8	49.3
	missing	1,644	12.7	74.3±6.0	43.9
Industry	participation	1,199	9.3	71.6±5.4	77.4
	non-participation	10,124	78.2	72.5±5.9	46.8
	missing	1,628	12.6	74.5±6.0	40.4
Volunteer	participation	1,180	9.1	70.5±4.6	52.4
	non-participation	10,111	78.1	72.6±5.9	49.3
	missing	1,660	12.8	74.6±6.1	43.2

Table 1. Cont.

		N	%	Age	Men (%)
Politics	participation	921	7.1	71.8±5.4	70.5
	non-participation	10,573	81.6	72.5±5.9	48.1
	missing	1,457	11.3	74.6±6.0	40.3
Citizen	participation	532	4.1	71.0±4.7	43.0
	non-participation	10,659	82.3	72.5±5.9	49.9
	missing	1,760	13.6	74.4±6.1	43.6

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Discussion

In this study, we examined the relationship between incident functional disability and social participation from the perspective of number of types of organizations and type of social participation in a prospective cohort study. Social participation significantly lowered the risk of incident functional disability, and this effect increased with an increasing variety of organizations in which subjects participated. In analyses stratified by gender, as well as excluding subjects who became disabled within one year of follow-up, the results still suggested a protective effect of participating in more than two organizations. Previous studies have suggested that social participation can lower the risk of incident disability, [10], [11], which supports the results of the present study. Analysis adjusted for behavioral, psychosocial, and physiological factors resulted in a tendency towards weaker positive associations. Behavioral, psychosocial, and physiological pathways may be potential mechanisms for social participation to influence health, [24]. The results of the present study support that finding. In addition, participation in a greater number of different organizations brought the HR closer to 1.00. Participation in multiple organizations may have a protective effect on depression, [15], well-being, [16] and oral health status, [17], while having a role within the organization may reduce the risk of mental health problems, [18]. These findings indicate that social participation may decrease the risk of incident functional disability in older Japanese people, and that this effect may be strengthened by participation in a variety of organizations.

The relationship between social participation and prevention of functional decline may be under-pinned by at least three distinct mechanisms. First, social participation encourages older individuals to keep active (e.g. getting dressed each day to leave the house), and these daily routines may help to preserve functioning (the “use it or lose it” hypothesis). Secondly, social participation provides individuals with access to various forms of social support (e.g. access to material resources, or health-relevant information) which may promote the preservation of functional status. Thirdly, social participation may have direct physiological benefits such as buffering stress, boosting host resistance, and lowering biomarkers of disease risk, such as inflammation, [27].

Regarding type of social participation, the risk was significantly lower for participation in a local community, hobby, or sports organization. This decrease remained significant even when those who became certified for long-term care within a year were excluded from the analysis. When each gender was examined separately, the HR remained lower than 1.00 for participation in a local community organization, but this difference was no longer significant. Participation in a hobby or sport organization significantly lowered the risk for both men and women. In a similar trend, previous studies that each looked at different

organizations did not always show participation to lower the risk of all-cause mortality, [4], [5] or impaired cognitive function, [5]. The finding that participation in a hobby or sports organization significantly lowers the risk for both men and women is similar to the finding of an association with all-cause mortality, [4]. Among the different types of social participation, it is thus likely that participating in a local community, hobby, or sports group organization may be especially effective for decreasing the risk of requiring long-term care in the future.

For these three types of organizations, adjusting for behavioral, psychosocial, and physiological factors resulted in a tendency towards a weaker positive relationship. The association with participation in a hobby or sports organization may be due to the influence of hobby activities, [28] or physical activities, [29] that may help prevent incident functional disability. In addition to the benefits of physical activity, participation in a sports organization may have positive effects from the social interaction itself, e.g. instrumental and emotional support exchanged between members, or even just the social reinforcement (i.e. reinforcers such as acceptance, praise, and attention from other people) that comes from belonging to a group, [19]. The reason for the protective effect of local community organizations may be that sports and leisure activities are often included in the activities of these organizations, [20]. One type of neighborhood-based organization common throughout Japan is the community-based senior centers (called “salons”), which have been shown to improve self-rated health, [30] and increase emotional social support, [31]. These may help reduce the risk of needing long-term care. However, the association was weaker than that of participation in hobby and sports organizations, and was no longer significant when each gender was analyzed separately. The reason for this may be in the negative side of social relationships, such as sense of obligation to the community or burden, [32]. These findings point to the existence of behavioral, psychosocial, and physiological pathways in the weakening of the risk of incident functional disability due to participation in a local community, hobby, and sports organization. Significant associations remained for participation in three or more organizations and in participation in a hobby and sports organization even in Model 5 that included all covariates. Further studies are needed to elucidate the reason for this, as it is possible that there may be some other factor acting on these types of participation that were not examined here (such as eating behavior or physical fitness).

Of all types of participation, only participation in a religious group showed an inverse association with incident functional disability in the crude model, although the association became statistically non-significant in later models that adjusted for age and other variables. This result is contrary to a meta-analysis that found religious involvement to be related to low mortality, [33].