E．結論

各都道府県の医療計画をレヴィユーし、がん対策の比較を行った。

平成１９年度から本格化していく都道府県でのがん対策には、本研究で示したようながんの段階、メニューの包括度、目標値の設定に配慮した内容が求められる。また広島、長崎を例示したが、システムの全体像を示す視点も必要となる。

これまでの医療計画が疾病別の記載を必須としていないため、本研究で比較・検討した調査項目は今後の各県でのがん対策計画策定に役立つことと思われる。

「がん対策推進計画」において、新たに患者中心のがんという疾病に視点をおいた包括的対策が、今後どのように立案されるか、医療費適正化計画や医療計画との整合性、各計画の存在意義等、継続した調査研究が必要である。

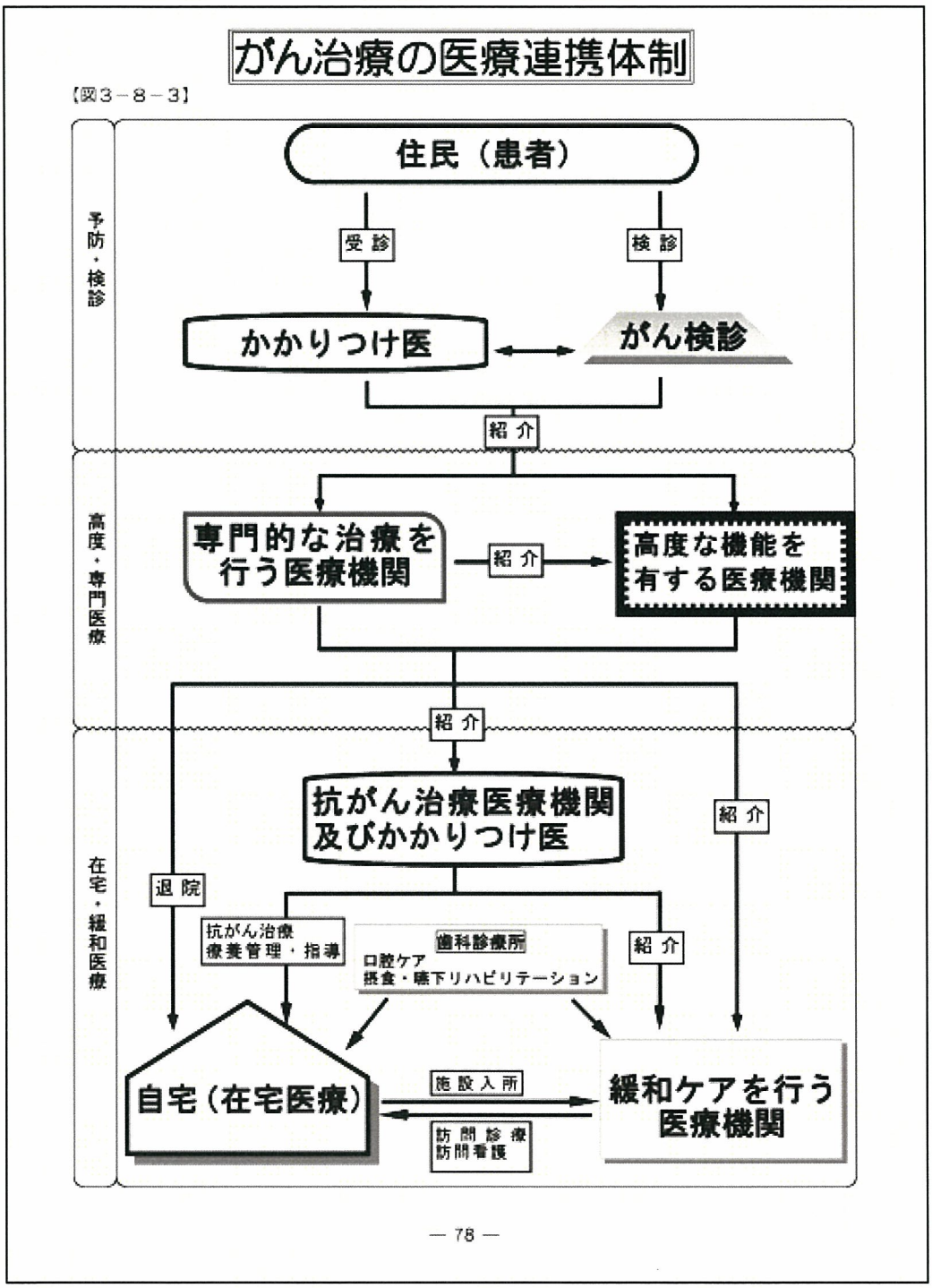
F．知的所有権の取得状況

特になし。

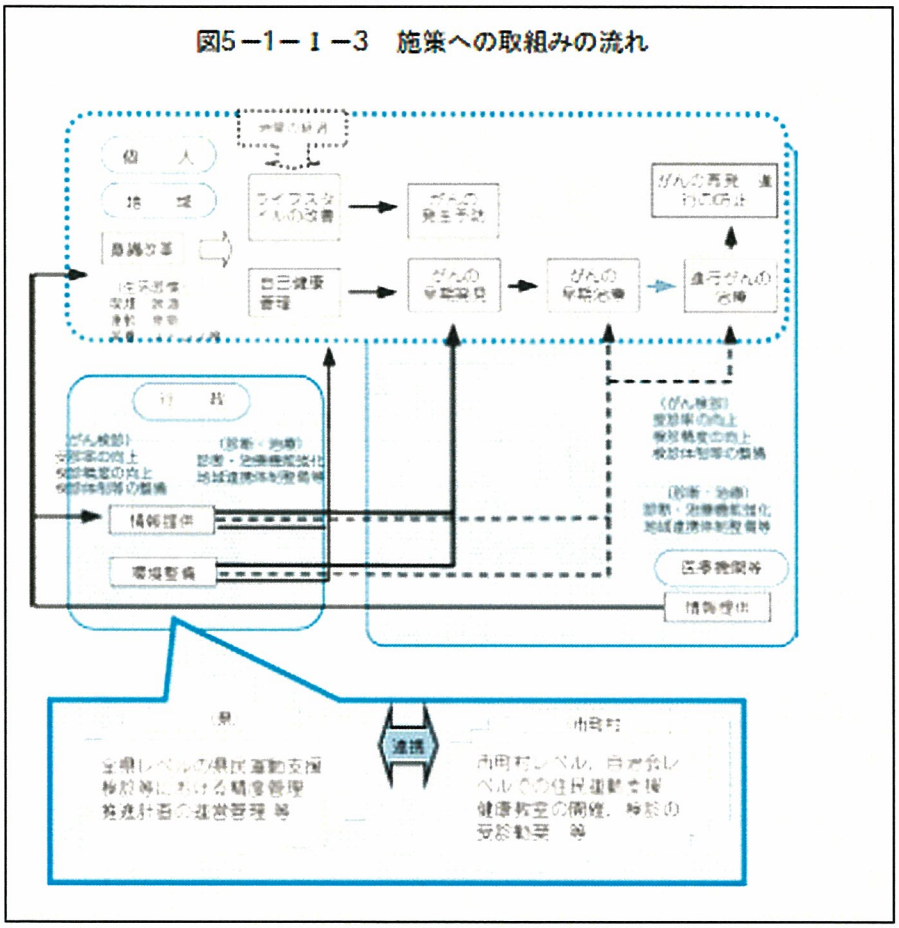
参考文献

全都道府県医療計画

資料：長崎県「がん治療の医療連携体制」



資料：広島県「施策への取り組みの流れ」



	都道府県	がん項目	計画としての構成要素			がんメニュー										段階ごとの目標・取り組み						目標値					段階			
			計画名	策定年	最終年度	対策										構造				過程	結果	構造				過程 結果	検診	治療	リハ	終末期
						機能整備	機器	連携	人材	情報	がん登録	緩和ケア	検診	その他	高度医療	施設	機器	情報	人材			施設	機器	情報						
1	北海道	×	北海道保健医療福	2003	2007	小児がん集約的医療体制の充実																								
2	青森県	○	青森県保健医療計	2005	2011	がん診療体制の充実 特定機能病院の機能充	地域バランスを考慮した基幹病院の医療機器充実	特定機能病院と県内医療機関の連携促進	専門医等医療従事者の養成・確保 研修	施設間のがん診療施設情報ネットワークシステム		緩和ケアの充実 緩和ケアの普及啓発 緩和ケア病棟の整備				○						地域拠点病院0→								
3	岩手県	×	岩手県保健福祉計	2006						国立がんセンターがんネット																				
4	宮城県	×	宮城県地域保健医	2003	2010	拠点病院の整備						県立がんセンターでのホスピスケア提供 緩和ケア病棟の整備 連携体制の構築 在宅ホスピスケア体制構 医療安全の確保																		
5	秋田県	×	秋田県医療保健福	2002	2007		ほぼ全診療科をカバーできるよう、放射線治療機器や高度検査機器を備え					末期がん患者等に対して痛みと症状のコントロールを主体とした緩和ケアを行う。		C型肝炎のところで肝がんに関する記述		○														○
6	山形県	○	山形県保健医療計	2003.2	2007	がん診療施設・設備の充実。 地域がん診療拠点病院二次保健医療			医師の研修参加促進	がん診療情報ネットワークによる診療レベル向上	地域がん登録の充実	緩和ケア病床整備 在宅末期医療の充実 末期医療の人材育成 普及・啓発	がん検診受診促進		三次医療機関及び基幹病院等におけるがん医療・循環器疾患医療体制の充実を目指しま			○	○	○							○			○
7	福島県	×	うつくしま保健医療	2003.3	2010							緩和ケアのあり方を検討します 緩和ケア提供体制の整備 在宅緩和ケア提供体制の整備																		
8	茨城県	○	茨城県保健医療計	2004.4	2008	二次医療圏に拠点病院	PET整備、粒子線治療体制の整備 放射線利用の診断・治療の対策		診療医療機関ネットワークの整備	科学的根拠のある情報提供体制、相談窓口、SO 「いばらきブロードバンドネットワーク」を利用した情報ネットワー	地域がん登録充実	終末期ケア	受診率・精度向上			○											○	○	○	○
9	栃木県	×	栃木県保健医療計	2003	2008							ネットワーク化の研究 末期医療の普及啓発 麻薬の適正使用に係わる技術習得																		
10	群馬県	×	群馬県保健医療計	2005.3	2009						地域がん登録事業	体制整備 在宅ケア体制の整備																		
11	埼玉県	×	埼玉県地域保健医	2002	2006	専門、特殊な治療を除き診療体制の整備、充実を図ります。									三次医療圏での高度医療を担う拠点病院の確保														
12	千葉県	○	千葉県保健医療計	2006	2010	拠点病院二次医療圏に1つ		がんセンターに連絡協議会を設置、連携協力体制を拡充	乳がん検診精度向上のため撮影技師、検診従事者らの研修 拠点病院での研修	相談等の機能強化 がんセンターを中心した情報ネットワークの構築	がん登録の充実	緩和医療の提供	乳がんのマンモグラフィー整備による検診向上 精度管理、効果的ながん検診のための評価		遺伝子研究等先端的臨床研究の強化			○		○										
13	東京都	×	東京都保健医療計	2002	2006	駒込病院をがん・感染症医療センターに再編 地域がん診療拠点病院の確保12か所			人材育成ーターミナル・ケア従事者研修やボランティア育成等の人材育成事業を、継続して実施する。			緩和ケア病棟（病床）の整備　300床 （平成13年度末 261床）			東京都医学研究機構でのがん研究	○			○			地域がん診療拠点						○		○
14	神奈川県	×	神奈川県保健医療		2007	足柄上病院を基幹病院としてがん医療充実 がんセンターでの緩和ケ						緩和ケア病棟整備 ターミナルケアの人材育成 在宅ターミナルケアの推進																		
15	新潟県	○	新潟県地域保健医	2006	2010	地域がん診療連携拠点病院の複数化	陽電子放射線断層撮影装置(PET) 等の設備整備	地域ごとに関係機関が連携して診断・治療機能の充実	マンモグラフィ読影医師養成研修を実施			ターミナルケアの普及や高度専門的な化学療法の実施体制の充実	がん検診の精度管理を図るとともにするなど検診体制の充実		二次保健医療圏で対応できない小児がんなどの高度ながん医療の拠点病院等の連携による診療体制の													
16	富山県	○	新富山県医療計画	2005	2010	二次医療圏毎に地域がん診療拠点病院を整備	早期発見を推進するため医療機器の整 PETやガンマナイフ等、高度な診療機器の共同利用					各医療圏における緩和ケア病棟と緩和ケア病床の整備																		
17	石川県	○	石川県保健医療計	2002	2006	地域がん拠点病院の検討																								

	都道府県	がん項目	計画としての構成要素 計画名	策定年	最終年度	がんメニュー 対策 機能整備	機器	連携	人材	情報	がん登録	緩和ケア	検診	その他	高度医療	段階ごとの目標・取り組み 構造 施設	機器	情報	人材	過程	結果	目標値 構造 施設	機器	情報	過程	結果	段階 検診	治療	リハ	終末期
18	福井県	×	福井県保健医療計画		2007	拠点病院指定	陽子線がん治療専用施設の検討			国立がんセンターと情報交換。医療技術のレベルアップ図る。												四五箇所の拠点病院								
19	山梨県	○	山梨県地域保健医	2003	2008							普及啓発 緩和ケア病床の整備 在宅緩和ケアの推進 患者の自己決定を尊重した環境づくり	早期発見の取り組み徹底		専門医療体制の充実										がん死亡者の						
20	長野県	○	長野県保健医療計		2007	中核病院での導入拡大、登録の拡大 拠点病院の必要性の検		地域包括医療協議会が中心となりネットワーク化		医療情報の活用フォローアップ 県民への情報提供	情報(がん登録システムプロジェクト)	機能整備(がん診療ネットワーク化プロジェクト) 在宅ケアチーム、病棟での医療促進	マンモグラフィー導入等による検診体制充実	事後指導把握による治療への誘導		○	○						マンモネット			○			
21	岐阜県	○	岐阜県保健医療計	2004	2008	がん拠点病院を中心とした治療水準向上					がん登録事業の普及推進	緩和ケアの推進 患者、家族、医療関係者への普及啓発 緩和医療チームによるケア提供	検診精度管理															
22	静岡県	○	静岡県保健医療計	2005.3	2009	拠点病院整備	マンモグラフィー整備	医療機関のがん診療実績を公表すること等により、地域における病診、病病連携推進		市町村における相談窓口の強化、地域における相談体制の充実、ホームページを活用した情報提供		在宅ホスピスケアの推進	検診従事者の研修	がん告知後の心のケアや社会復帰のためのリハビリテーション、在宅支援などを行う施設等も含めて幅広く医療資源のあり方検討														
23	愛知県	○	愛知県地域保健医	2006	2010	地域拠点病院を医療圏にニーズに応じた医療の提供できる体制		集学的治療機能について連携ネットワーク			地域がん登録の精度向上				愛知県がんセンター中央病院での高度先進医療の提供													
24	三重県	○	三重県保健医療計	2003	2008	拠点病院の充実、機能強化事業			がん医療、緩和ケアの人材確保・育成	拠点病院による住民向けの情報提供	地域がん登録システムの整備					○												
25	滋賀県	×	滋賀県保健医療計	2003	2007									肝がん、乳がんの効果的、効率的検診の検討													
26	京都府	×	京都府保健医療計	2004	2008	なし																					
27	大阪府	×	大阪府保健医療計	2002	2006	拠点病院の機能強化事								肝炎肝がん緊急総合対策事													
28	兵庫県	○	兵庫県保健医療計		2011	拠点病院のがん医療の充実	CT、MRI、PETによる早期発見、リニアックによる治療			病院のがんに関する医療機能の県民への開示推進	地域がん登録の再開		40歳以上の受診率50%以上、年間10万人以上検診体制の整備	アスベスト健康被害への迅速な対応 肝がん対策 肝がん肺がん臨床研究支援					○		全二次医療圏に拠				死亡率全国値			
29	奈良県	○	奈良県保健医療計画		2007	拠点病院を中心とした連携体制整備			精度向上のための研修	必要な情報の提供	がん登録システムの構築	在宅緩和ケアの支援体制の整備	マンモグラフィによる検診基盤整備	がん患者のQOL向上													
30	和歌山県	○	和歌山県保健医療	2003		拠点病院の整備				県民に必要な医療機関情報の提供 ITを活用したネットワーク整備		緩和ケア病床の整備・充実	精度管理事業	肝がん普及啓発													
31	鳥取県	○	鳥取県保健医療計	2003	2007	地域がん拠点病院を医療圏にひとつ						緩和ケア病棟の整備 終末期医療の情報提供、人材育成 保健医療福祉が連携した在宅緩和ケア 開業医に対する緩和ケアの啓発											地域がん拠点病院						
32	島根県	×	島根県保健医療計	2004.4	2008					がん医療ネットワーク(仮称)の整備																	
33	岡山県	×	岡山県保健医療計	2006.4	2010	がん拠点病院		拠点病院で構成する岡山県地域がん診療拠点病院連絡会議の設	地域の医師に研修																		
34	広島県	○	広島県保健医療計	2002	2006	県立病院での放射線部門や内視鏡部門等を充実させる		拠点病院を中心とした地域がん連携体制	専門医の養成・確保		情報ネットワーク、がん登録システム整備	緩和ケアの拠点整備 生き方を尊重したケアの推進 保健医療福祉介護連携での質の高い緩和ケアの推進(緩和ケアセンター) 在宅・施設の総合的緩和ケア推進	検診精度向上のため研修体制、支援体制	患者のQOLの向上															
35	山口県	○	山口県保健医療計	2006	2010				がん専門医療関係者の資	医療機関がん治療等関連	がん登録精度向上											地域がん拠点病院 緩和ケア病棟設置				受療率減らす 年齢調整死亡			
36	徳島県	×	徳島県保健医療計	2002	2006	地域がん診療拠点病院の整備					地域がん登録事業	保健医療福祉の連携 緩和ケアの充実 終末期訪問看護サービス推進 終末期医療の普及啓発																
37	香川県	○	香川県保健医療計	2004	2008	地域がん拠点病院の整備			地域のがん診療に携わる医師などの研修	がん診療に関する情報収集・提供		緩和ケアを含むがん医療充実															
										患者、医療機関からの相談体制		在宅ターミナルケアの整備															

			計画としての構成要素			がんメニュー										段階ごとの目標・取り組み						目標値					段階			
						対策										構造				過程	結果	構造			過程	結果	検診	治療	リハ	終末期
	都道府県	がん項目	計画名	策定年	最終年度	機能整備	機器	連携	人材	情報	がん登録	緩和ケア	検診	その他	高度医療	施設	機器	情報	人材			施設	機器	情報						
38	愛媛県	○	愛媛県地域保健医	2002	2006	二次医療圏全てに拠点病院	放射線治療機器導入 高度先進医療機器の導				地域がん登録の充実	人材育成 病棟整備	超音波、ヘリカルCTによる検診精度向上と早期診断	肝臓がん検診の充実		○						全医療圏で拠点病								
39	高知県	×	高知県保健医療計	2002	2007							在宅ケアのサポート体制																		
40	福岡県	○	福岡県保健医療計	2002.3	??							保健医療福祉の連携 在宅介護支援センターの整備、促進		骨髄移植医療の普及啓発																
41	佐賀県	×	佐賀県保健医療計	2003.4	2010				特定機能病院、拠点病院での研修	ホームページでのがん診療情報発信				肝疾患検診推進、予防、早期発見						○					がん死半減	○			
42	長崎県	○	長崎県保健医療計	2006	2010	拠点病院の機能強化		拠点病院がない場合には連携 回復期の患者の切れ目のない治療			がん登録の普及		早期発見	肝臓がんの早期発見 乳がん早期発 協議会の立ち上げ 白血病治療での連携 肺がん早期発 胃がん早期発									地域拠点病院5、								
43	熊本県	×	熊本県保健医療計	2003	2007							医療情報の提供 ケア提供体制の整備																		
44	大分県	×	大分県地域保健医	2004	2010	地域拠点病院の整備					地域がん登録の整備	ターミナルケアの推進 県民の理解推進		肝臓がんになる肝炎の対策																
45	宮崎県	×	宮崎県保健医療計	2003.5	2012	地域がん拠点病院の整備					がん登録システム整備	終末期医療の充実	精度管理							○					がん死亡率の低下を目指す				
46	鹿児島県	○	鹿児島県保健医療	2002	??	拠点病院整備						専用病床の整備 在宅緩和ケアの推進 県民への普及、啓発																		
47	沖縄県	○	沖縄県保健医療計	2004	2008	地域がん拠点病院の整備			拠点病院での研修		がん登録推進事業																			

厚生労働科学研究費補助金（がん臨床研究事業）
自治体におけるがん対策の現状分析とマネジメントシステムの構築支援に関する研究

分担研究報告書

米国における地域がん対策支援について

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米国におけるがん対策の現状を把握するため，米国疾病管理予防センター（CDC）を訪問し，National Comprehensive Cancer Control Program（全国包括的がん対策プログラム：NCCCP）についてヒアリング調査，資料収集および討議を行った．約 10 年前より実施されている当該プログラムは，日本の自治体におけるがん対策の推進にあたり有用な先行事例であり，わが国への応用のための有益な情報が得られた．

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A. 研究目的

米国における地域がん対策支援について，その現状を明らかにするとともに，日本の自治体におけるがん対策の推進にあたり，今後の応用のための有益な資料を得ることを，この研究の目的とする．

B. 研究方法

米国におけるがん対策の現状を把握するため，米国疾病管理予防センター（CDC）を訪問し，National Comprehensive Cancer Control Program（全国包括的がん対策プログラム：NCCCP）について，特に，

（1） NCCCP の概要
（2） NCCCP の歴史
（3） 他組織との連携
（4） CCC における技術支援

に関してヒアリング調査，資料収集および討議を行った．

C. 研究結果

（1）NCCCP の概要

NCCCP とは，CDC が，米国のがんの罹患率と死亡率を低下させることを目的に，国立がん研究所（NCI）・米国対がん協会(ACS)等と共同して，州などが行う包括的ながん対策（予防・早期発見・治療・リハビリ・終末医療）に対して，技術的・財源的支援を行う国家プロジェクトである．

（2）NCCCP の歴史

Comprehensive Cancer Control (CCC)

は，Department of Health and Human Services 及び Public Health Service の Healthy People[1]と National Institutes of Health(NCI) の National Cancer Program に端を発する．1986 年に NCI は Cancer Control Objectives for the Nation: 1985-2000[2]を発表した．この中で，全がんの年齢調整死亡率を，2000 年までに 50%減少させるという意欲的な目標を掲げた．

食習慣の改善，喫煙率の減少，がん検診の充実により，全がんの死亡率を 16%から 23%減少させることができると予測した．また，がん患者が最新の治療を受けることで，死亡率を 10%から 26%減少させることができると予測した．

1980年代半ばから1990年代初期にかけて，CDC，NCI，ACS はそれぞれ独自に新しい研究及び先駆的なプログラムを始めた[3-7]．しかし，1986 年に NCI が掲げた，がん死亡率減少に関する目標達成には及ばず，罹患率と死亡率を有意に減少させるためには，多様ながん関連部門間の連係を密にした包括的なアプローチが必要であることが認識された．

1994 年，CDC の Division of Cancer Prevention and Control (DCPC) 内の Program Services Branch は，ACS や州・国の公衆衛生分野の専門家と協力して，がん対策への包括的なアプローチを始めた．そのアプローチは，それまでの資金提供体制の枠組みを超えて，プログラムを統合することを目指した[8]．1995 年から 1998 年にかけて開かれたがん対策に関連するミーティングやワークショップにおいて，州レベルでの CCC プログラムの実現の可能性や，実施段階における阻害要因の有無について，意見収集が行われた．これらのミーティングやワークショップを通じて，CCC の定義（予防・早期発見・治療・リハビリ・終末医療を通じて，がん罹患率・死亡率を低下させるための統合的なアプローチ）[9]，枠組み[9]，必須要素[10]，計画モデル[11]について，合意が得られた．

1998 年，CDC は CCC 計画を既に有していた 5 州（コロラド・マサチューセッツ・ミシガン・ノースカロライナ・テキサス）と 1 部族の保健委員会（ポートランド北西部インディアン保健委員会）へ資金提供を行った．1998 年以来，CDC の NCCCP に関係するプログラム数は 6 から 63 へと増加した．2006 年度には政府予算から 1500 万ドルを得て，全ての州・コロンビア区・6 の部族と部族組織・6 の米領環太平洋の島々において，がん対策プログラムの支援を行っている．この支援を受けて，各州，区，部族，環太平洋諸島の保健部局は広域な CCC 協議会の設立，がんの社会的負担の評価，がん予防対策に関する優先順位の決定，CCC 計画の展開・実施に必要な社会基盤の整備等を行っている．また，CCC 計画内の各がん対策活動（結腸直腸，前立腺，卵巣，皮膚等）を支援するために，NCCCP 資金を受けている組織に対して，CDC が追加援助を行っている．なお，2006 年 5 月に，NCCCP のみを担当する新しい部署（Comprehensive Cancer Control Branch）が DCPC 内に設立された．

2006 年度，CCC 活動を実施している州，部族，米領地域の状況を図 1 に示す．また，CDC から資金援助を受けている州，部族，米領地域の状況を図 2 に示す．

（3）がん対策協力機関（NPCCC)による技術支援

1994年以降，CDCは全米のさまざまな組織・団体と協力して，専門知識の供与や人材育成の機会を提供してきた[12]．やがて，この協力関係ががん対策協力機関（National Partners for Comprehensive Cancer Control：NPCCC)と呼ばれるネットワークへと発展した．NPCCCは，CCC推進にあたり必要とされる人材育成や技術支援の資源を確保する役割を果たしている．ここでは，全米のがん対策に関連する主要なステークホルダーが，各々の目的や課題とは別に，協力してNCCCPに取り組む体制が確立した．NPCCCのメンバーは以下のとおりである．

- National Cancer Institute (NCI)：国立がん研究所
- American Cancer Society (ACS)：米国対がん協会
- Centers for Disease Control and Prevention (CDC)：米国疾病管理予防センター
- C-Change：がん征圧のための共同体
- North American Association of Central Cancer Registries (NAACCR)：北米中央がん登録室協議会
- American College of Surgeons (ACS), Commission on Cancer (COC)：米国外科学会がん委員会
- Chronic Disease Directors (CDD)：慢性疾患管理責任者
- Lance Armstrong Foundation (LAF)：ランス・アームストロング財団
- Intercultural Cancer Council (ICC)：がん協議会
- National Association of County and city Health Officials (NACCHO)：米国群市役所協会

（4）CCCにおける技術支援の例

NPCCCは，がん対策推進のためのツールや資料などを提供するために，Cancer Control PLANET[13]とCancerPlan.org[14]という2つのウェブサイトを公開した．CDCは財政面・人材面のリソースを提供して，これらのウェブサイト運営に貢献している．

2003年に，連邦政府の省庁とNCIが協力して，Cancer Control PLANET (Plan：計画，Link：つながり，Act：行動，Network：ネットワーク，with Evidence-based tools：根拠に基づいたツールを持つ)を立ち上げた．このウェブサイトでは，州・地方の保健部局の職員・研究者が，全米・州・郡ごとのがん関連の多方面からの統計情報等を掲載し，これらの情報の閲覧と情報収集を容易にさせた．また，このサイトは根拠に基づくレビュー，根拠に基づいた介入プログラム，がん対策計画立案・実行・評価用のツールなどが含まれている．NPCCCの組織・団体は，それぞれが持つ情報やツールを，ウェブサイトに掲載したリンクから閲覧できるようにしており，公衆衛生従事者は，がん対策に必要なデータやツールの系統的な情報収集が可能になった．

CancerPlan.orgは，ACS，CDC，NCIの協力のもと，CCCのウェブサイトとして開発された．各州のがん対策計画がダウ

ンロードできる他，CCC の専門家のためのポータルサイト（情報窓口）として，各種情報の情報源やツールをウェブ上に提供している．

人材育成の点では，NCCCP は，地域におけるがん対策従事者のための研修会を開催している．2000 年 8 月に中部地区を皮切りに 2002 年 6 月までに全米各地区で 3 日間の第 1 段階（基本レベル）研修会を実施した．その後，2004 年に 3 日間の第 2 段階（計画立案，実施，評価）研修会をテキサス州オースティン，ワシントン DC，南カリフォルニア，イリノイ州シカゴの 4 ヶ所にて実施した．その後も，これらの研修会は前述したがん対策協力機関の組織・団体の協力下に行われている．

D. 考察

米国では，日本よりも 10 年程度先んじて，がんの罹患率・死亡率を低下させる体系的な取り組みが進められている．その中でも，NCCCP は，一次予防から終末医療までの包括的な取り組みを地域レベルで促進するコアのプログラムである．活動内容やプログラムの評価などの課題はあるものの，自治体への人材育成支援，技術・情報提供などの点で，NCCCP の取り組みは，日本におけるがん対策推進の参考となる．

E. 結論

米国におけるがん対策の現状を把握するため，CDC を訪問し，NCCCP についてヒアリング調査，資料収集および討議を行った．約 10 年前より実施されている当該プログラムは，日本の自治体におけるがん対策の推進にあたり有用な先行事例であり，自治体への人材育成支援，技術・情報提供など，わが国への応用のための有益な情報が得られた．

G. 研究発表

1．論文発表

なし

2．学会発表

なし

H. 知的財産権の出願・登録状況

なし

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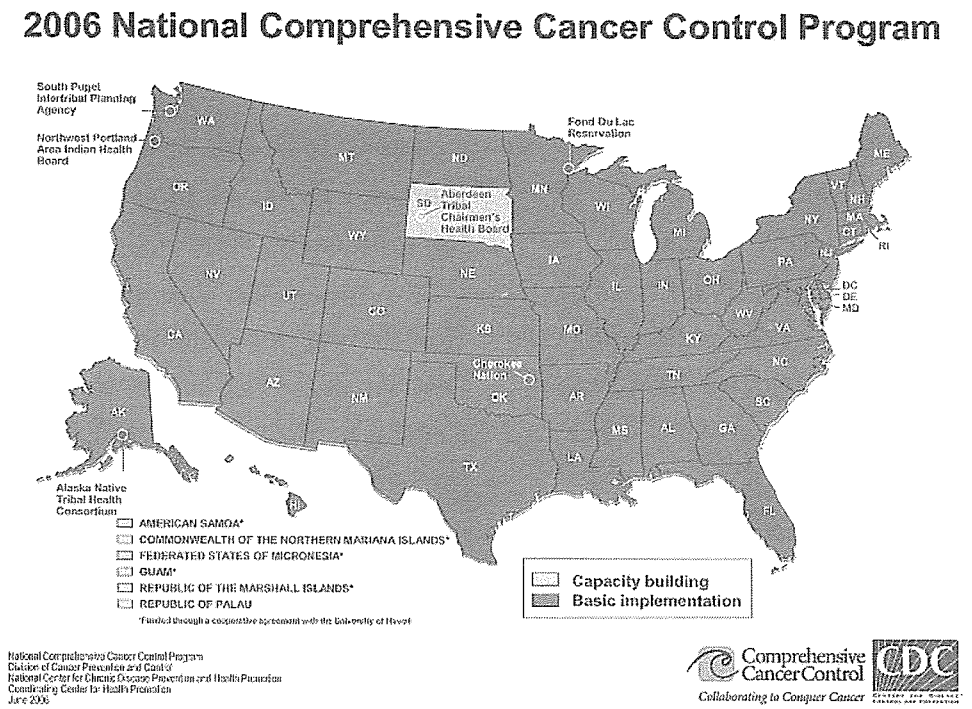

図１．CCC 活動を実施している州，部族，米領地域の状況（2006 年度）

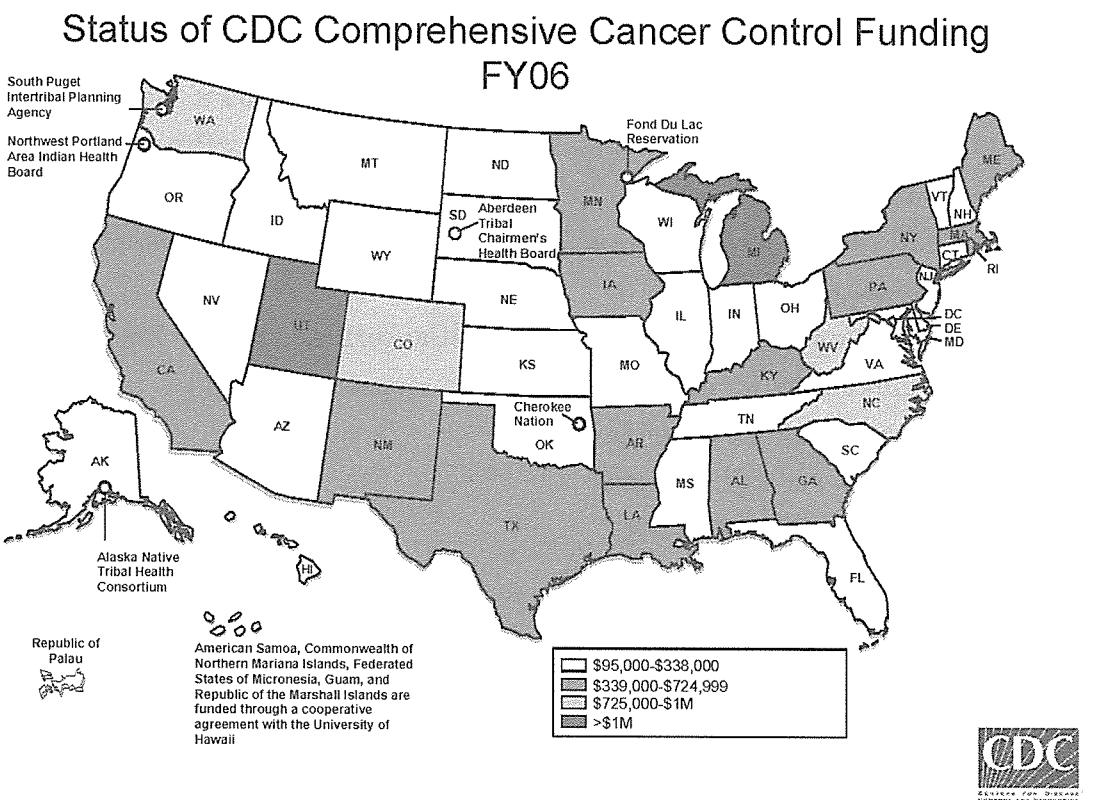

図２．CDC から資金援助を受けている州，部族，米領地域の状況（2006 年度）

Ⅲ. 研究成果の刊行に関する一覧表

著者氏名	論文タイトル	雑誌名	巻号	ページ	出版年
Fukuda Y, Nakamura K, Takano T, Nakao H, Imai H	Socioeconomic status and cancer screening in Japanese men: large inequality in middle-aged and urban residents	Environmental Health and Preventive Medicine.	11	90-96	2007
Fukuda Y, Nakamura K, Takano T	Higher mortality in areas of lower socioeconomic position measured by a single index of deprivation in Japan	Public Health	121	163-73	2007

Ⅳ. 研究成果の刊行物・別刷

[Environmental Health and Preventive Medicine 12, 90–96, March 2007]

Original Article

Socioeconomic Status and Cancer Screening in Japanese Males: Large Inequlaity in Middle-Aged and Urban Residents

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Abstract

Objectives: Cancer screening has become common in Japan. However, little is known about the socioeconomic factors affecting cancer screening participation. This study was performed to examine the association between socioeconomic status and cancer screening participation in Japanese males.

Methods: Using the data of 23,394 males sampled from across Japan, the associations between self-reported participation in screenings for three types of cancer (*i.e.*, stomach, lung and colon) and socioeconomic variables, including marital status, types of residential area (metropolitan/nonmetropolitan), household income, and employment status, were examined using multilevel logistic regression by age group (40 to 64 and ≥65 years).

Results: The cancer screening participation rates were 34.5% (stomach), 21.3% (lung), and 24.8% (colon) for the total population studied. Being married, living in a nonmetropolitan area, having a higher income and being employed in a large-scale company showed independent associations with a higher rate of cancer screening participation for all three types of cancer. Income-related differences in cancer screening were more pronounced in the middle-aged population than in the elderly population, and in metropolitan areas than in nonmetropolitan areas.

Conclusions: There are notable socioeconomic differences in cancer screening participation in Japan. To promote cancer screening, socioeconomic factors should be considered, particularly for middle-aged and urban residents.

Key words: cancer screening, health inequality, socioeconomic factor, urban health

Introduction

There is considerable inequality in health with regard to socioeconomic status, and the elimination of health inequality is an important public health concern (1). Socioeconomic inequality has been confirmed to be associated with not only mortality, morbidity, and health-related behavior, but also access to and the utilization of health services, including cancer screening (1–3). Lower socioeconomic status in terms of income and education level inhibit participation in cancer screenings, in combination with marital status, health insurance coverage status, type of residential area, ethnicity, and other factors (4–10).

Cancer screening is mainly carried out in three settings in Japan. First, cancer screening programs in communities have been encouraged by the Health Law for the Elderly since 1983 (11, 12). Screenings for stomach, lung, uterine cervical, breast, and colon cancers are offered to community residents, generally to those aged over 40 years, by local municipal governments, with or without a small copayment (11, 13). Second, a multiphasic health check-up program is provided in the workplace, which includes cancer screening in addition to an obligatory annual health check-up (14, 15). Last, people can also receive preventive health programs at their own expense at hospitals and clinics. A typical program is the so-called "Ningen Dock", which is a comprehensive program for cardiovascular disease, cancer, and other disorders. Health insurance organizations encourage the insured to participate in these programs, which are not covered by insurance benefits, with some financial support.

Thus, there are various opportunities to participate in cancer screenings in Japan, with minimal financial concern.

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However, little is known about how these various opportunities influence socioeconomic differences in cancer screening participation. In this study, we examined the associations between cancer screening participation and individual socioeconomic variables, including marital status, type of residential area, household income, and employment status, in Japanese males.

Methods

Data from the 2001 Comprehensive Survey of the Living Conditions of People on Health and Welfare by the Ministry of Health, Labour and Welfare were used (16). This survey involved interviewing all household members within 5240 area units of stratified random samples from across the country (16). It contained questions to obtain basic information on household and individual characteristics regarding demographics, health, illness profiles, lifestyle, and others. The total number of households participating in the basic information survey was 247,195. Of them, 30,386 households were selected at random and interviewed regarding income and savings. Consequently, both basic information and income information were available for only these 30,386 households; in this study, we analyzed the data of 23,394 males aged over 40 years from these households. The response rate was 87.3% for the basic information survey and 79.5% for the income survey (16). Microdata files (digitalized files of individual records) from this survey were used with permission from the Ministry of Internal Affairs and Communication.

Participation in cancer screening for stomach, lung, and colon cancers in the past year was surveyed by the interviewers. In this survey, cancer screening included all types of examination, provider and setting and the type of examination was not specified (*e.g.*, "Have you participated in a cancer screening for stomach cancer, for example, a community mass screening, a regular health check-up or Ningen Dock, in the past 12 months?").

We used age, marital status, type of residential area, employment status, and household income as socioeconomic variables. Marital status was divided into married and others (*i.e.*, never married, separated or divorced).

The type of residential area was categorized as metropolitan or nonmetropolitan. The 23 special wards of Tokyo and 12 metropolitan cities (*i.e.*, Sapporo, Sendai, Chiba, Yokohama, Kawasaki, Nagoya, Kyoto, Osaka, Kobe, Hiroshima, Kitakyushu and Fukuoka) were defined as metropolitan areas.

We used information on annual household income before tax, including benefits and transfer payments. To adjust for family size and composition, we used the modified OECD (Organization for Economic Cooperation and Development) equivalence scale of 1.0 for the first adult, 0.5 for the second and each subsequent person aged 14 and over, and 0.3 for each child aged under 14 (17). The study subjects were categorized into quintiles according to household income. The quintile categorization was conducted by age group: middle-aged group (aged 40 to 64 years) and elderly group (aged ≥65 years).

Employment status was based on the size of the company in which the subjects were employed, because the occupational and preventive health services provided strongly depend on company size (14, 18, 19). Employment status was divided into the following five categories: self-employment or employment in a small-scale company with fewer than 30 employees, employment in a medium-scale company with 30 to 999 employees, employment in a large-scale company with more than 1000 employees or a government office, not working, and others. 'Not working' included people performing housework, students, and the unemployed and retired. 'Others' consisted of officers of companies or organizations, part-time workers and unspecified workers.

Multilevel logistic regression analysis with individuals (level 1) nested in 47 prefectures (level 2) was used to calculate the adjusted odds ratio (OR) and 95% confidence interval (CI) of independent variables for participation in cancer screenings with two models. In model 1, age, marital status, type of residential area and income were assigned as independent variables. In model 2, employment status was added to the analysis as an independent variable. These analyses were conducted separately for the middle-aged and elderly groups. To compare the influence of income on cancer screening participation between metropolitan and nonmetropolitan areas, model 2 was conducted by residential area for the middle-aged group. The differences in the influences of income on screening by age group and residential area were examined using interaction terms in which income quintiles were dealt with as continuous variables. The statistical package MLwiN 1.10 (Centre for Multilevel Modelling, Institute of Education, University of London, London) was used for the analyses, and the Iterative Generalized Least Squares (IGLS) method was applied to estimate coefficients (20).

Results

Table 1 shows the socioeconomic characteristics of the study subjects by age group. The cancer screening participation rates of the total population were 34.5% for stomach cancer, 21.3% for lung cancer and 24.8% for colon cancer. The participation rates by socioeconomic characteristics are shown in Table 2. The participation rate of subjects who were married and living in a nonmetropolitan area was higher than those of the other groups. Marked gradients in participation rate according to income quintile were found for all types of cancer. Employment in a large-scale company showed the highest participation rate, followed by employment in a medium-scale company.

Table 3 shows the adjusted ORs for participation in screening for stomach cancer. In model 1, others for marital status and living in a metropolitan area showed significantly lower odds of cancer screening participation than being married and living in a nonmetropolitan area, respectively, for both age groups. Although a gradient in OR according to income quintile was found for both age groups, the gradient for the middle-aged group was steeper than that for the elderly group. In model 2, in which employment status was included as an independent variable, employment in a medium- or large-scale company showed significantly higher odds than self-employment or employment in a small-scale company for the middle-aged group. The gradient in OR according to income

Table 1 Socioeconomic characteristics of study subjects by age group

Variable	40–64 years	≥65 years
	N (%)	N (%)
Marital status[a]		
Married	13,120 (86.3)	7,117 (86.9)
Others	2,086 (13.7)	1,071 (13.1)
Residential area[b]		
Nonmetropolitan area	13,244 (87.1)	7,193 (87.8)
Metropolitan area	1,962 (12.9)	995 (12.2)
Income (median: thousand yen)		
1st quintile (lowest)	1,249	973
2nd quintile	2,250	1,747
3rd quintile	3,120	2,397
4th quintile	4,190	3,133
5th quintile (highest)	6,464	4,833
Employment status[c]		
Self-employed/small scale	5,602 (36.8)	2,131 (26.0)
Medium scale	3,743 (24.6)	157 (1.9)
Large scale	2,952 (19.4)	46 (0.6)
Not working	1,152 (7.6)	4,882 (59.6)
Others	1,757 (11.6)	972 (11.9)

[a] Others includes never married, separated, and divorced.
[b] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.
[c] Self-employed/small scale: self-employed or an employee of a company with fewer than 30 employees; medium scale: employee in a company with 30 to 999 employees; large-scale: employee in a company with at least 1000 employees.

Table 2 Participation in cancer screening by socioeconomic characteristics

	Stomach cancer	Lung cancer	Colon cancer
	N (%)	N (%)	N (%)
Age (years)			
40–64	5,231 (35.1)	3,201 (21.4)	3,719 (24.9)
≥65	2,658 (33.5)	1,677 (21.1)	1,957 (24.7)
Marital status[a]			
Married	7,171 (36.2)	4,414 (22.3)	5,216 (26.3)
Others	718 (23.5)	464 (15.2)	460 (15.1)
Residential area[b]			
Nonmetropolitan area	7,061 (35.4)	4,426 (22.2)	5,097 (25.6)
Metropolitan area	828 (28.7)	452 (15.6)	579 (19.8)
Income			
1st quintile (lowest)	1,080 (23.9)	683 (15.1)	754 (16.7)
2nd quintile	1,336 (29.3)	879 (19.3)	984 (21.6)
3rd quintile	1,619 (35.4)	1,017 (22.2)	1,227 (26.8)
4th quintile	1,733 (37.8)	1,063 (23.2)	1,241 (27.1)
5th quintile (highest)	2,118 (45.9)	1,234 (26.8)	1,467 (31.8)
Employment status[c]			
Self-employed/small scale	2,210 (29.3)	1,434 (19.0)	1,585 (21.0)
Medium scale	1,463 (38.2)	872 (22.8)	1,013 (26.4)
Large scale	1,514 (51.1)	897 (30.3)	1,081 (36.5)
Not working	1,744 (29.9)	1,084 (18.6)	1,310 (22.5)
Others	958 (35.9)	591 (22.2)	687 (25.7)

[a] Others includes never married, separated, and divorced.
[b] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.
[c] Self-employed/small scale: self-employed or an employee of a company with fewer than 30 employees; medium scale: employee in a company with 30 to 999 employees; large scale: employee in a company with at least 1000 employees.

quintile in model 2 for the middle-aged group was moderate compared with that in model 1.

Tables 4 and 5 show the adjusted ORs for participation in screening for lung and colon cancers, respectively. Similar tendencies to those observed for stomach cancer screening were found: others for marital status and living in a metropolitan area showed lower odds; higher income and employment in a medium- or large-scale company showed higher odds; and the gradient in OR according to income quintile was steeper for the middle-aged group than that for the elderly group. For lung cancer screening participation in the elderly group, the odds of the 2nd quintile was not significantly higher compared with that of the 1st quintile, and the odds of the 3rd, 4th and 5th quintiles did not differ significantly.

As for the interaction between income and age group, model 1 (without employment status) of stomach and colon cancers and model 2 (with employment status) of stomach cancer showed significant ($p<0.05$) negative coefficients for the interaction terms (data not shown). These findings indicate that income-related differences in cancer screening participation rates were significantly smaller in the elderly group than in the middle-aged group.

The adjusted ORs according to income quintile for cancer screening participation by residential area for the middle-aged group are shown in Table 6. The gradient in OR was steeper for metropolitan areas than for non-metropolitan areas. The interaction terms of income and residential area showed significant ($p<0.05$) coefficients for all types of cancer, indicating that the effects of income on cancer screening participation differed significantly according to the type of residential area: the impact of income in metropolitan areas was stronger than that in nonmetropolitan areas.

Discussion

Using a large sample from across the country, this study showed that socioeconomic status, particularly income, is significantly associated with the rate of cancer screening participation. There are a few plausible explanations for the association between income and cancer screening participation, in addition to the economic barrier.

First, socioeconomic status influences health-related behavior through health knowledge and attitudes. It is possible that inadequate knowledge of and poor attitudes toward health in people with a lower income (21–23) deter participation in cancer screenings, even if such people have the opportunity to participate.

Second, previous studies demonstrated that lack of time and inconvenience were common reasons for notparticipating in cancer screenings (24, 25), and that improving screening convenience, for example, by holding early morning and weekend screenings, is associated with an increased participation rate (26). Lack of time and indirect costs of participation seem to be plausible reasons for nonparticipation among people of

Table 3 Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for participation in screening for stomach cancer in Japanese males aged 45–64 and those aged ≥65 years

Socioeconomic variable	Model 1[a]		Model 2[a]	
	45–64	≥65	45-64	≥65
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Marital status[b]				
Married	1.00	1.00	1.00	1.00
Others	0.58 (0.52, 0.65)	0.72 (0.60, 0.85)	0.62 (0.52, 0.73)	0.72 (0.62, 0.85)
Residential area[c]				
Nonmetropolitan area	1.00	1.00	1.00	1.00
Metropolitan area	0.85 (0.75, 0.97)	0.78 (0.64, 0.95)	0.85 (0.74, 0.96)	0.79 (0.66, 0.94)
Income				
1st quintile (lowest)	1.00	1.00	1.00	1.00
2nd quintile	1.40 (1.24, 1.58)	1.12 (0.94, 1.34)	1.30 (1.15, 1.47)	1.13 (0.96, 1.32)
3rd quintile	1.75 (1.56, 1.97)	1.48 (1.24, 1.75)	1.44 (1.28, 1.63)	1.49 (1.28, 1.74)
4th quintile	2.39 (2.13, 2.69)	1.50 (1.26, 1.78)	1.82 (1.62, 2.06)	1.50 (1.28, 1.75)
5th quintile (highest)	3.44 (3.06, 3.86)	1.80 (1.51, 2.14)	2.45 (2.17, 2.76)	1.75 (1.50, 2.05)
Employment status[d]				
Self-employed/small scale			1.00	1.00
Medium scale			1.71 (1.56, 1.88)	0.83 (0.58, 1.17)
Large scale			2.60 (2.34, 2.88)	2.03 (1.09, 3.78)
Not working			1.13 (0.97, 1.32)	0.82 (0.78, 0.92)
Others			1.40 (1.24, 1.58)	0.95 (0.81, 1.12)

[a] Model 1: The independent variables are age, marital status, residential area, and income; model 2: the independent variables are age, marital status, residential area, income, and employment status.
[b] Others includes never married, separated, and divorced.
[c] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.
[d] Self-employed/small scale: self-employed or employee of a company with fewer than 30 employees; medium scale: employee in a company with 30 to 999 employees; large scale: employee in a company with at least 1000 employees.

Table 4 Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for participation in screening for lung cancer in Japanese males aged 45–64 and those aged ≥65 years

Socioeconomic variable	Model 1[a]		Model 2[a]	
	45–64	≥65	45–64	≥65
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Marital status[b]				
Married	1.00	1.00	1.00	1.00
Others	0.68 (0.58, 0.76)	0.70 (0.58, 0.84)	0.70 (0.62, 0.80)	0.71 (0.59, 0.85)
Residential area[c]				
Nonmetropolitan area	1.00	1.00	1.00	1.00
Metropolitan area	0.77 (0.66, 0.89)	0.74 (0.60, 0.92)	0.76 (0.65, 0.88)	0.73 (0.59, 0.90)
Income				
1st quintile (lowest)	1.00	1.00	1.00	1.00
2nd quintile	1.40 (1.21, 1.60)	1.16 (0.96, 1.40)	1.32 (1.15, 1.53)	1.16 (0.97, 1.40)
3rd quintile	1.61 (1.41, 1.85)	1.55 (1.30, 1.86)	1.41 (1.22, 1.62)	1.57 (1.32, 1.88)
4th quintile	2.01 (1.76, 2.30)	1.48 (1.24, 1.78)	1.66 (1.44, 1.91)	1.48 (1.24, 1.78)
5th quintile (highest)	2.45 (2.14, 2.80)	1.55 (1.30, 1.86)	1.91 (1.66, 2.20)	1.53 (1.27, 1.83)
Employment status[d]				
Self-employed/small scale			1.00	1.00
Medium scale			1.38 (1.24, 1.54)	0.61 (0.39, 0.94)
Large scale			1.87 (1.66, 2.10)	1.44 (0.75, 2.75)
Not working			0.97 (0.81, 1.17)	0.85 (0.74, 0.96)
Others			1.30 (1.13, 1.49)	0.97 (0.81, 1.17)

[a] Model 1: The independent variables are age, marital status, residential area, and income; model 2: the independent variables are age, marital status, residential area, income, and employment status.
[b] Others includes never married, separated, and divorced.
[c] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.
[d] Self-employed/small scale: self-employed or employee of a company with fewer than 30 employees; medium scale: employee in a company with 30 to 999 employees; large scale: employee in a company with at least 1000 employees.

Table 5 Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for participation in screening for colon cancer in Japanese males aged 45–64 and those aged ≥65 years

Socioeconomic variable	Model 1[a]		Model 2[a]	
	45–64	≥65	45–64	≥65
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Marital status[b]				
Married	1.00	1.00	1.00	1.00
Others	0.51 (0.45, 0.59)	0.69 (0.58, 0.83)	0.54 (0.47, 0.62)	0.69 (0.58, 0.83)
Residential area[c]				
Nonmetropolitan area	1.00	1.00	1.00	1.00
Metropolitan area	0.75 (0.66, 0.86)	0.74 (0.61, 0.91)	0.73 (0.64, 0.84)	0.75 (0.62, 0.92)
Income				
1st quintile (lowest)	1.00	1.00	1.00	1.00
2nd quintile	1.48 (1.30, 1.70)	1.23 (1.03, 1.47)	1.39 (1.22, 1.60)	1.23 (1.03, 1.47)
3rd quintile	1.85 (1.62, 2.11)	1.67 (1.40, 1.99)	1.56 (1.36, 1.79)	1.68 (1.41, 2.00)
4th quintile	2.10 (1.84, 2.39)	1.72 (1.45, 2.05)	1.65 (1.44, 1.89)	1.72 (1.45, 2.04)
5th quintile (highest)	2.67 (2.35, 3.03)	1.84 (1.55, 2.19)	1.97 (1.72, 2.25)	1.82 (1.53, 2.17)
Employment status[d]				
Self-employed/small scale			1.00	1.00
Medium scale			1.55 (1.40, 1.72)	0.69 (0.46, 1.03)
Large scale			2.29 (2.05, 2.57)	1.40 (0.74, 2.63)
Not working			1.13 (0.95, 1.34)	0.92 (0.82, 1.05)
Others			1.32 (1.16, 1.51)	1.02 (0.86, 1.22)

[a] Model 1: The independent variables are age, marital status, residential area, and income; model 2: the independent variables are age, marital status, residential area, income, and employment status.
[b] Others includes never married, separated, and divorced.
[c] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.
[d] Self-employed/small scale: self-employed or employee of a company with fewer than 30 employees; medium scale: employee in a company with 30 to 999 employees; large scale: employee in a company with at least 1000 employees.

Table 6 Adjusted odds ratios (ORs)[a] and 95% confidence intervals (CIs) for participation in screening for stomach, lung and colon cancers according to income quintile in Japanese men aged 40–64 years by residential area

	Metropolitan area[b]	Nonmetropolitan[b]
	OR (95%CI)	OR (95%CI)
Stomach cancer		
1st quintile (lowest)	1.00	1.00
2nd quintile	1.25 (0.81, 1.92)	1.31 (1.15, 1.48)
3rd quintile	2.09 (1.40, 3.13)	1.39 (1.22, 1.58)
4th quintile	2.53 (1.71, 3.74)	1.78 (1.56, 2.02)
5th quintile (highest)	3.74 (2.54, 5.52)	2.33 (2.05, 2.65)
Lung cancer		
1st quintile (lowest)	1.00	1.00
2nd quintile	2.09 (1.19, 3.65)	1.28 (1.11, 1.49)
3rd quintile	2.24 (1.30, 3.87)	1.36 (1.17, 1.57)
4th quintile	2.23 (1.31, 3.80)	1.64 (1.41, 1.90)
5th quintile (highest)	3.36 (1.99, 5.67)	1.81 (1.56, 2.10)
Colon cancer		
1st quintile (lowest)	1.00	1.00
2nd quintile	1.51 (0.90, 2.51)	1.39 (1.21, 1.60)
3rd quintile	2.25 (1.39, 3.65)	1.51 (1.31, 1.74)
4th quintile	2.28 (1.42, 3.64)	1.61 (1.40, 1.86)
5th quintile (highest)	3.10 (1.94, 4.94)	1.88 (1.63, 2.17)

[a] Adjusted for age and marital and employment statuses.
[b] Metropolitan area includes 23 special wards of Tokyo and 12 ordinance-designated cities.

lower socioeconomic status.

Last, in this study, we confirmed that people employed in a large-scale company can receive greater preventive health service benefits (18). The gradient in OR according to income quintile in model 1 was steeper than that in model 2. This finding indicates that inequality in opportunities for cancer screening according to employment status contributes to the large income-related differences in cancer screening.

One of the notable findings of this study is the difference in the association between income and screening by age group. The middle-aged group showed larger income-related differences in cancer screening participation rate than the elderly group. Although community health programs provide a feasible means of reducing income-related differences in cancer screening participation rate, the majority of people participating in these programs are the elderly (*e.g.*, national data showed that 62% of participants in stomach cancer screenings are more than 60) (27). Therefore, it is likely that these community health programs do not play a sufficient role in overcoming socioeconomic inequality among middle-aged people.

A notable inconsistency between the results of this study and those of studies in other countries is related to the type of residential area. Previous studies in other countries demonstrated that living in an urban area or a less deprived area is a positive factor in cancer screening participation (9, 21). However, in this study, we suggest that living in an urban area is a negative factor for participation, and income differences in cancer screening in urban areas are larger than those in rural areas

in Japan.

This study has several possible limitations that should be acknowledged. First, because the information on cancer screening participation was based on self-reporting, there might be a bias related to self-reporting, particularly a misclassification bias (28, 29). The self-reporting of cancer screening participation is likely to result in the overestimation of the participation rate, and the difference in the rates between self-reporting and actual participation depends on individual characteristics, including socioeconomic factors (30–32).

Second, in this study, we did not consider the type of program for each cancer screening. Programs and examinations different from the common programs include the pepsinogen method for stomach cancer, endoscopy for stomach and colon cancers, and low-dose spiral computed tomography for lung cancer (33–35). A government survey demonstrated that the cancer screening participation rate for lung cancer was higher than that for stomach cancer (13). The finding in this study is opposite from that in the government survey, suggesting that some citizens misunderstand the purposes of the examinations (*e.g.*, failure to distinguish lung cancer screening from tuberculosis examination).

Third, the income information used in this study was also obtained by self-reporting. Because income is sensitive information for respondents (36, 37), the income of the study subjects might be either over-reported or under-reported. In this study, however, the household income was determined on the basis of detailed items and for each household member. Thus, the income information used in this study is some of the most valid income information in the Japanese population (38).

Fourth, it is possible that the larger income differences in cancer screening participation among the middle-aged population and urban residents were due to the larger income inequality *per se* among these populations. However, Gini coefficients of income, a measure of inequality, were similar between the middle-aged (0.35) and elderly (0.35) groups, and between the metropolitan (0.35) and the nonmetropolitan (0.34) areas in this study sample.

Finally, because the study subjects were drawn from various residential areas, a more accurate examination of individual factors must take into account differences in the characteristics of the regions in which the individuals reside. In this study, we applied multilevel analysis to elucidate the effects of individual factors on cancer screening participation, considering that the regional variation in cancer screening participation underlies the individual variation (39, 40).

Over the past several decades, the relative health level of urban residents in Japan has deteriorated (41). In previous study, the contribution of higher mortality from cancer to this relative deterioration in health was confirmed (42). In addition to increased risk related to urban living conditions such as health risk behaviors, stress, and a less natural environment (43–45), there should be a greater focus on the significant socioeconomic inequality in health services including cancer screenings in urban areas.

Although comprehensive strategies are required to tackle income inequality, a few potential solutions can be implied on the basis of the above discussions. Health education and promotion across all socioeconomic statuses and focusing on disadvantaged populations will promote health knowledge and attitudes to overcome inequalities. The dependence of cancer screening participation on worksite could be weakened by other settings including the community and insurance. Last but not least in importance, evidence-based cancer screening should be encouraged. Promoting effective and efficient screening programs will increase opportunities for the populations requiring them.

In conclusion, this analysis demonstrated that having a higher income, as well as being married, being employed in a large-scale company, and living in a nonmetropolitan area, promote cancer screening participation. There was marked income-related inequality in cancer screening participation rates in the middle-aged population and people living in metropolitan areas. To promote cancer screening, socioeconomic factors, particularly those affecting middle-aged and urban residents, should be considered.

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