

吉村典子、中村耕三、阿久根徹、藤原佐枝子、清水容子、吉田英世、大森豪、浜藤啓広、西脇祐司、吉田宗人、下方浩史	【最新の骨粗鬆症学-骨粗鬆症の最新知見】 大規模臨床試験の概要・住民コホート研究の概要 LOCOMOスタディ	日本臨床	71, 増刊2	642-645	2013
川口浩、阿久根徹、吉村典子	生活自立を指標とした生活習慣病の検査基準値 生活自立からみた生活習慣病の基準値 ロコモティブシンドローム 変形性関節症	日本老年医学会雑誌	50	191-193	2013
吉村典子	【健康づくりのための身体活動・運動と栄養-新しい身体活動指針とロコモティブシンドロームの予防-】 ロコモティブシンドロームって何? メタボとの関連を中心に	日本栄養士学会雑誌	56	612-614	2013
吉村典子	【ウデを磨く・アタマを鍛えるシリーズ ロコモティブシンドローム】 (第13章)ロコモとメタボと認知症 大規模住民調査が示すもの	日本医事新報	4679	105-110	2013
吉村典子	大規模住民調査ROADスタディからみたロコモの疫学	整形外科ナース「超高齢社会における運動器医療とケア 'ロコモティブシンドローム'」			in press
吉村典子	将来の自立度低下の予測におけるロコチェックの有用性: ROADスタディから	整形外科ナース「超高齢社会における運動器医療とケア 'ロコモティブシンドローム'」			in press
吉村典子	ロコモティブシンドローム	日本臨床		「生活習慣病と認知症」	in press
Tatsukawa Y, Misumi M, Yamada M, Masunari N, Oyama H, Nakanishi S, Fukunaga M, Fujiwara S.	Alteration of body mass index and body composition in atomic bomb survivors.	Int J Obes	37	1123-8	2013

Soen S, Fukunaga M, Sugimoto T, Sone T, <u>Fujiwara S</u> , Endo N, Gorai I, Shiraki M, Hagino H, Hosoi T, Ohta H, Yoneda T, Tomomitsu T	Diagnostic criteria for primary osteoporosis: year 2012 revision.	J Bone Miner Metabo	31	247-257	2013
Johansson HI, Kanis JA, Odén A, McCloskey E, Chapurlat RD, Christiansen C, Cummings SR, Diez-Perez A, Eisman JA, <u>Fujiwara S</u> , Glüer CC, Goltzman D, Hans D, Khaw KT, Krieg MA, Kröger H, LaCroix AZ, Lau E, Leslie WD, Mellström D, Melton LJ 3rd, O'Neill TW, Pasco JA, Prior JC, Reid DM, Rivadeneira F, van Staa T, <u>Yoshimura N</u> , Zillikens MC	A meta-analysis of the association of fracture risk and body mass index in women.	J Bone Miner Res.	29	223-233	2014
高橋郁乃、増成直美、 <u>藤原佐枝子</u>	高齢者の動脈硬化性疾患と骨折リスク 広島コホート調査	Osteoporosis Jpn	21	90-93	2013
宗圓聰、福永仁夫、杉本利嗣、曾根照喜、 <u>藤原佐枝子</u> 、遠藤直人、五來逸雄、白木正孝、萩野浩、細井孝之、太田博明、米田俊之、友光達志	原発性骨粗鬆症の診断基準 (2012年度改訂版)	Osteoporosis Jpn	21	9-21	2013
<u>藤原佐枝子</u>	骨粗鬆症の概念・定義・疫学	Hormone Frontier in Gynecology	20	201-204	2013
<u>藤原佐枝子</u>	FRAXに含まれる骨折危険因子	内科	111	657-660	2013
<u>藤原佐枝子</u>	骨粗鬆症による骨折の疫学	日本臨床	71, 増刊2	433-438	2013
<u>藤原佐枝子</u>	骨折の危険因子 図で見る骨粗鬆症2013	Osteoporosis Jpn 別冊	21	46-47	2013
<u>藤原佐枝子</u>	骨折リスクとその評価 FRAXの活用	Geriat Med	51	1037-1040	2013
<u>Suzuki T</u> , Shimada H, Makizako H, Doi T, Yoshida D, Ito K, Shimokata H, Washimi Y, Endo H, Kato T	A randomized controlled trial of multicomponent exercise in older adults with mild cognitive impairment.	PLOS ONE	8	e61483	2013

Shimada H, <u>Suzuki T</u> , Suzukawa M, Makizako H, Doi T, Yoshida D, Tsutsumimoto K, Anan Y, Uemura K, Ito T, Lee S, Park H	Performance-based assessments and demand for personal care in older Japanese people: a cross- sectional study.	BMJ OPEN	3	e002424	2013
Kim H, <u>Suzuki T</u> , Saito K, <u>Yoshida H</u> , Kojima N, Kim M, Sudo M, Yamashiro Y, Tokimitsu I	Effects of exercise and tea catechins on muscle mass, strength and walking ability in community-dwelling elderly Japanese sarcopenic women: A randomized controlled trial.	Geriatr Gerontol Int	13	458-465	2013
Uemura K, Shimada H, Makizako H, Doi T, Yoshida D, Tsutsumimoto K, Anan Y, <u>Suzuki T</u>	Cognitive function affects trainability for physical performance in exercise intervention among older adults with mild cognitive impairment.	Clinical Interventions in Aging	8	97-102	2013
Fujita H, <u>Suzuki T</u> , Shoda S, Kawakubo Y, Ohno K, Giannakopoulou P, Harihara S	Contribution of antemortem tooth loss (AMTL) and dental attrition to oral palaeopathology in the human skeletal series from the Yean-ri site, South Korea.	International Journal of Archaeology	1	1-5	2013
Makizako H, Shimada H, Doi T, Park H, Yoshida D, Uemura K, Tsutsumimoto K, Liu-Ambrose T, <u>Suzuki T</u>	Poor balance and lower gray matter volume predict falls in older adults with mild cognitive impairment	BMC Neurology	13	102	2013
Makizako H, Shimada H, Doi T, Park H, Yoshida D, <u>Suzuki T</u>	Six-Minute Walking Distance Correlated with Memory and Brain Volume in Older Adults with Mild Cognitive Impairment: A Voxel-Based Morphometry Study.	Dement Geriatr Cogn Disord Extra	3	223-232	2013
Shimada H, Makizako H, Doi T, Yoshida D, Tsutsumimoto K, Anan Y, Uemura K, Ito T, Lee S, Park H, <u>Suzuki T</u>	Combined Prevalence of Frailty and Mild Cognitive Impairment in a Population of Elderly Japanese People.	JAMDA	14	518-524	2013
Yoshimatsu T, Yoshida D, Shimada H, Komatsu T, Harada A, <u>Suzuki T</u>	Relation between near- infrared spectroscopy and subcutaneous fat and muscle thickness measured by ultrasonography in Japanese community-dwelling elderly.	Geriatr Gerontol Int	13	351-357	2013

Uemura K, Shimada H, Makizako H, Yoshida D, Doi T, Yamada M, <u>Suzuki T</u>	Factors associated with life-space in older adults with amnesic mild cognitive impairment.	Geriatr Gerontol Int	13	161-166	2013
Doi T, Shimada H, Makizako H, Yoshida D, Shimokata H, Ito K, Washimi Y, Endo H, <u>Suzuki T</u>	Characteristics of cognitive function in early and late stages of amnesic mild cognitive impairment.	Geriatr Gerontol Int,	13	83-89	2013
Makizako H, Doi T, Shimada H, Park H, Uemura K, Yoshida D, Tsutsumimoto K, Anan Y, <u>Suzuki T</u>	Relationship between going outdoors daily and activation of the prefrontal cortex during verbal fluency tasks (VFTs) among older adults: a near-infrared spectroscopy study.	Arch Gerontol Geriatr	56	118-123	2013
Doi T, Makizako H, Shimada H, Yoshida D, Tsutsumimoto K, Sawa R, Misu S, <u>Suzuki T</u>	Effects of multicomponent exercise on spatial-temporal gait parameters among the elderly with amnesic mild cognitive impairment (aMCI): Preliminary results from a randomized controlled trial (RCT).	Arch Gerontol Geriatr	56	104-108	2013
Mochizuki T, Sato T, Tanifuji O, Kobayashi K, Koga Y, Yamagiwa H, <u>Omori G</u> , Endo M.	In vivo pre- and postoperative three-dimensional knee kinematics in unicompartmental knee arthroplasty.	J Orthop Sci	18	54-60	2013
Ishijima M, Nakamura T, Shimizu K, Hayashi K, Kikuchi H, Soen S, <u>Omori G</u> , Yamashita T, Uchio Y, Chiba J, Kubota M, Kurosawa H, Kaneko K	Intra-articular hyaluronic acid injection versus oral non-steroidal anti-inflammatory drug for the treatment of knee osteoarthritis: a multi-center, randomized open-label, non-inferiority trial.	Arthritis Res Ther	16	R18	2014
Mochizuki T, Sato T, Blaha JD, Tanifuji O, Kobayashi K, Yamagiwa H, Watanabe S, Matsueda M, Koga Y, <u>Omori G</u> , Endo N	Kinematics of the knee after unicompartmental arthroplasty is not the same as normal and is similar to the kinematics of the knee with osteoarthritis.	Knee Surg Sports Traumatol Arthrosc			in press
Tanishi N, Yamagiwa H, Hayami T, Mera H, Koga Y, <u>Omori G</u> , Endo N	Usefulness of urinary CTX-II and NTX-I in evaluating radiological knee osteoarthritis: the Matsudai knee osteoarthritis survey.	J Orthop Sci			in press

大森豪	変形性膝関節症の疫学と危険因子	運動器リハビリテーション	24	252-258	2013
山際浩史、渡辺聡、古賀寛、高木繁、村岡治、大森豪	膝痛患者における尿中CTX-IIと膝X線OA変化との関連—3年以上の縦断的検討	JOSKAS誌	38	704-710	2013
小林弘樹、大森豪、西野勝敏、田邊裕治、古賀良生	内側型変形性膝関節症におけるスラストと膝関節アライメント及び膝伸展筋力との関連性	臨床バイオメカニクス	34	279-285	2013
大森豪	変形性膝関節症における薬物療法	Clinical Magazine	527	37-40	2013
Ishiguro S, Akeda K, Tsujii M, Sudo A	Is kyphoplasty necessary?	Asian Spine J	7	218-221	2013
Ishiguro S, Akeda K, Tsujii M, Sudo A	Delayed diagnosis of cauda equina syndrome with perineural cyst after combined spinal-epidural anesthesia in hemodialysis patient.	Asian Spine J	7	232-235	2013
Nakamura T, Matsumine A, Matsubara T, Asanuma K, Uchida A, Sudo A	The combined use of the neutrophil-lymphocyte ratio and C-reactive protein level as prognostic predictors in adult patients with soft tissue sarcoma.	J Surg Oncol	108	481-485	2013
Yamaguchi T, Matsumine A, Niimi R, Nakamura T, Matsubara T, Asanuma K, Hasegawa M, Sudo A	Deep-vein thrombosis after resection of musculoskeletal tumours of the lower limb.	Bone Joint J.	95	1280-1284	2013
Niimi R, Matsumine A, Nakamura T, Morimoto R, Murata T, Suzuki T, Nakashima Y, Nojima T, Uchida A, Sudo A	Ewing's sarcoma with an uncommon clinical course: A case report.	Oncol Lett	6	9-12	2013
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Atsumi S, Matsumine A, Toyoda H, Niimi R, Iino T, Sudo A	Prognostic significance of CD155 mRNA expression in soft tissue sarcomas.	Oncol Lett	5	1771-1776	2013

Niimi R, Matsumine A, Iino T, Nakazora S, Nakamura T, Uchida A, <u>Sudo A</u>	Soluble Neural-cadherin as a novel biomarker for malignant bone and soft tissue tumors.	BMC Cancer	13	309	2013
Nakamura T, Matsumine A, Yamakado K, Takao M, Uchida A, <u>Sudo A</u>	Clinical significance of radiofrequency ablation and metastasectomy in elderly patients with lung metastases from musculoskeletal sarcomas	J Cancer Res Ther	9	219-223	2013
Hasegawa M, Yoshida K, Wakabayashi H, <u>Sudo A</u>	Prevalence of adverse reactions to metal debris following metal-on-metal THA.	Orthopedics	36	e606-e612	2013
Wakabayashi H, Hasegawa M, Yoshida K, Nishioka K, <u>Sudo A</u>	Hip score and disease activity correlation in patients with rheumatoid arthritis after total hip arthroplasty.	Int Orthop	37	1245-1250	2013
Hasegawa M, <u>Sudo A</u>	In vivo wear performance of highly cross-linked polyethylene vs. yttria stabilized zirconia and alumina stabilized zirconia at a mean seven-year follow-up.	BMC Musculoskelet Disord	14	154	2013
Hasegawa M, Horiki N, Tanaka K, Wakabayashi H, Tano S, Katsurahara M, Uchida A, Takei Y, <u>Sudo A</u>	The efficacy of rebamipide add-on therapy in arthritic patients with COX-2 selective inhibitor-related gastrointestinal events: a prospective, randomized, open-label blinded-endpoint pilot study by the GLORIA study group.	Mod Rheumatol	23	1172-1178	2013
Asanuma K, Wakabayashi H, Okamoto T, Asanuma Y, Akita N, Yoshikawa T, Hayashi T, Matsumine A, Uchida A, <u>Sudo A</u>	The thrombin inhibitor, argatroban, inhibits breast cancer metastasis to bone.	Breast Cancer	20	241-246	2013

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Nakamura T, Grimer R, Gaston C, Carter S, Tillman R, Abudu A, Jeys L, <u>Sudo A</u>	The relationship between pretreatment anaemia and survival in patients with adult soft tissue sarcoma.	J Orthop Sci	18	987-993	2013
Nakamura T, Grimer RJ, Carter SR, Tillman RM, Abudu A, Jeys L, <u>Sudo A</u>	Outcome of soft-tissue sarcoma patients who were alive and event-free more than five years after initial treatment.	Bone Joint J	95	1139-1143	2013
Wang Z, Sakakibara T, <u>Sudo A</u> , Kasai Y	Porosity of β -tricalcium phosphate affects the results of lumbar posterolateral fusion.	J Spinal Disord Tech	26	E40-E45	2013
Okita S, Hasegawa M, Takahashi Y, Puppulin L, <u>Sudo A</u> , Pezzotti G	Failure analysis of sandwich-type ceramic-on-ceramic hip joints: A spectroscopic investigation into the role of the polyethylene shell component.	J Mech Behav Biomed Mater	31	55-67	2014
Fukuda A, Nishimura A, Kato K, <u>Sudo A</u>	Arthroscopically assisted minimally invasive plate osteosynthesis for posterior fracture-dislocation of the shoulder.	J Orthop Sci	19	194-197	2014
Nakamura T, Matsumine A, Iino T, Matsubara T, Asanuma K, Uchida A, <u>Sudo A</u>	Role of High-sensitivity C-reactive Protein in the Differentiation of Benign and Malignant Soft Tissue Tumors.	Anticancer Res	34	933-936	2014
Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Kono T, <u>Sudo A</u>	Efficacy of the dynamic radiographs for diagnosing acute osteoporotic vertebral fractures.	Osteoporos Int	25	605-612	2014
Niimi R, Kono T, Nishihara A, Hasegawa M, Matsumine A, Nakamura T, Kono T, <u>Sudo A</u>	An algorithm using the early changes in PINP to predict the future BMD response for patients treated with daily teriparatide.	Osteoporos Int	25	377-384	2014

Nakamura T, Matsumine A, Uchida A, Kawai A, Nishida Y, Kunisada T, Araki N, Sugiura H, Tomita M, Yokouchi M, Ueda T, <u>Sudo A</u>	Clinical outcomes of Kyocera Modular Limb Salvage system after resection of bone sarcoma of the distal part of the femur: the Japanese Musculoskeletal Oncology Group study.	Int Orthop	38	825-830	2014
Nishimura A, Kato K, Fukuda A, Nakazora S, Yamada T, Uchida A, <u>Sudo A</u>	Prevalence of hallux valgus and risk factors among Japanese community dwellers.	J Orthop Sci	19	257-262	2014
Nishimura A, Akeda K, Kato K, Asanuma K, Yamada T, Uchida A, <u>Sudo A</u>	Osteoporosis, vertebral fractures and mortality in a Japanese rural community.	Mod Rheumatol			in press
Yamakado K, Matsumine A, Nakamura T, Nakatsuka A, Takaki H, Matsubara T, Asanuma K, <u>Sudo A</u> , Sugimura Y, Sakuma H.	Radiofrequency ablation for the treatment of recurrent bone and soft-tissue sarcomas in non-surgical candidates.	Int J Clin Oncol			in press
Wakabayashi H, Takigawa S, Hasegawa M, Kakimoto T, Yoshida K, <u>Sudo A</u>	Polyarticular late infection of total joint arthroplasties in a patient with rheumatoid arthritis treated with anti-interleukin-6 therapy.	Rheumatology (Oxford)			in press
Nishimura A, Fukuda A, Kato K, Fujisawa K, Uchida A, <u>Sudo A</u>	Vascular safety during arthroscopic all-inside meniscus suture.	Knee Surg Sports Traumatol Arthrosc			in press
Asanuma Y, Fujimoto H, Nakabayashi H, Akeda K, Asanuma K, Tanaka M, Nagakura T, Miura Y, Iino T, Ogawa K, Kasai Y, <u>Sudo A</u>	Extradural cryptococcoma at the sacral spine without bone involvement in an immunocompetent patient.	J Orthop Sci			in press
Akeda K, Matsunaga H, Imanishi T, Hasegawa M, Sakakibara T, Kasai Y, <u>Sudo A</u>	Prevalence and Countermeasures for Venous Thromboembolic Diseases Associated With Spinal Surgery: A Follow-up Study of an Institutional Protocol in 209 Patients.	Spine			in press
新美壘、河野稔文、中西加菜、西原淳、河野稔彦、 <u>湊藤啓広</u>	【腰椎疾患up-to-date】骨粗鬆症性椎体骨折に対する診断・治療の進歩 治療 テリパラチド連日皮下投与製剤の治療成績	別冊整形外科	63	143-146	2013
山田淳一、明田浩司、 <u>湊藤啓広</u> 、榊原紀彦、笠井裕一、藤井渉、福島達樹	頸椎に発生した平滑筋肉腫の1例	東海脊椎外科	27	40-43	2013

村田耕一郎、明田浩司、 <u>湊藤啓広</u> 、高北久嗣、榊原紀彦、笠井裕一	小脳腫瘍に合併した有痛性斜頸の1例	東海脊椎外科	27	47-50	2013
榊原紀彦、王卓、笠井裕一、明田浩司、 <u>湊藤啓広</u> 、三枝ふみの	新しく考案した脊椎固定法UPSS(Unilateral Pedicle and Spinous process System)の使用経験	Journal of Spine Research	4	884-887	2013
新美塁、河野稔文、川村将司、兵頭弘康、山下託矢、竹野博斗、西原淳、河野稔彦、 <u>湊藤啓広</u>	仰臥位と坐位での単純エックス線像を用いた新鮮椎体骨折の診断精度	Osteoporosis Jpn	21	360-362	2013
植村剛、辻井雅也、里中東彦、國分直樹、 <u>湊藤啓広</u>	上腕骨外顆骨折変形治癒に対し矯正骨切り術を施行した1例	中部日本整形外科災害外科学会雑誌	56	553-554	2013
飯田竜、辻井雅也、浅間信治、吉川智朗、 <u>湊藤啓広</u>	上腕骨内側上顆骨折の陳旧性関節内嵌入例に対して手術的加療を行った1例	中部日本整形外科災害外科学会雑誌	56	555-556	2013
塚本正、辻井雅也、植村剛、松峯昭彦、 <u>湊藤啓広</u> 、森本政司	橈骨遠位骨巨細胞腫による骨変形で生じた長母指伸筋腱断裂の1例	中部日本整形外科災害外科学会雑誌	56	601-602	2013
中瀬一真、明田浩司、榊原紀彦、笠井裕一、村田耕一郎、 <u>湊藤啓広</u>	成人期の脊髄係留症候群に対し脊柱短縮術を行った1例	中部日本整形外科災害外科学会雑誌	56	727-728	2013
森本亮、明田浩司、今西隆夫、榊原紀彦、笠井裕一、 <u>湊藤啓広</u>	腰部脊柱管狭窄症患者における動脈硬化関連疾患の治療歴および治療内容の調査	中部日本整形外科災害外科学会雑誌	56	759-760	2013
町田博文、清原実千代、武内操、武内秀之、辻井雅也、 <u>湊藤啓広</u>	透析関連疼痛がバスキュラーアクセス切除にて著明に改善した1例	腎と透析	74巻別冊	146-148	2013
山口和輝、直江祐樹、谷有紀子、岡嶋正幸、野首清矢、坂本妙子、南端翔多、長谷川正裕、松原孝夫、 <u>湊藤啓広</u>	MIS TKAにおけるmini-midvastusアプローチとmini-subvastusアプローチによる術後 早期成績の比較	国立大学リハビリテーション療法士学術大会誌	34回	43-46	2013
和田英夫、長谷川正裕、宮本憲、 <u>湊藤啓広</u> 、太田覚史、山田典一、中村真潮	整形外科術後のフォンダパリヌクス投与例における抗Xa活性と合併症との関係	心臓	45	877-878	2013
伊東直也、松峯昭彦、竹上徳彦、辻井雅也、 <u>湊藤啓広</u>	コンパートメント症候群様症状で発症した悪性リンパ腫の1例	部日本整形外科災害外科学会雑誌	56	1159-1160	2013
植村剛、辻井雅也、國分直樹、飯田竜、平田仁、 <u>湊藤啓広</u>	MRIを用いた尺骨動脈と有鉤骨鉤の解剖学的検討	中部日本整形外科災害外科学会雑誌	56	1371-1372	2013

吉田格之進、長谷川正裕、友田良太、宮崎晋一、西村誠、新美墨、若林弘樹、宮本憲、 <u>須藤啓広</u>	THAにおける術前計画とナビゲーション THAにおけるCT-based navigation使用有無でのカップ設置精度の比較検討	日本人工関節学会誌	43	63-64	2013
吉川智朗、山川徹、森川丞二、松本衛、中空繁登、細井哲、 <u>須藤啓広</u>	THAメタルオンメタル人工股関節置換術後にヘッド-ネック接合部に金属腐食を生じた症例におけるステムネックテーパー部の電子顕微鏡的解析	日本人工関節学会誌	43	249-250	2013
松井佑梨世、長谷川正裕、宮本憲、若林弘樹、 <u>須藤啓広</u>	THAその他 人工股関節置換術における術中運動誘発電位モニタリングの使用経験	日本人工関節学会誌	43	687-688	2013
<u>西脇祐司</u>	新しいエクササイズガイドを考える 介護予防からみたエクササイズ	日本臨床スポーツ医学会誌	21	327-329	2013
Minamide A, <u>Yoshida M</u> , Maio K	The natural clinical course of lumbar spinal stenosis: a longitudinal cohort study over a minimum of 10 years.	J Orthop Sci	18	693-698	2013

IV. 研究成果の刊行物・別刷

Incidence of disability and its associated factors in Japanese men and women: the Longitudinal Cohorts of Motor System Organ (LOCOMO) study

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Abstract We investigated the incidence of disability and its risk factors in older Japanese adults to establish an evidence-based disability prevention strategy for this population. For this purpose, we used data from the Longitudinal Cohorts of Motor System Organ (LOCOMO) study, initiated in 2008 to integrate information from cohorts in nine communities across Japan: Tokyo (two regions), Wakayama (two regions), Hiroshima, Niigata, Mie, Akita, and Gunma prefectures. We examined the annual occurrence of disability from 8,454 individuals (2,705 men and 5,749 women) aged ≥ 65 years. The estimated incidence of disability was 3.58/100 person-years (p-y) (men: 3.17/100 p-y; women: 3.78/100 p-y). To determine factors associated with disability, Cox's proportional hazard model was

used, with the occurrence of disability as an objective variable and age (+1 year), gender (vs. women), body build (0: normal/overweight range, BMI 18.5–27.5 kg/m²; 1: emaciation, BMI <18.5 kg/m²; 2: obesity, BMI >27.5 kg/m²), and regional differences (0: rural areas including Wakayama, Niigata, Mie, Akita, and Gunma vs. 1: urban areas including Tokyo and Hiroshima) as explanatory variables. Age, body build, and regional difference significantly influenced the occurrence of disability (age, +1 year: hazard ratio 1.13, 95 % confidence interval 1.12–1.15, $p < 0.001$; body build, vs. emaciation: 1.24, 1.01–1.53, $p = 0.041$; body build, vs. obesity: 1.36, 1.08–1.71, $p = 0.009$; residence, vs. living in rural areas: 1.59, 1.37–1.85, $p < 0.001$). We concluded that higher age,

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both emaciation and obesity, and living in rural areas would be risk factors for the occurrence of disability.

Keywords Nation-wide population-based cohort study · Epidemiology · Incidence · Disability · Body build

Introduction

In Japan, the proportion of the population aged 65 years or older has increased rapidly over the years. In 1950, 1985, 2005, and 2010, this proportion was 4.9, 10.3, 19.9, and 23.0 %, respectively [1]. Further, this proportion is estimated to reach 30.1 % in 2024 and 39.0 % in 2051 [2]. The rapid aging of Japanese society, unprecedented in world history, has led to an increase in the number of disabled elderly individuals requiring support or long-term care. The Japanese government initiated the national long-term care insurance system in April 2000 in adherence with the Long-Term Care Insurance Act [3]. The aim of the national long-term care insurance system was to certify the level of care needed by elderly adults and to provide suitable care services to them according to the levels of their long-term care needs. According to the recent National Livelihood Survey by the Ministry of Health, Labour and Welfare in Japan, the number of elderly individuals certified as needing care services increases annually, having reached 5 million in 2011 [4].

However, few prospective, longitudinal, and cross-national studies have been carried out to inform the development of a prevention strategy against disability. To establish evidence-based prevention strategies, it is critically important to accumulate epidemiologic evidence, including the incidence of disability, and identify its risk factors. However, few studies have attempted to estimate the incidence of the disability and its risk factors by using population-based cohorts. In addition, to identify the incidence of disability, a study should have a large number of subjects. Further, to determine regional differences in epidemiological indices, a survey of cohorts across Japan is required.

The Longitudinal Cohorts of Motor System Organ (LOCOMO) study was initiated in 2008, through a grant from Japan's Ministry of Health, Labour and Welfare, for the prevention of knee pain, back pain, bone fractures, and subsequent disability. It aimed to integrate data gathered from cohorts from 2000 onwards and follow-up surveys from 2006 onwards, using a unified questionnaire, with an ultimate goal being the prevention of musculoskeletal diseases. The present study specifically aims at using LOCOMO data, which is based on the long-term care insurance system, to investigate the occurrence of disability in order to clarify its incidence and risk factors, especially in terms of body build and regional differences.

Materials and methods

Participants were residents of nine communities located in Tokyo (two regions: Tokyo-1, principal investigators (PIs): Shigeyuki Muraki, Toru Akune, Noriko Yoshimura, Kozo Nakamura; Tokyo-2, PIs: Yoko Shimizu, Hideyo Yoshida, Takao Suzuki), Wakayama [two regions: Wakayama-1 (mountainous region) and Wakayama-2 (coastal region), PIs: Noriko Yoshimura, Munehito Yoshida], Hiroshima (PI: Saeko Fujiwara), Niigata (PI: Go Omori), Mie (PI: Akihiro Sudo), Akita (PI: Hideyo Yoshida), and Gunma (PI: Yuji Nishiwaki) prefectures [5]. Figure 1 shows the location of each cohort in Japan.

Disability in the present study was defined as 'cases requiring long-term care', as determined by the long-term care insurance system. The procedure for identifying these cases is as follows: (1) each municipality establishes a long-term care approval board consisting of clinical experts, physicians, and specialists at the Division of Health and Welfare in each municipal office; (2) The long-term care approval board investigates the insured person by using an interviewer-administered questionnaire consisting of 82 items regarding mental and physical conditions, and makes a screening judgement based on the opinion of a regular doctor; (3) 'Cases requiring long-term care' are determined according to standards for long-term care certification that are uniformly and objectively applied nationwide [6].

In order to identify the incidence of disability, data were collected from participants aged 65 years and older within the above-mentioned cohorts. In Japan, most individuals certified as 'cases requiring long-term care' are 65 years and older. Table 1 shows the number of subjects per region, as well as the data obtained within the first year of the observation. The smallest cohort consisted of 239 subjects, residing in Mie, while the largest consisted of 1,758, who resided in Gunma.

The earliest baseline data were collected in 2000 in Hiroshima, while the latest were obtained in 2008 in Tokyo-2. The cohorts were subsequently followed until 2012. Data regarding participants' deaths, changes of residence, and occurrence or non-occurrence of certified disability were gathered annually from public health centres of the participating municipalities. As an index of body build, baseline data on participants' height and weight were collected, and used to calculate body mass index (BMI, kg/m²). Participants were classified as follows: normal or overweight (BMI = 18.5–27.5), obese (BMI >27.5), or emaciated (BMI <18.5). These cut-off points were determined according to a WHO report [7]. From 2008 onwards, follow-up data was obtained using the unified questionnaire.

All participants provided written informed consent, and the study was conducted with the approval of the ethics committees of the University of Tokyo (nos. 1264 and 1326), the Tokyo Metropolitan Institute of Gerontology

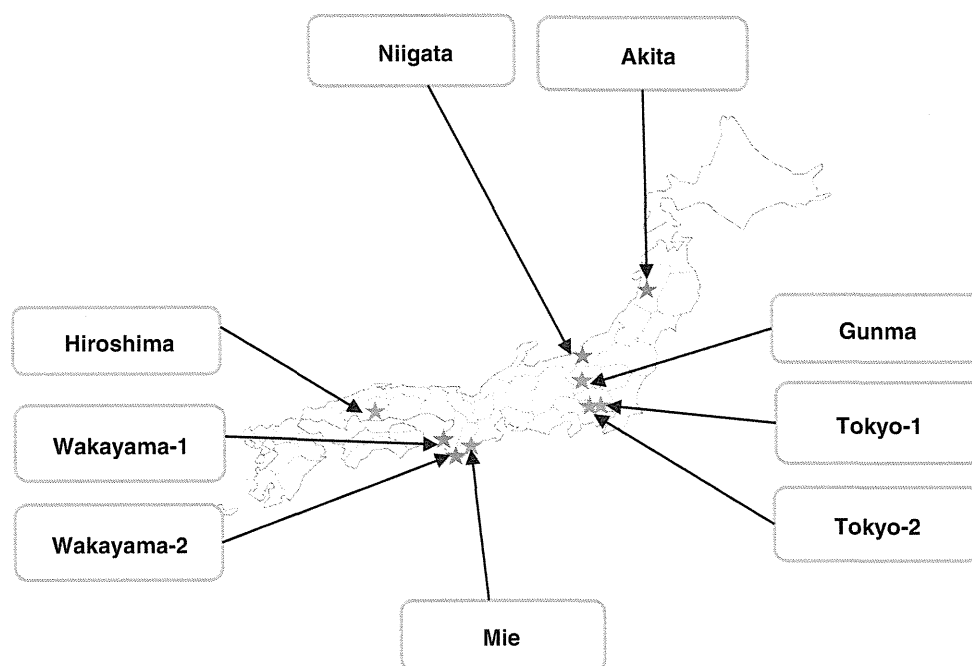


Fig. 1 Location of nine regions from which the study cohorts were selected

Table 1 Number of subjects classified by regions of each cohort

Region	Start year	Total	Men	Women
Tokyo-1	2005	1,332	461	871
Tokyo-2	2008	1,453	59	1,394
Wakayama-1 (Mountainous)	2005	610	239	371
Wakayama-2 (Coastal)	2006	357	129	228
Hiroshima	2000	1,341	351	990
Niigata	2007	805	343	462
Mie	2001	239	95	144
Akita	2006	559	223	336
Gunma	2005	1,758	805	953
Total		8,454	2,705	5,749

(no. 5), Wakayama (no. 373), the Radiation Effects Research Foundation (RP 03-89), Niigata University (no. 446), Mie University (nos. 837 and 139), Keio University (no. 16–20), and the National Center for Geriatrics and Gerontology (no. 249). Careful consideration was given to ensure the safety of the participants during all of the study procedures.

Statistical analysis

All statistical analyses were performed using STATA (STATA Corp., College Station, Texas, USA). Differences in proportions were compared using the chi-squared test. Differences in continuous variables were tested using an analysis of variance (ANOVA) with Scheffe's least significant difference test for post-hoc pairwise comparisons. To

test the association between the occurrence of disability and other variables, Cox's proportional hazard regression analysis was used. Hazard ratios (HRs) were estimated using the occurrence of disability as an objective variable (0: non-occurrence, 1: occurrence) and the following explanatory variables: age (± 1 year), gender (vs. female), body build (0: normal and overweight vs. 1: emaciation vs. 2: obesity), and regional differences (0: rural areas, including Wakayama-1, Wakayama-2, Niigata, Mie, Akita, and Gunma vs. 1: urban areas, including Tokyo-1, Tokyo-2, and Hiroshima). All *p* values and 95 % confidence intervals (CI) of two-sided analyses are presented.

Results

Table 2 shows the number of participants classified by age and gender. The majority of participants were 75–79 years old; two-thirds of the participants were women.

Selected characteristics of the study population, including age, height, weight, and BMI, are shown in Table 3. The mean values of age, height, and weight were significantly greater in women than in men ($p < 0.001$), but BMI did not significantly differ between men and women ($p = 0.479$).

The estimated incidence of disability is shown in Fig. 2. In total, the incidence of disability among individuals aged 65 years and older was 3.58/100 person-years (p-y) (p-y; men: 3.17/100 p-y; women: 3.78/100 p-y). The incidence of disability was 0.83/100 p-y, 1.70/100 p-y, 3.00/100 p-y,

Table 2 Number of subjects classified by age and gender

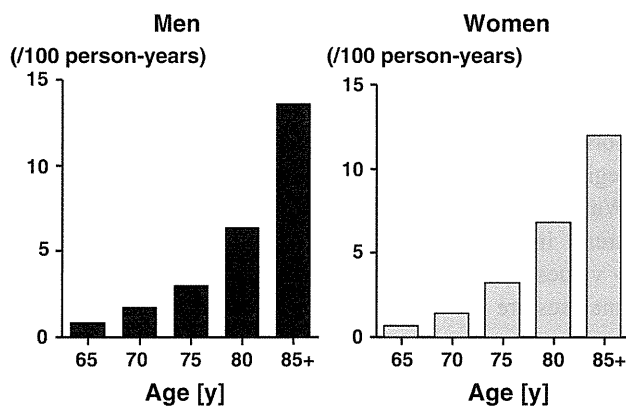
Age strata (years)	Total (%)	Men (%)	Women (%)
65–69	1,390 (16.4)	555 (20.5)	835 (14.5)
70–74	1,704 (20.2)	668 (24.7)	1,036 (18.0)
75–79	2,923 (34.6)	812 (30.0)	2,111 (36.7)
80–84	1,810 (21.4)	463 (17.1)	1,347 (23.4)
≥85	627 (7.4)	207 (7.7)	420 (7.3)
Total	8,454 (100.0)	2,705 (100.0)	5,749 (100.0)

Table 3 Baseline characteristics of subjects classified by age and gender

Variables	Men	Women	<i>p</i> (men vs. women)
Age (years)	75.3 (6.4)	76.5 (6.0)	<0.001
Height (cm)	160.5 (6.5)	147.7 (6.1)	<0.001
Weight (kg)	58.7 (9.1)	49.8 (8.4)	<0.001
BMI (kg/m ²)	22.7 (2.9)	22.8 (3.5)	0.479
Living in rural area (%)	84.8	58.5	<0.001

Values are represented as mean (standard deviation)

BMI body mass index

**Fig. 2** Incidence of disability according to age and gender

6.36/100 p-y, and 13.54/100 p-y in 65–69-, 70–74-, 75–79-, 80–84-, and ≥85-year-old men, respectively. In women, the incidence of disability was 0.71/100 p-y, 1.40/100 p-y, 3.25/100 p-y, 6.85/100 p-y, and 12.01/100 p-y in the age ranges of 65–69, 70–74, 75–79, 80–84, and 85 or more years, respectively (Table 4).

Cox's proportional hazard regression analysis showed that occurrence of disability was significantly influenced by age, body build, and regional differences, but not gender (age, +1 years: hazard ratio 1.13, 95 % confidence interval 1.12–1.15, $p < 0.001$; sex, vs. female: 1.13, 0.97–1.31, $p = 0.125$; body build: emaciation: 1.24, 1.01–1.53, $p = 0.041$; body build; obesity: 1.36, 1.08–1.71, $p = 0.009$; residence, vs. living in rural areas: 1.59, 1.37–1.85, $p < 0.001$).

Discussion

Using the data of the LOCOMO study, we determined the incidence of disability and identified age, emaciation, obesity, and residence in rural areas as risk factors for the occurrence of disability. More specifically, we integrated data collected from subjects aged 65 and older in individual cohorts established in nine regions across Japan to determine the incidence of disability in the specified regions. We found an association between various risk factors and disability; these include age, emaciation, and obesity, as well as residence in rural areas.

The LOCOMO study was the first nation-wide prospective study to track a large number of the subjects from several population-based cohorts. The LOCOMO study aimed to integrate information from these cohorts, to prevent musculoskeletal diseases and subsequent disability. The data shed light on the prevalence and characteristics of targeted clinical symptoms such as knee pain or lumbar pain, or defined diseases such as knee osteoarthritis (KOA), lumbar spondylosis (LS), and osteoporosis (OP), as well as their prognosis in reference to either mortality or chances of developing a disability. In the present study, we also

Table 4 Hazard ratios (HRs) of potential risk factors for the occurrence and non-occurrence of disability

Disability (occurrence vs. non-occurrence)				
Explanatory variable	Reference	HR	95 % confidence interval	<i>p</i>
Age (years)	+1 year	1.13	1.12–1.15	<0.001***
Gender	0: men, 1: women	1.13	0.97–1.31	0.125
Body build	0: $18.5 \leq \text{BMI} \leq 27.5$, 1: $\text{BMI} < 18.5$	1.24	1.01–1.53	0.041*
	0: $18.5 \leq \text{BMI} \leq 27.5$, 2: $\text{BMI} > 27.5$	1.36	1.08–1.71	0.009**
Type of residential area	0: urban area, 1: rural area	1.59	1.37–1.85	<0.001***

BMI body mass index

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

compared the above-mentioned symptoms, diseases, and prognoses between regions.

The overall incidence of disability among individuals aged 65 years and older was 3.58/100 person-years. When results from the present study are applied to the total age-sex distribution derived from the Japanese census in 2010 [1], it could be assumed that 1,110,000 people (410,000 men and 700,000 women) aged 65 years and older are newly affected by disability and require support. It has been reported that the total number of subjects who were certified as needing care increases annually [4]; however, few of these reports estimate the number of newly certified cases through a population-based cohort. Clarifying the incidence of disability and its risk factors was viewed as the first step toward preventing its occurrence.

Emaciation and obesity were both identified as risk factors for disability; thus, there appears to be a U-shaped association between BMI and disability as well as between BMI and mortality [8, 9]. According to the recent National Livelihood Survey, the leading cause of disabilities that require support and long-term care is cardiovascular disease (CVD), followed by dementia, senility, osteoarthritis, and fractures [4]. Obesity is an established risk factor for chronic diseases, including hypertension, dyslipidemia, and diabetes mellitus, which increase the risk for CVD [10]; in turn, CVD causes ADL-related disabilities in older adults. In addition, numerous reports have shown an association between overweight or obesity and KOA [11–17]. In previous reports, we found a significant association between BMI and not only the presence of KOA, but also the occurrence and progression of KOA [18, 19]. In addition, emaciation is an established risk factor for OP and OP-related fractures [20]. OP might be related to low nutrition due to chronic wasting diseases.

The current study also found an association between living in a rural area and the occurrence of disability. There have been reports of regional differences in the certification rate of disability in Japan. For instance, Kobayashi reported a prefectural difference in the certification rate of disability, which was particularly prominent among individuals aged 75 years and older at lower nursing care levels in the long-term care insurance system [21]. In addition, Shimizutani et al. [22] pointed out that the financial condition of the insurer influenced the certification rate of disability. Further, Nakamura found that the certification of lower care levels was influenced by social and/or individual factors, such as the type of service provider, the application rate, and number of medical treatment recipients. However, certification of advanced nursing care levels was influenced by CVD and lifestyle-related diseases [23].

Other than differences in the social backgrounds of individuals in each prefecture, we posited that regional differences (rural or urban) in the occurrence of disability

might be due to differences in the frequency of diseases and ailments that cause disability in each area. The prevalence of musculoskeletal diseases, such as KOA and LS, differs among mountainous, coastal, and urban areas [24]. Evidence also exists for regional differences in the incidence of hip fractures [25–27]. It was also found that mortality and incidence of ischemic stroke, which is related to CVD, was higher in the northeastern than in the southwestern part of Japan [28]. However, there is currently no information on regional differences in dementia prevalence and incidence in Japan. In general, differences in the frequency of diseases causing disability might influence regional differences in disability rates. In relation to this, in a future study on follow-up data from the LOCOMO study, it might be necessary to collect information on the prevalence and frequency of diseases that cause disability, such as musculoskeletal diseases, CVD, and dementia. This future study should also attempt to clarify mutual associations among risk factors for disability, so as to inform the development of measures for its primary prevention.

Despite its contribution to existing knowledge, the present study has several limitations. First, its sample does not truly represent the entire Japanese population, because our cohorts were not drawn from the northernmost and southernmost parts of Japan (e.g., Okinawa prefecture or Hokkaido prefecture). This limitation must be taken into consideration, especially when determining the generalisability of the results. However, the LOCOMO study is the first large-scale, population-based prospective study with approximately 9,000 participants aged 65 years and older. Second, data collected from the cohorts were not uniform, as certain information was obtained from some participants, but not others. For example, the X-ray examinations of subjects' knees were performed in Tokyo-1, Wakayama-1, Wakayama-2, Niigata, and Mie; lumbar spine X-ray examinations were performed in Tokyo-1, Wakayama-1, Wakayama-2, Hiroshima, and Mie. Therefore, we could not evaluate the presence or absence of KOA, LS, or OP as a possible cause of disability by using the data of the entire LOCOMO study. Further investigation following the integration of information on musculoskeletal disorders would enable us to evaluate all the factors that are associated with disability.

Nevertheless, our study has several strengths. As mentioned above, the large sample size is the study's biggest strength. The second strength is that we collected data from nine cohorts across Japan, which enabled us to compare regional differences in the incidence of disability. In addition, the variety of measures and assessments used in this study enabled us to collect a substantial amount of detailed information. However, given the fact that not all of the measures were administered in all cohorts, regional selection bias in the analysis should be considered when interpreting the results.

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Conflict of interest All authors declare no conflicts of interest.

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Prevalence of knee pain, lumbar pain and its coexistence in Japanese men and women: The Longitudinal Cohorts of Motor System Organ (LOCOMO) study

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Abstract The Longitudinal Cohorts of Motor System Organ (LOCOMO) study was initiated in 2008 through a grant from the Ministry of Health, Labour, and Welfare of Japan to integrate information from several cohorts established for the prevention of musculoskeletal diseases. We integrated the information of 12,019 participants (3,959 men and 8,060 women) in the cohorts comprising nine communities located in Tokyo (two regions: Tokyo-1 and Tokyo-2), Wakayama [two regions: Wakayama-1 (mountainous region) and Wakayama-2 (seaside region)], Hiroshima, Niigata, Mie, Akita, and Gunma prefectures. The baseline examination of the LOCOMO study consisted of an interviewer-administered questionnaire, anthropometric measurements, medical information recording, X-ray

radiography, and bone mineral density measurement. The prevalence of knee pain was 32.7 % (men 27.9 %; women 35.1 %) and that of lumbar pain was 37.7 % (men 34.2 %; women 39.4 %). Among the 9,046 individuals who were surveyed on both knee pain and lumbar pain at the baseline examination in each cohort, we noted that the prevalence of both knee pain and lumbar pain was 12.2 % (men 10.9 %; women 12.8 %). Logistic regression analysis showed that higher age, female sex, higher body mass index (BMI), living in a rural area, and the presence of lumbar pain significantly influenced the presence of knee pain. Similarly, higher age, female sex, higher BMI, living in a rural area, and the presence of knee pain significantly influenced the presence of lumbar pain. Thus, by using the data of the

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LOCOMO study, we clarified the prevalence of knee pain and lumbar pain, their coexistence, and their associated factors.

Keywords Nation-wide population-based cohort study · Epidemiology · Prevalence · Knee pain · Lumbar pain

Introduction

Musculoskeletal diseases, including osteoarthritis (OA) and osteoporosis (OP), are major public health problems among the elderly; these diseases can affect activities of daily living (ADL) and quality of life (QOL), and can lead to increased morbidity and mortality. According to the recent National Livelihood Survey by the Ministry of Health, Labour, and Welfare in Japan, OA is ranked fourth among diseases that cause disabilities and subsequently require support for ADL, whereas falls and osteoporotic fractures are ranked fifth [1]. Studies have reported increased mortality after osteoporotic fractures at the hip and other sites [2]. An estimated 47,000,000 individuals (21,000,000 men and 26,000,000 women) aged ≥ 40 years will eventually be affected by either OA or OP [3].

Considering that the population of Japan is aging rapidly, a comprehensive and evidence-based prevention strategy for musculoskeletal diseases is urgently needed. However, only a few prospective, longitudinal studies designed to develop such a strategy have been conducted. Therefore, little information is available regarding the incidence of disability and the prevalence and incidence of musculoskeletal disorders, including knee pain, and lumbar pain, and their associated factors in Japan. The absence of such epidemiological data hampers the rational design of clinical and public health approaches for the diagnosis, evaluation, and prevention of musculoskeletal diseases.

Several cohorts have focused on the prevention of OP, knee OA (KOA), lumbar spondylosis (LS) or disability caused by musculoskeletal diseases. However, since the prevalence of the musculoskeletal diseases has been reported to be high [3], the extent of the population at risk after excluding those who had the target disease at the baseline seems to be small. To identify epidemiological indices, especially the incidence of musculoskeletal diseases and/or disability, a large number of subjects is required. In addition, to determine the regional differences in epidemiological indices, we need a survey of cohorts across Japan.

The Longitudinal Cohorts of Motor System Organ (LOCOMO) study was initiated in 2008 by the members of the committee for 'the prevention of knee and back pain and bone fractures in a large cohort of regionally

representative residents from across Japan,' through a grant from the Ministry of Health, Labour, and Welfare of Japan (Director, Noriko Yoshimura). This study aimed to integrate the information of several cohorts established for the prevention of musculoskeletal diseases from 2000 onwards, and to initiate a follow-up examination using the unified questionnaire from 2006 onwards in Japan.

In the present paper, by using the integrated information at the baseline of the LOCOMO study, we tried to confirm the prevalence of clinical symptoms of musculoskeletal diseases, such as knee pain and lumbar pain and their characteristics.

Materials and methods

Participants

Participants in the cohorts were residents of nine communities located in Tokyo (two regions: Tokyo-1, principle investigators (PIs): Shigeyuki Muraki, Toru Akune, Noriko Yoshimura, Kozo Nakamura; Tokyo-2, PIs: Yoko Shimizu, Hideyo Yoshida, Takao Suzuki), Wakayama [two regions: Wakayama-1 (mountainous region) and Wakayama-2 (sea-side region); PIs: Noriko Yoshimura, Munehito Yoshida], Hiroshima (PI: Saeko Fujiwara), Niigata (PI: Go Omori), Mie (PI: Akihiro Sudo), Akita (PI: Hideyo Yoshida), and Gunma (PI: Yuji Nishiwaki) prefectures [4]. Figure 1 shows the location of each cohort in Japan, and Fig. 2 provides the timeline of the LOCOMO study. Residents of the nine regions were recruited from resident registration lists in the relevant region. Data for the 12,019 participants were collected and registered as an integrated cohort. Numbers of participants in the LOCOMO study classified by regions of each cohort are shown in Table 1. The smallest cohort consisted of 826 individuals in Wakayama-2, and the largest consisted of 2,613 individuals in Hiroshima.

All participants provided written informed consent, and the study was conducted with the approval of the ethics committees of the University of Tokyo (nos. 1264 and 1326), the Tokyo Metropolitan Institute of Gerontology (no. 5), Wakayama (no. 373), The Radiation Effects Research Foundation (RP03-89), Niigata University (no. 446), Mie University (no. 837 and no. 139), Keio University (no. 16–20), and National Center for Geriatrics and Gerontology (no. 249). Safety of the participants was ensured during the examination and during all other study procedures.

Data collection

The baseline examination of the LOCOMO study consisted of the following: an interviewer-administered questionnaire,

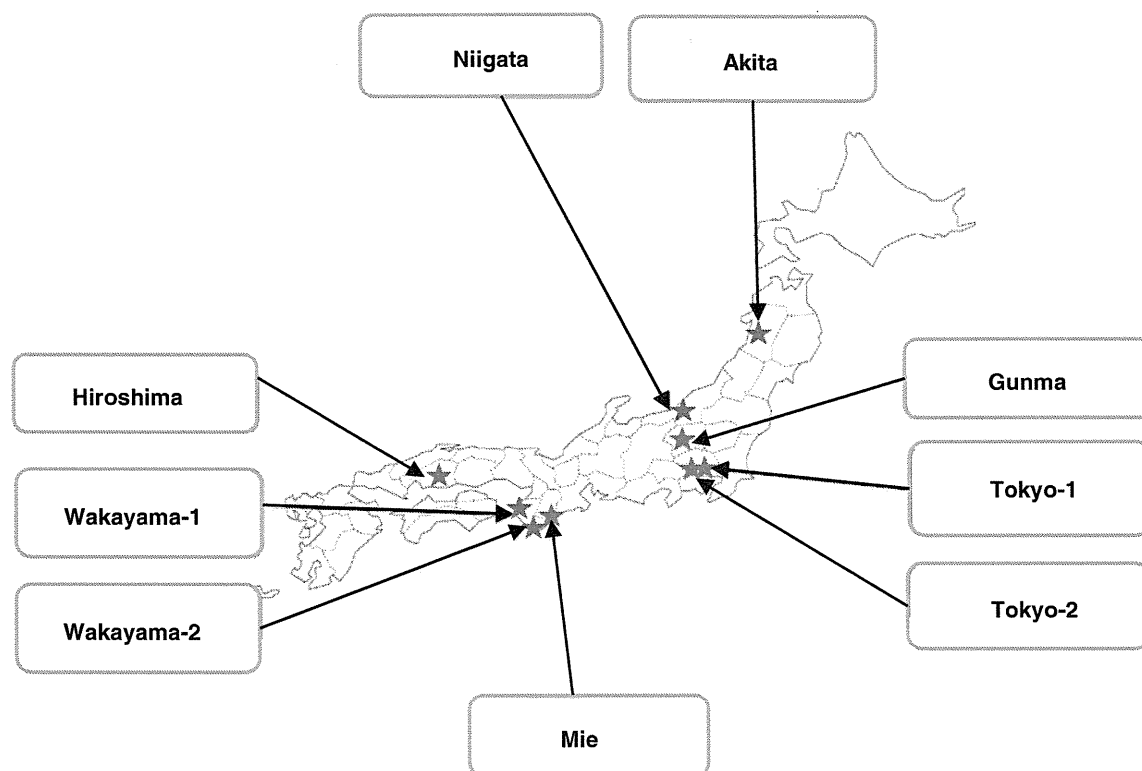


Fig. 1 Locations of the nine different regions from which the study cohorts were derived

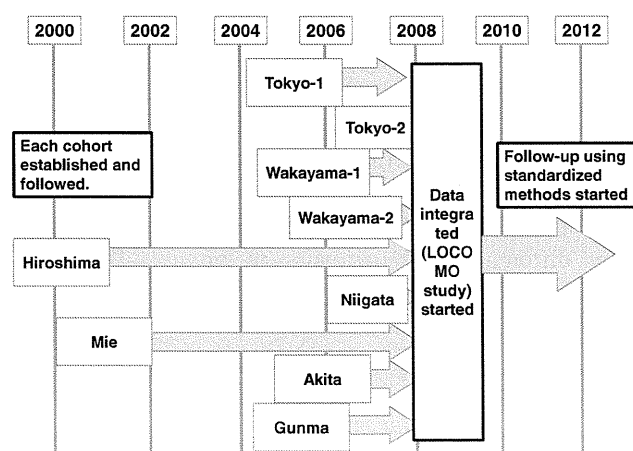


Fig. 2 Timeline of the LOCOMO study

Table 1 Numbers of participants in the LOCOMO study classified by regions of each cohort

Regions of each cohort	Start year	Total	Men	Women
Tokyo-1	2005	1,350	465	885
Tokyo-2	2008	1,453	59	1,394
Wakayama-1 (mountainous)	2005	864	319	545
Wakayama-2 (seaside)	2006	826	277	549
Hiroshima	2000	2,613	794	1,819
Niigata	2007	1,474	628	846
Mie	2001	1,175	423	752
Akita	2006	852	366	486
Gunma	2005	1,412	628	784
Total		12,019	3,959	8,060

anthropometric measurements, medical information recording, radiography, and bone mineral density (BMD) measurement.

Interviewer-administered questionnaire

A questionnaire was prepared by modifying the questionnaire used in the Osteoporotic Fractures in Men Study (MrOS) [5], and some new items were added to the modified questionnaire. Knee symptoms were evaluated using

the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) [6]. Health-related QOL was evaluated using the European QOL-5 dimensions instrument (EuroQOL EQ5D) [7] and the Medical Outcomes Study 8-item Short Form (SF-8) [8]. The study staff recorded all the medications administered and their doses.

Anthropometric measurements

Anthropometric factors were measured by well-trained medical nurses. Body mass index [BMI; weight in