の技術的側面が大きく改善された。しかし，健診結果を判定する基準は健診施設ごとに統一されておらず，施設間の連携は十分取れていない。健診の質の向上という点から，健診結果の判定を標準化することも重要であり，これにより地域健診と職域健診のつながりが生まれ，終身的健康管理が実現されると期待される。そして，健診結果を判定する基準は最新の科学的根拠を踏まえた専門学会や専門委員会の判定基準を反映させることが，科学的根拠に基づく健康管理を実現するためにも，健診と医療との連携をスムーズにするためにも，有効であると考えられる。

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Summary

Criteria for Detection and Evaluation of Lifestyle Diseases

Machi SUKA, Katsumi YOSHIDA

Health examination data should be evaluated appropriately to instruct the health examinee what to do. Health examination organizations should determine reasonable criteria for detecting unhealthy conditions. Here we describe the latest criteria of obesity, diabetes, hypertension, hyperlipidemia, and hyperurinemia that have been developed by the corresponding expert panels. We discuss how to evaluate health examination data.

Key Words : Clinical Guideline, Criteria, Lifestyle Diseases, Health Examination

Health Risk Appraisal Using Internet Technology

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Summary

Objective: To develop a Web-based Health Risk Appraisal (HRA) system as a tool for health education based on personal health examination data.

Methods: A Japanese health examination database was analyzed to develop models for HRA, which were designed to predict each of ten laboratory values in a year with and without lifestyle modifications. The HRA models were embedded into a server.

Results: The Web-based HRA system has been introduced into a Japanese health care association having 37 branch centers. Following a health examination, an individual health education program using the Web-based HRA system is provided to a given client at each branch center or at a client's office. A measured laboratory value and corresponding predicted laboratory values in a year with and without lifestyle modifications are displayed on the screen in forms of both numerical values and graphs. A trained nurse or another health care provider operates the system and explains the HRA result.

Conclusion: The Web-based HRA system will be a practical tool for individual health education following health examination.

Keywords

Health Risk Appraisal, Internet, health education, health examination

Methods Inf Med 2005; 44: 310–4

1. Introduction

In Japan, health examinations are regularly performed as a public health service. The aim is early detection of diseases and their risk factors, which should lead to disease prevention and health promotion. Health education for high risk individuals is one of the major preventive activities following health examinations. A trained nurse or another health care provider explains health examination data, elicits current lifestyles, and encourages goal setting for healthy lifestyles. However, there have been arguments whether such a health education program is cost-effective. Another innovative tool for individual health education has been much in demand.

Health Risk Appraisal (HRA) has become a popular component of health education programs, especially in the United States, for stimulating lifestyle modifications [1, 2]. The visual presentation of health risks can be of help in attracting attention to and promoting active participation of clients in a given health education program. Nowadays, a number of computer-assisted HRA systems have been developed by Japanese researchers [3]. Most of them are stand-alone type systems, which work on specific application software. Accordingly, they have been used exclusively at health care facilities concerned.

In the recent decade, the Internet technology has made remarkable progress and come into wide use. A rapid increase in access to the Internet has made it a viable mode for delivering health education programs [4]. We developed a Web-based HRA system as a tool for health education based on personal health examination data. The system has been introduced into a Japanese health care association having 37 branch centers.

2. Methods

2.1 Basic Concept of the Web-based HRA System

A Web-based HRA system is designed to be used in the individual health education programs following health examinations at health care centers or at client's offices. It is assumed that the system should be operated by a trained nurse or another health care provider with active participation of clients.

The system can be used by any type of computer (Windows, Mac, UNIX, etc.). No additional software except for browser is required of users.

2.2 HRA Models

A health examination database of a Japanese population (65,847 men and 10,287 women) was analyzed to develop models for HRA. The HRA models were designed to predict each of the ten laboratory values (systolic blood pressure, diastolic blood pressure, triglyceride, cholesterol, fasting blood glucose, uric acid, AST, ALT, γGTP, and hemoglobin) in a year with and without lifestyle modifications for a given client. Finally, the HRA models were embedded into a Windows server that was installed Oracle as a relational database management system [3].

2.3 Prototype Test

A working prototype was introduced into a Japanese health care association having 37 branch centers (Japan Association of Health Service. http://www.yobouigaku-chuo.jp). A written operation guide was provided to each branch center. Hour-long

workshops for actual users (trained nurses and other health care providers) were conducted on demand.

After a year-long trial period (between April 2001 and April 2002), user's comments and suggestions on the prototype were collected via telephone, fax, or e-mail. Moreover, one of the authors organized a small group discussion with users to identify improvement area.

2.4 Upgrade

The HRA system was upgraded on the basis of findings from the prototype test. Main changes that incorporated the user's comments and suggestions were:

1) Increased number of lifestyle items to be input.
2) Increased number of categories in the pull-down menu for each lifestyle item.
3) Indication of a possible change interval in the resulting graph.

The server was replaced in November, 2002.

2.5 System Security

There is hardly any problem with data protection, because no personal identification data including name and address is known and stored. A firewall is placed between the server and the Internet. Only users certified by ID and password can log into the server.

3. Results

Figure 1 shows an overview of the Web-based HRA system, which has been introduced into a Japanese health care association having 37 branch centers. Following a health examination, an individual health education program using the Web-based HRA system is provided to a given client at each branch center or at a client's office. A trained nurse or another health care provider operates the system and explains the HRA result.

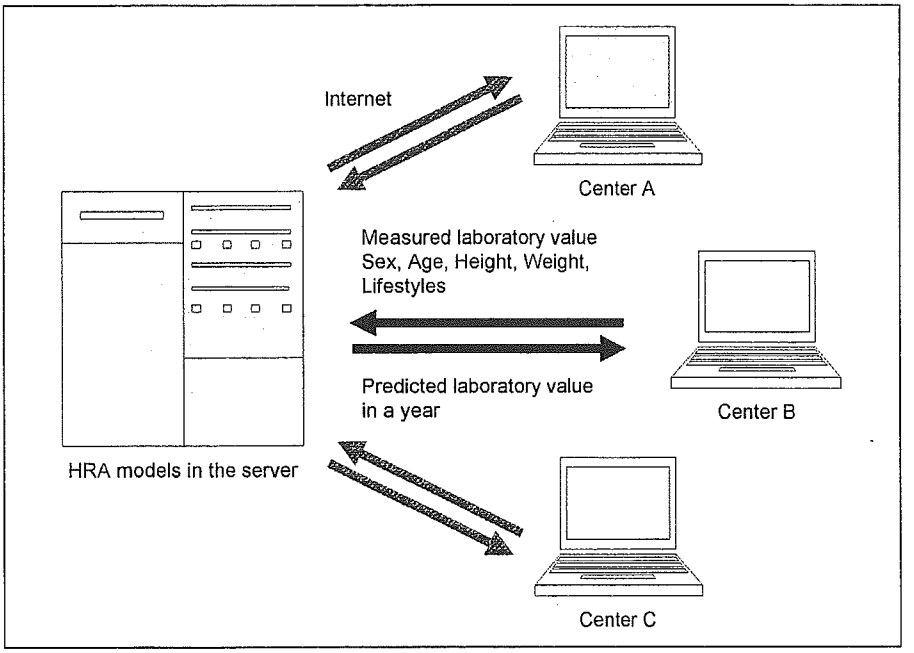

Fig. 1 Overview of the Web-based HRA system

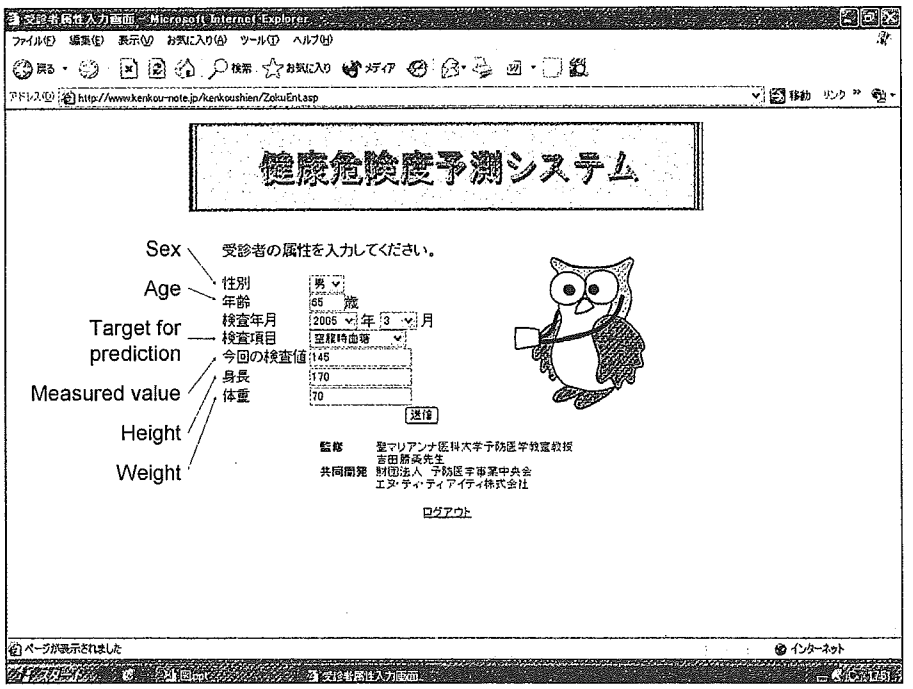

Fig. 2 Welcome screen of the HRA system. A laboratory item to be targeted for prediction is selected from a pull-down menu. A measured value of the selected laboratory item along with sex, age, height, and weight is input into respective fields.

After certified by ID and password, users log into the server. Figure 2 shows a welcome screen of the HRA system. The user selects a laboratory item to be targeted for prediction from a pull-down menu and inputs a measured value of the selected laboratory item along with sex, age, height, and weight into respective fields.

Figure 3 shows a screen to be input current lifestyles. For each lifestyle item, the

Table 1 Lifestyle items

	Categories
Household	live with family live alone
Overtime work	< 10 hours per month ≥ 10 hours per month
Smoking	rarely or never < 20 cigarettes per day ≥ 20 cigarettes per day
Alcohol drinking	0-1 day per week 2-3 days per week 4-5 days per week 6-7 days per week
Salty foods	less normal much
Sweets	less normal much
Oily foods	less normal much
Vegetables	much normal less
Three meals a day	every day some days not at all
Exercise	regularly do irregularly or never do
Walk	≥ 60 minutes per day < 60 minutes per day
Sleep	≥ 6 hours per day < 6 hours per day
Insomnia	rarely or never feel feel
Pressure at workplace	rarely or never feel feel
Distress in relationships	rarely or never feel feel
Depression	rarely or never feel feel
Morning fatigue	rarely or never feel feel

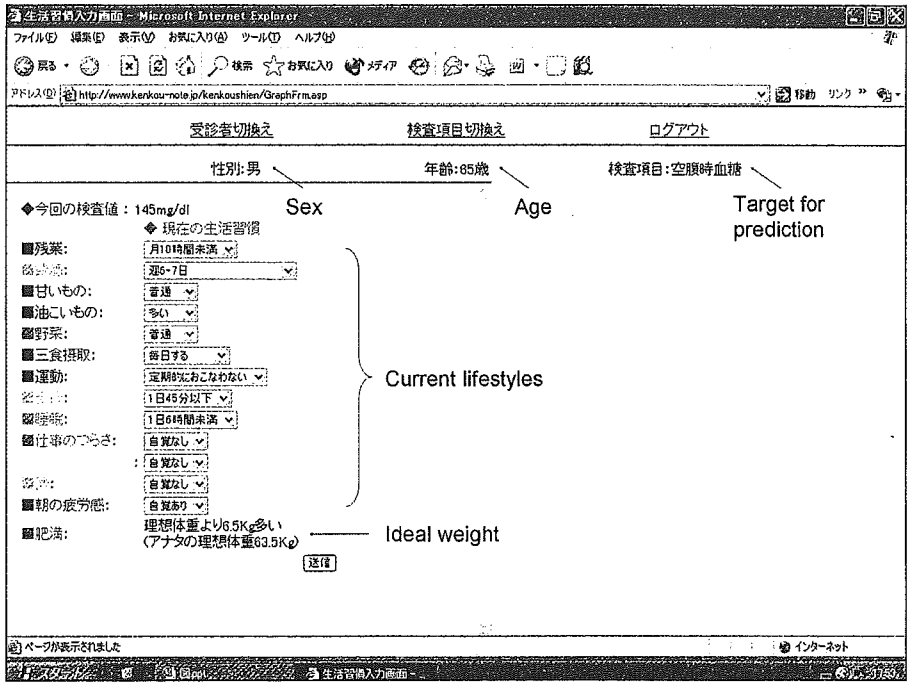

Fig. 3 Screen to be input current lifestyles. For each lifestyle item, an appropriate category is selected from a pull-down menu.

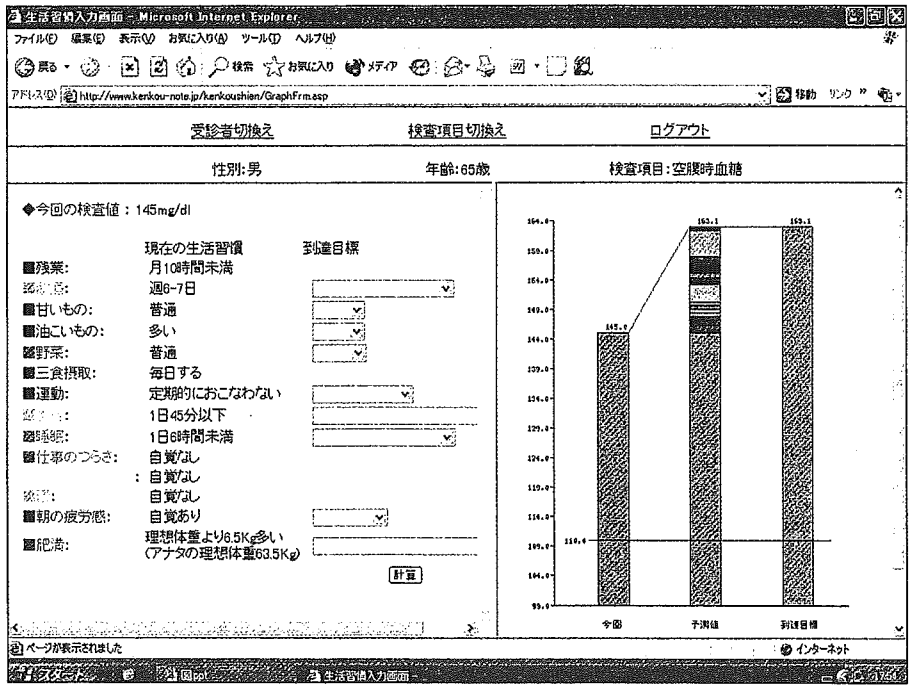

Fig. 4 First prediction screen (without lifestyle modifications). Compared with a measured value (the left bar), a predicted value in a year without lifestyle modification (the middle bar) is graphed out in the right part of the screen. Changes associated with aggravating items are expressed as respective colored bars (the middle bar).

user selects an appropriate category from a pull-down menu. Among a total of 17 lifestyle items (Table 1), those to be input are different by sex, a laboratory item selected on the welcome screen, and a measured value of the selected laboratory item. To use a 65-year-old man with a fasting blood glucose of 145 mg/dl as an example, the following 13 items are listed: overtime work, alcohol drinking, sweets, oily foods, vegetables, three meals a day, exercise, walk, sleep, pressure of job, distress at relationships, depression, and morning fatigue (Fig. 3). If the client is obese, a weight accounting for a body mass index of 22 kg/m^2 is suggested as his/her ideal weight.

As soon as press the transmission button, predicted laboratory values in a year are calculated and displayed in the right part of the screen in forms of both numerical values and graphs (Fig. 4). The left bar indicates the measured laboratory value. The middle bar indicates the predicted laboratory value in a year without lifestyle modifications. Changes associated with aggravating items are expressed as respective colored bars (the middle bar); the colors of bars are matched with those of characters in the left part of the screen. When some goals are selected from the pull-down menus in the left part of the screen, the right bar goes down, representing the benefit of lifestyle modifications (Fig. 5). Interval prediction can produces a possible change interval, which is expressed as a light-colored bar (the right bar).

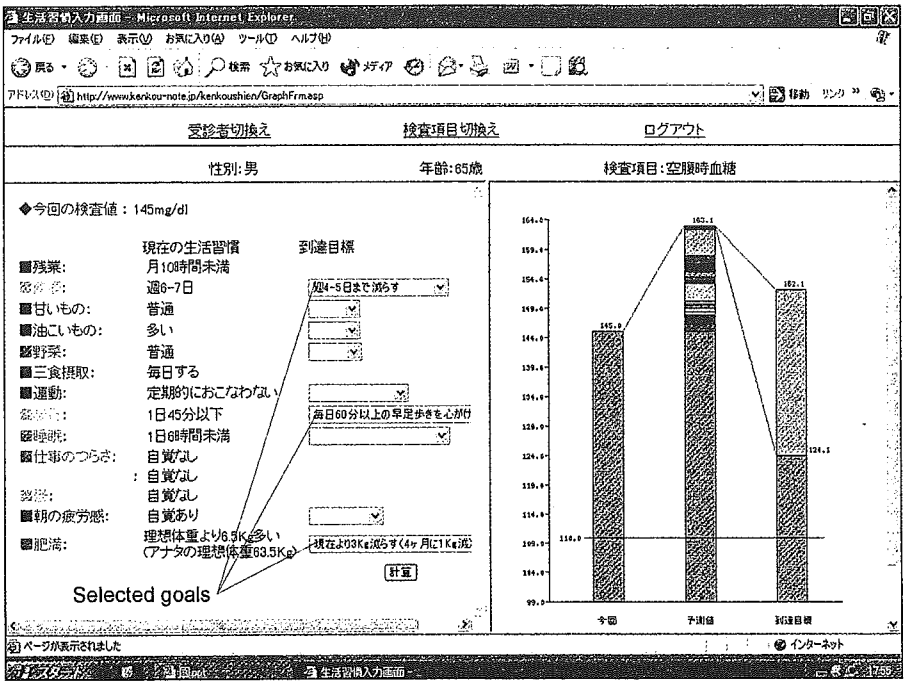

Fig. 5 Second prediction screen (with lifestyle modifications). Compared with a measured value (the left bar), a predicted value in a year without lifestyle modification (the middle bar) and that with lifestyle modifications (the right bar) are graphed out in the right part of the screen. When some goals are selected from the pull-down menus in the left part of the screen, the right bar goes down, representing the benefit of lifestyle modifications. A possible change interval is expressed as a light-colored bar.

4. Discussion

There have been few or no computer-assisted HRA systems used at multiple health care facilities in Japan. We developed a Web-based HRA system as a tool for health education based on personal health examination data. The system has been introduced into a Japanese health care association having 37 branch centers, and it proved to be of practical use in the individual health education programs following health examinations at branch centers or at client's offices.

HRA has the advantage of conveying an extensive amount of personalized information quickly and concisely [1, 2]. The introduction of computer technology leads to ease of processing, and that of the Internet technology allows for instant access and cost reduction. Moreover, the Web-based HRA system permits modifications of HRA models and functions on demand (i.e. convenient system upgrade). There is hardly any problem with data protection, because no personal identification data including name and address is known and stored. A firewall is placed between the server and the Internet. Only users certified by ID and password can log into the server.

For functional HRA, the following implementation strategies have been recommended by Moriarty in his review [5]:

1) HRA should be used in small groups or educational counseling settings.
2) HRA should be presented to clients in a convenient and interesting way with personalized statistics relating health behaviors and disease risk.
3) Interpretation of HRA feedback appears to be essential and should be done by someone trained in the meaning of HRA results and in broader issues relevant to health promotion and disease prevention.

The Web-based HRA system is designed to support individual health education following health examination. The tasks of explaining health examination data, eliciting current lifestyles, and encouraging goal setting for healthy lifestyles may be totally performed through the execution of HRA. As for the first implementation strategy, the system is used in the individual health education programs following health examinations at branch centers or at client's offices. As for the second implementation strategy, a measured laboratory value and corresponding predicted laboratory values in a year with and without lifestyle modifications are displayed on the screen in forms of both numerical values and graphs. When we conducted a questionnaire survey with 36 clients (31 men and 5 women), 95% (n = 34) answered that they could understand how their lifestyles contribute to their health risks, and 75% (n = 27) answered that they would immediately start lifestyle modifications [3]. Successfully incorporated into the system design were also user's comments and suggestions. As for the third implementation strategy, this system has been operated by trained nurses or other health care providers with active participation of clients. A written operation guide was provided to each branch center and hour-long workshops for actual users were conducted on demand. The Web-based HRA system fulfills all of the three implementation strategies, and it may bring out the best in HRA.

Some health care providers are likely to hesitate to use HRA, because they might come to spend more time on health education [1]. However, a health education pro-

gram using the Web-based HRA system takes about 20 minutes, no longer than the time spent in conventional health education procedures. The Web-based HRA system may be useful for structuring and standardizing health education, and its interactive processing using the Internet technology may be advantageous in health promotion. Previous studies showed that health education programs using HRA had great potential to stimulate lifestyle modifications and reduce health risks [6-9]. In the future, we intend to carry out a controlled trial assessing the efficacy of the Web-based HRA system.

5. Conclusion

The Web-based HRA system will be a practical tool for individual health education following health examination.

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Japan Association of Health Service:
http://www.yobouigaku-chuo.jp
NTT-IT Corporation:
http://www.ntt-it.co.jp/main.html

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Original Article

Body Image and Body Satisfaction Play Important Roles in the Path to Dieting Behavior in Japanese Preadolescents: The Toyama Birth Cohort Study

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Abstract

Objectives: To analyze the path to dieting behavior in Japanese preadolescents.

Methods: A cross-sectional study of dieting behavior among 5,244 preadolescents (2,452 boys and 2,792 girls aged 12–13) born in Toyama prefecture.

Results: While increasing with body mass index (BMI), the percentage of those who had tried dieting was higher in those who perceived themselves fat than in those who perceived themselves thin or average. Of those who wanted to be thinner, 16.1% of boys and 26.8% of girls had tried dieting. Path analysis in nonobese subjects (2,116 boys and 2,334 girls) showed that (1) body image was primarily based on BMI, (2) body image led to body dissatisfaction, and (3) body dissatisfaction led to dieting behavior. Pubertal changes had a significant effect on body image (path coefficient <0) for boys and body satisfaction (path coefficient >0) for girls, in addition to that on BMI. Maternal BMI had a significant effect on BMI but not on body image, body satisfaction, or dieting behavior.

Conclusions: Body image and body satisfaction play important roles in the path to dieting behavior in Japanese preadolescents. Pubertal changes may reinforce dieting behavior, but the mechanism may differ by sex.

Key words: preadolescents, dieting behavior, path analysis

Introduction

Because of the tracking of health conditions and lifestyles from childhood to adulthood (1–5), it is important to educate people about the sense of weight control from childhood. Currently, there is increasing emphasis on thinness, which occasionally incites pre- and post-adolescents to harmful dieting behavior. Dieting behavior can be associated with poor diet quality (6), and frequent dieters can be at a high risk of developing eating disorders (7). Factors related to dieting behavior may be useful information for both promoting weight control and avoiding harmful dieting behavior.

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Many investigators have reported about the relationships between body image, body satisfaction, and dieting behavior in preadolescents and adolescents (8–15). Pubertal changes are likely to have some role in dieting behavior, but there have been few attempts to examine the effects of pubertal changes on body image, body satisfaction, and dieting behavior. Environmental factors such as parents, peers, friends, the mass media influence body image, body satisfaction, and dieting behavior (6, 16–20). In particular, parental influence is important, because children and their parents share lifestyles as well as genetic predispositions (21). We previously reported that weight changes of children were concurrent with weight changes of their parents (22). In this study, we aimed to analyze the path to dieting behavior in Japanese preadolescents. We examined the effects of pubertal changes and maternal overweight in the path analysis.

Subjects and Methods

The Toyama Birth Cohort Study is an ongoing population-

based birth cohort study, which consists of almost all children born from April 2, 1989 to April 1, 1990 in Toyama prefecture, Japan (23). The initial survey using a questionnaire and anthropometric measurement was conducted in 1992 (at ages 2–4). The follow-up surveys using a questionnaire were conducted in 1996 (at ages 6–7), 1999 (at ages 9–10, described below as age 9), and 2002 (at ages 12–13, described below as age 12). Information on family members, lifestyles, and the physical status of the children and their parents was collected at each survey. Informed consent was obtained from all the parents of the participants, and we paid special attention to the protection of the anonymity and confidentiality of the available information.

The study subjects were 5,244 eligible participants in the age 12 survey (2,492 boys and 2,752 girls), who had complete information on sex, height and weight at age 12, body image, body satisfaction, dieting behavior, pubertal changes, maternal height and weight (collected at the age 12 survey), and height and weight at age 9 (collected at the age 9 survey).

Heights and weights at ages 9 and 12 were reported by children and parents. Heights were specified to the nearest 0.1 cm and weights were specified to the nearest 0.1 kg. Previous studies revealed that heights and weights reported by children and parents were close to actually measurements (24, 25). Body mass index (BMI; kg/m^2) was used to assess obesity in children, because the International Obesity Task Force proved BMI to offer a reasonable measure of body fat in children (26). BMI in childhood changes substantially with age (27, 28), therefore, BMIs were classified as age- and sex-specific quartiles of the study subjects: ≤15.4, 15.5–16.7, 16.8–18.5, and 18.6≤ for boys at age 9; ≤15.2, 15.3–16.4, 16.5–18.0, and 18.1≤ for girls at age 9; ≤17.1, 17.2–18.4, 18.5–20.4, and 20.5≤ for boys at age 12; ≤17.0, 17.1–18.5, 18.6–20.5, and 20.6≤ for girls at age 12.

Body image, body satisfaction, and dieting behavior were assessed using the following questions, respectively: (1) Do you perceive yourself thin, average, or fat? (2) Do you want to be thinner or fatter, or are you satisfied as you are? (3) Have you tried dieting? Pubertal changes were defined by one or more affirmative answers to the following questions: (1) Has your axillary hair grown? (2) Has your pubic hair grown? (3) Has your voice changed? (for boys) (4) Have you experienced your first menstruation? (for girls).

Maternal BMIs, which were calculated from self-reported heights and weights, were classified as underweight (≤18.5), normal (18.6–24.9), and overweight (25.0≤) on the basis of the Japanese expert committees' guidelines (29).

Statistical analyses were performed with the Statistical Analysis Systems (SAS, version 8.2). The distributions of body image, body satisfaction, and dieting behavior were compared by chi-square test and Mantel-Haenszel test (for stratified data). The percentages of those who perceived themselves fat, those who want to be thinner, and those who have tried dieting were calculated by BMI quartile, and their trends were examined by

Table 1 Percentages of preadolescents who want to be thinner and who have tried dieting in the context of BMI and body image

BMI quartile		Boy (n=2492)				Girl (n=2752)			
		All	Body image			All	Body image		
			Thin	Average	Fat		Thin	Average	Fat
All	Want to be thinner	647/2492 (26.0%)	11/656 (1.7%)	249/1338 (18.6%)	387/498 (77.7%)	1595/2752 (58.0%)	18/332 (5.4%)	707/1478 (47.8%)	870/942 (92.4%)
	Dieting behavior	141/2492 (5.7%)	8/656 (1.2%)	58/1338 (4.3%)	75/498 (15.1%)	477/2752 (17.3%)	9/332 (2.7%)	180/1478 (12.2%)	288/942 (30.6%)
1st	Want to be thinner	21/638 (3.3%)	3/421 (0.7%)	14/212 (6.6%)	4/5 (80.0%)	167/681 (24.5%)	10/266 (3.8%)	124/380 (32.6%)	33/35 (94.3%)
	Dieting behavior	6/638 (0.9%)	4/421 (1.0%)	2/212 (0.9%)	0/5 (0.0%)	51/681 (7.5%)	5/266 (1.9%)	37/380 (9.7%)	9/35 (25.7%)
2nd	Want to be thinner	75/603 (12.4%)	6/176 (3.4%)	53/405 (13.1%)	16/22 (72.7%)	343/695 (49.4%)	6/59 (10.2%)	249/545 (45.7%)	88/91 (96.7%)
	Dieting behavior	14/603 (2.3%)	3/176 (1.7%)	9/405 (2.2%)	2/22 (9.1%)	93/695 (13.4%)	3/59 (5.1%)	63/545 (11.6%)	27/91 (29.7%)
3rd	Want to be thinner	157/627 (25.0%)	2/55 (3.6%)	105/502 (20.9%)	50/70 (71.4%)	481/683 (70.4%)	2/7 (28.6%)	241/415 (58.1%)	238/261 (91.2%)
	Dieting behavior	28/627 (4.5%)	1/55 (1.8%)	20/502 (4.0%)	7/70 (10.0%)	145/683 (21.2%)	1/7 (14.3%)	55/415 (13.3%)	89/261 (34.1%)
4th	Want to be thinner	394/624 (63.1%)	0/4 (0.0%)	77/219 (35.2%)	317/401 (79.1%)	604/693 (87.2%)	0/0 (—)	93/138 (67.4%)	511/555 (92.1%)
	Dieting behavior	93/624 (14.9%)	0/4 (0.0%)	27/219 (12.3%)	66/401 (16.5%)	188/693 (27.1%)	0/0 (—)	25/138 (18.1%)	163/555 (29.4%)

BMI: body mass index.

BMIs were classified as age- and sex-specific quartiles: 1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12.

Percentage of those who want to be thinner: $p<0.001$ in boys, $p<0.001$ in girls (Mantel-Haenszel test).

Percentage of those who have tried dieting: $p<0.001$ in boys, $p<0.001$ in girls (Mantel-Haenszel test).

the Cochran-Armitage test. Path analysis (30) was conducted to examine the relationships between BMIs at ages 9 and 12 (quartiles), body image (1=thin, 2=average, 3=fat), body satisfaction (1=to be fatter, 2=satisfied, 3=to be thinner), dieting behavior (0=no, 1=yes), pubertal changes (0=no, 1=yes), and maternal BMI (1=underweight, 2=normal, 3=overweight). To focus on unnecessary or harmful dieting behavior, only nonobese subjects were included in the path analysis. The 85th percentile of BMI for age and sex is widely used and recommended as the cutoff for identifying overweight (27, 28). Therefore, 2,116 boys and 2,334 girls who had a BMI of less than the 85th percentile of the study subjects (22.3 for boys and 21.8 for girls at age 12) were counted as nonobese. The strength of the relationship was determined using path coefficient, which was estimated as a partial regression coefficient (β) in a multiple regression model. The final path diagrams consisted of paths with a path coefficient of more than 0.05 or less than −0.05.

Results

Table 1 shows the percentages of preadolescents who want to be thinner and who have tried dieting in the context of BMI and body image. While increasing with BMI (Cochran-Armitage test for trend $p<0.001$), the percentage of those who want to be thinner was higher in those who perceived themselves fat than in those who perceived themselves thin or average. The same pattern was found for the percentage of those who have tried dieting. Of those who wanted to be thinner, 16.1% of boys and 26.8% of girls had tried dieting.

Table 2 shows the percentages of preadolescents who perceive themselves fat, who want to be thinner, and who have

Table 2 Percentages of preadolescents who perceive themselves fat, who want to be thinner, and who have tried dieting by pubertal changes

BMI quartile		Boy (n=2492)			Girl (n=2752)		
		All	Pubertal changes		All	Pubertal changes	
			−	+		−	+
All	Perceive themselves fat	498/2492 (20.0%)	198/966 (20.5%)	300/1526 (19.7%)	942/2752 (34.2%)	147/819 (17.9%)	795/1933 (41.1%)
	Want to be thinner	647/2492 (26.0%)	244/966 (25.3%)	403/1526 (26.4%)	1595/2752 (58.0%)	322/819 (39.3%)	1273/1933 (65.9%)
	Dieting behavior	141/2492 (5.7%)	33/966 (3.4%)	108/1526 (7.1%)	477/2752 (17.3%)	90/819 (11.0%)	387/1933 (20.0%)
1st	Perceive themselves fat	5/638 (0.8%)	2/353 (0.6%)	3/285 (1.1%)	35/681 (5.1%)	24/419 (5.7%)	11/262 (4.2%)
	Want to be thinner	21/638 (3.3%)	9/353 (2.5%)	12/285 (4.2%)	167/681 (24.5%)	100/419 (23.9%)	67/262 (25.6%)
	Dieting behavior	6/638 (0.9%)	2/353 (0.6%)	4/285 (1.4%)	51/681 (7.5%)	30/419 (7.2%)	21/262 (8.0%)
2nd	Perceive themselves fat	22/603 (3.6%)	13/258 (5.0%)	9/345 (2.6%)	91/695 (13.1%)	34/231 (14.7%)	57/464 (12.3%)
	Want to be thinner	75/603 (12.4%)	40/258 (15.5%)	35/345 (10.1%)	343/695 (49.4%)	99/231 (42.9%)	244/464 (52.6%)
	Dieting behavior	14/603 (2.3%)	7/258 (2.7%)	7/345 (2.0%)	93/695 (13.4%)	30/231 (13.0%)	63/464 (13.6%)
3rd	Perceive themselves fat	70/627 (11.2%)	31/162 (19.1%)	39/465 (8.4%)	261/683 (38.2%)	35/103 (34.0%)	226/580 (39.0%)
	Want to be thinner	157/627 (25.0%)	58/162 (35.8%)	99/465 (21.3%)	481/683 (70.4%)	66/103 (64.1%)	415/580 (71.6%)
	Dieting behavior	28/627 (4.5%)	3/162 (1.9%)	25/465 (5.4%)	145/683 (21.2%)	16/103 (15.5%)	129/580 (22.2%)
4th	Perceive themselves fat	401/624 (64.3%)	152/193 (78.8%)	249/431 (57.8%)	555/693 (80.1%)	54/66 (81.8%)	501/627 (79.9%)
	Want to be thinner	394/624 (63.1%)	137/193 (71.0%)	257/431 (59.6%)	604/693 (87.2%)	57/66 (86.4%)	547/627 (87.2%)
	Dieting behavior	93/624 (14.9%)	21/193 (10.9%)	72/431 (16.7%)	188/693 (27.1%)	14/66 (21.2%)	174/627 (27.8%)

BMI: body mass index.
BMIs were classified as age- and sex-specific quartiles: 1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12.
Percentage of those who perceive themselves fat: $p<0.001$ in boys, $p=0.7$ in girls (Mantel-Haenszel test).
Percentage of those who want to be thinner: $p<0.001$ in boys, $p<0.05$ in girls (Mantel-Haenszel test).
Percentage of those who have tried dieting: $p<0.05$ in boys, $p=0.1$ in girls (Mantel-Haenszel test).

tried dieting by pubertal changes. For boys, pubertal changes were significantly associated with the percentages of those who perceive themselves fat, who want to be thinner, and who have tried dieting; those with pubertal changes were more likely to report dieting behavior; on the other hand, they were less likely to perceive themselves fat and want to be thinner. For girls, pubertal changes were significantly associated with the percentage of those who want to be thinner; those with pubertal changes were more likely to want to be thinner.

Table 3 shows the percentages of preadolescents who perceive themselves fat, who want to be thinner, and who have tried dieting by maternal BMI. The percentages of those who perceive themselves fat, who want to be thinner, and who have tried dieting were higher in those whose mother was overweight than in those whose mother was normal or underweight. However, when taking account of BMI, maternal BMI was not significantly associated with the percentages of those who perceive themselves fat, who want to be thinner, or who have tried dieting.

Fig. 1 shows the path diagrams for dieting behavior in nonobese boys and girls. Body image was primarily based on BMI, body image led to body dissatisfaction, and body dissatisfaction led to dieting behavior. Pubertal changes had a significant effect on body image (path coefficient <0) for boys and body satisfaction (path coefficient >0) for girls, in addition to that on BMI. Maternal BMI had a significant effect on BMI but not on body image, body satisfaction, or dieting behavior. For boys, the total effect on dieting behavior was largest in body satisfaction (0.07), followed by body image (0.03) and BMI at age 12 (0.01). For girls, the total effect on dieting behavior was largest in body image (0.14), followed by body satisfaction (0.13), pubertal changes (0.04), and BMI at age 12 (0.03).

Table 3 Percentages of preadolescents who perceive themselves fat, who want to be thinner, and who have tried dieting by maternal BMI

BMI quartile		Boy (n=2492)				Girl (n=2752)			
		All	Maternal BMI			All	Maternal BMI		
			Underweight	Normal	Overweight		Underweight	Normal	Overweight
All	Perceive themselves fat	498/2492	38/299	386/1993	74/200	942/2752	74/319	715/2151	153/282
		(20.0%)	(12.7%)	(19.4%)	(37.0%)	(34.2%)	(23.2%)	(33.2%)	(54.3%)
	Want to be thinner	647/2492	55/299	512/1993	80/200	1227/2752	143/319	882/2151	202/282
		(26.0%)	(18.4%)	(25.7%)	(40.0%)	(44.6%)	(44.8%)	(41.0%)	(71.6%)
	Dieting behavior	141/2492	10/299	108/1993	23/200	477/2752	44/319	369/2151	64/282
		(5.7%)	(3.3%)	(5.4%)	(11.5%)	(17.3%)	(13.8%)	(17.2%)	(22.7%)
1st	Perceive themselves fat	5/638	0/117	5/497	0/24	35/681	1/124	32/521	2/36
		(0.8%)	(0.0%)	(1.0%)	(0.0%)	(5.1%)	(0.8%)	(6.1%)	(5.6%)
	Want to be thinner	21/638	2/117	19/497	0/24	167/681	21/124	134/521	12/36
		(3.3%)	(1.7%)	(3.8%)	(0.0%)	(24.5%)	(16.9%)	(25.7%)	(33.3%)
	Dieting behavior	6/638	0/117	5/497	1/24	51/681	7/124	39/521	5/36
		(0.9%)	(0.0%)	(1.0%)	(4.2%)	(7.5%)	(5.6%)	(7.5%)	(13.9%)
2nd	Perceive themselves fat	22/603	3/75	15/491	4/37	91/695	13/87	73/569	5/39
		(3.6%)	(4.0%)	(3.1%)	(10.8%)	(13.1%)	(14.9%)	(12.8%)	(12.8%)
	Want to be thinner	75/603	10/75	55/491	10/37	343/695	37/87	290/569	16/39
		(12.4%)	(13.3%)	(11.2%)	(27.0%)	(49.4%)	(42.5%)	(51.0%)	(41.0%)
	Dieting behavior	14/603	0/75	12/491	2/37	93/695	8/87	75/569	10/39
		(2.3%)	(0.0%)	(2.4%)	(5.4%)	(13.4%)	(9.2%)	(13.2%)	(25.6%)
3rd	Perceive themselves fat	70/627	4/60	62/522	4/45	261/683	28/68	213/559	20/56
		(11.2%)	(6.7%)	(11.9%)	(8.9%)	(38.2%)	(41.2%)	(38.1%)	(35.7%)
	Want to be thinner	157/627	17/60	130/522	10/45	481/683	46/68	391/559	44/56
		(25.0%)	(28.3%)	(24.9%)	(22.2%)	(70.4%)	(67.6%)	(69.9%)	(78.6%)
	Dieting behavior	28/627	0/60	25/522	3/45	145/683	15/68	123/559	7/56
		(4.5%)	(0.0%)	(4.8%)	(6.7%)	(21.2%)	(22.1%)	(22.0%)	(12.5%)
4th	Perceive themselves fat	401/624	31/47	304/483	66/94	555/693	32/40	397/502	126/151
		(64.3%)	(66.0%)	(62.9%)	(70.2%)	(80.1%)	(80.0%)	(79.1%)	(83.4%)
	Want to be thinner	394/624	26/47	308/483	60/94	236/693	39/40	67/502	130/151
		(63.1%)	(55.3%)	(63.8%)	(63.8%)	(34.1%)	(97.5%)	(13.3%)	(86.1%)
	Dieting behavior	93/624	10/47	66/483	17/94	188/693	14/40	132/502	42/151
		(14.9%)	(21.3%)	(13.7%)	(18.1%)	(27.1%)	(35.0%)	(26.3%)	(27.8%)

BMI: body mass index.

BMIs were classified as age- and sex-specific quartiles: 1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12.

Percentage of those who perceive themselves fat: p=0.2 in boys, p=0.5 in girls (Mantel-Haenszel test).

Percentage of those who want to be thinner: p=0.4 in boys, p=0.1 in girls (Mantel-Haenszel test).

Percentage of those who have tried dieting: p=0.1 in boys, p=0.5 in girls (Mantel-Haenszel test).

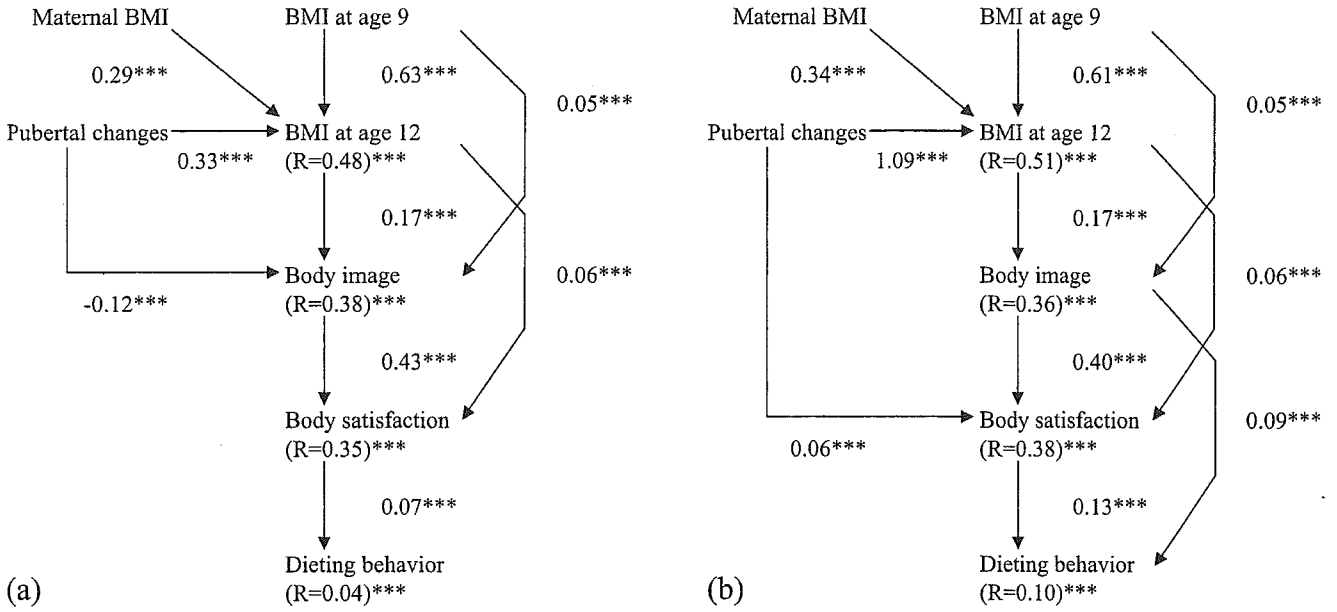

Fig. 1 Path diagrams for dieting behavior in nonobsese boys and girls. (a) Nonobese boys (n=2116). (b) Nonobese girls (n=2334). BMI: body mass index. Values are path coefficients indicating the strength of relationship. *** $p<0.001$.

Discussion

This is the first study to analyze the path to dieting behavior in Japanese preadolescents. Based on the Toyama Birth Cohort Study, we demonstrate the path diagram of body image, body satisfaction, and dieting behavior in relation to pubertal changes and maternal BMI.

Path analysis in nonobese subjects showed that (1) body image was primarily based on BMI, (2) body image led to body dissatisfaction, and (3) body dissatisfaction led to dieting behavior. Body image and body satisfaction were ranked among the top two factors in terms of total effect on dieting behavior. The gap between actual and ideal body images may cause body dissatisfaction (20), which may lead to induce dieting behavior. The fact that body image may contribute to the establishment of dieting behavior suggests the importance of the education of preadolescents in understanding their healthy weight and correcting their body image (both actual and ideal body images).

Pubertal changes had a significant effect on body image (path coefficient <0) for boys and body satisfaction (path coefficient >0) for girls. Compared with those without pubertal changes, boys with pubertal changes were more likely to perceive themselves thin or average and girls with pubertal changes were more likely to want to be thinner. It is possible that pubertal changes reinforce dieting behavior due to their effect on body image or body satisfaction. As shown in previous studies (17, 18), boys seem to accept pubertal changes, particularly physiological changes towards a muscular body, positively and adopt strategies to increase muscle tone, while girls seem to accept pubertal changes, particularly a physiological increase in body fat, negatively and adopt strategies to lose weight. In addition to obvious sex differences in body image and body satisfaction, the effect of pubertal changes should be considered in the education of preadolescents.

Maternal BMI had a significant effect on BMI but not on body image, body satisfaction, or dieting behavior. Previous studies suggested the significant effects of maternal BMI on child's weight concerns and dieting behavior, which contradicted each other; Tienboon reported that maternal overweight increased child's weight concerns and dieting behavior (31); on the other hand, Strauss reported that children of under- and normal-weight mothers were more likely to perceive themselves overweight and want to be thinner (10). From the results of this study and previous studies, it is difficult to determine the effect of maternal BMI on a child's dieting behavior, but it is worth pointing out the possible maternal influence on a child's dieting behavior. Previous studies revealed that parental feedback on a child's weight influenced child's body image (17, 19, 20), body satisfaction (19), and dieting behavior (16, 17, 19). If family members, particularly mother, frequently went on a diet, the child might be highly concerned with weight and go on a diet (6, 16). Unfortunately, the Toyama Birth Cohort Study did not collect information on parental feedback on a child's weight and parental dieting behavior. It is possible that the effect of maternal BMI in this study represents maternal feedback on a child's weight and maternal dieting behavior in addition to a child's negative perspective on maternal overweight.

As a major limitation of this study, the cross-sectional design makes it difficult to determine the causal relationships. BMI, body image, body satisfaction, and dieting behavior may form a feedback loop (20); dieting behavior, which depends on BMI, body image, and body satisfaction, will lead to a lower BMI. However, in this study, the percentage of those who have tried dieting was higher in those who had higher BMI. The results of this study were less likely to be affected by the feedback loop. The path to dieting behavior in this study should be confirmed in other populations and in a follow-up design.

In conclusion, body image and body satisfaction play

important roles in the path to dieting behavior in Japanese preadolescents. Pubertal changes may reinforce dieting behavior, but the mechanism may differ by sex. The results of this study suggest the importance of the education of preadolescents in understanding their healthy weight and correcting their body image. In addition to obvious sex differences in body image and body satisfaction, the effect of pubertal changes should be considered in the education of preadolescents.

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投稿

既存の統計資料を用いた推計による マクロ的医療経済効果の評価

——関節リウマチの新規治療薬導入——

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目的　新規治療薬を導入するにあたり，医療経済的側面からの評価は治療薬の利用可能性を表し，導入の根拠になる。国家単位の新規治療薬導入の効果を検討する場合，マクロ経済的評価が有用である。また，DALYやQALYなど質的調整変数を指標にする一方，疾患内の重症度を補正することも評価の妥当性を高めると考えられる。本研究では，関節リウマチ（RA）の新規治療薬導入による医療経済効果をマクロ経済的観点から試算した。

方法　患者調査の患者数と総務省統計局の推計人口から2000年のRA患者数を算出した。障害による損失年（YLD）は，患者数と障害度の重み付けの積により時間割引や年齢補正なしに算出した。RA患者の重症度分布の情報は，日本リウマチ財団リウマチ登録医を対象にした質問票調査から収集した。重症度別構成割合とQOLスコアの積を係数にして重症度別の患者数とYLDを算出した。厚生省研究班の推計によるYLDと国民医療費から効果単価（万円/YLD）を算出した。コクランライブラリーのメタアナリシスを参照して，アメリカリウマチ学会の評価基準による20%改善（ACR20），50%改善（ACR50），70%改善（ACR70）を指標にしたオッズ比を係数にしてレフルノミド導入によるYLDや医療費の変化を算出した。なお，レフルノミドは中等症以上が投与対象になると仮定した。

結果　レフルノミドの投与対象患者数は64,760人（20.8%）と推計された。レフルノミド導入によるYLDの減少は，ACR20を指標にしたとき3,172YLD(5.8%減)，ACR50を指標にしたとき9,394YLD（17.3%減），ACR70を指標にしたとき12,469YLD（23.0%減）と推計された。全体および1患者当たりの医療費の削減は，ACR20を指標にしたとき136億円，21.0万円，ACR50を指標にしたとき403億円，62.2万円，ACR70を指標にしたとき535億円，82.6万円と推計された。感度分析の結果から，1患者当たりの医療費の削減は投与対象患者数が少ないほど大きく，上記の推計値の安定性が示された。

結論　モニタリングの費用や副作用のスクリーニングの費用などの必要経費を考慮すべきであるが，概してレフルノミド導入の経済的妥当性が示された。本研究の手法は各種疾病，各種治療法の医療経済効果をマクロ経済的観点から試算するために応用可能である。

キーワード　関節リウマチ，抗リウマチ薬，障害による損失年，医療費，費用対効果

I 緒　　言

関節リウマチ（Rheumatoid arthritis；RA）の薬物療法は，非ステロイド系消炎鎮痛剤（Non-steroidal anti-inflammatory drugs；NSAIDs）と抗リウマチ薬（Disease modifying anti-rheumatic drugs；DMARDs）を2本柱に行われている。現在，日本において保険適応を

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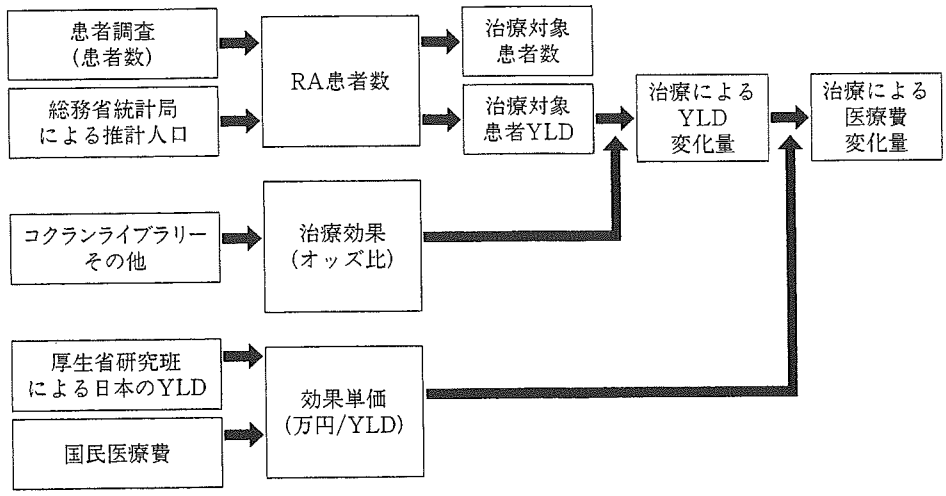
認められている9種類のDMARDsに加え，レフルノミド(商品名アラバ)，エタナルセプト（同エンブレム)，インフリキシマブ(同レミケード)など，新規治療薬の申請，承認が相次いで，これら薬剤導入によるRA治療の発展が注目されている[1]。

図1　既存の統計資料を用いた本研究の推計の流れ



新規治療薬を導入するにあたり，従来の治療薬と新規治療薬との比較検討が求められる。とくに医療経済的側面からの評価は治療薬の利用可能性を表し，導入の根拠になる[2]。従来，限られた患者の情報を用いて「ミクロ経済的」評価が行われることが一般的である。しかし，国家単位の新規治療薬導入の効果を検討する場合，「マクロ経済的」評価が有用である[3)4)]。また，障害調整生存年（Disability-adjusted life year；DALY)や質調整生存年(Quality-adjusted life year；QALY)など質的調整変数を指標にする一方，疾患内の重症度を補正することも評価の妥当性を高めると考えられる。本研究では，レフルノミドを例にあげ，RAの新規治療薬導入による医療経済効果を「マクロ経済的」観点から試算した。

II 方　　法

既存の統計資料を用いた本研究の推計の流れを図1に示した。

(1)　患者数とYLDの算出

平成11年患者調査[5]からRAの性，年齢，入院／外来別患者数を調べ，平成11年10月1日現在推計人口[6]で除して，RAの性，年齢，入院／外来別有病率を算出した。これら有病率を国立社会保障・人口問題研究所による将来推計人口[7]にかけあわせ，2000年と2010年のRA患者数を算出した。

表1　関節リウマチ患者の重症度分布
(リウマチ登録医の評価による)

	構成割合(%)	QOLスコア
軽症(通院群)	79.2	2.93
中等症(入院維持群)	12.3	7.57
重症(入院要治療群)	8.5	11.42

障害による損失年(Year lived with disability；YLD)は，患者数と障害度の重み付け（治療ありは0.174)の積により時間割引や年齢補正なしに算出した[8]。

(2)　重症度の補正

RA患者の重症度分布の情報は日本リウマチ財団リウマチ登録医を対象にした質問票調査から収集した[9]。診療形態と治療レベルにより3段階の重症度(通院群，入院維持群，入院要治療群)を定義して，3群の構成割合(%)とQOLスコア（1～16点)を求めた(表1)。3群の構成割合あるいは3群の構成割合とQOLスコアの積を係数にして，重症度別の患者数とYLDを算出した。

(3)　効果単価の算出

DALYの構成要素のうち，YLDは障害による生前の負担，YLLは早世による死後の負担を表し，医療費はおもにYLDに関するコストを反映すると仮定して，効果単価を算出した。厚生省研究班（主任研究者　長谷川敏彦）による日本の疾病負担の推計から，1993年の日本のYLDの

合計は5680.5千である[10]。一方，同年の国民医療費は24兆3631億円である[11]。効果単価は国民医療費/YLDにより算出して，428.9万円/YLDである。

（4） レフルノミドの治療効果

コクランライブラリー[12]からRA患者におけるレフルノミドの治療効果に関するメタアナリシス[13]を参照した。観察期間は12か月，対照群はプラセボ投与という設定において，アメリカリウマチ学会（ACR）評価基準による20%改善（ACR20），50%改善（ACR50），70%改善（ACR70）を指標にしたオッズ比（95%信頼区間）は0.35（0.22～0.55），0.23（0.13～0.40），0.27（0.14～0.53）である。これら数値を係数にして，レフルノミド導入によるYLDや医療費の変化を算出した。

（5） レフルノミド導入による医療経済効果

レフルノミドはメソトレキセート無効例が投与対象になる。そこで，中等症以上（入院維持群と入院要治療群）が投与対象になると仮定して，レフルノミド導入によるYLDや医療費の変化を算出した。

1） レフルノミド導入によるYLDの変化

⊿YLD＝YLD×（1－オッズ比）×割引率

により算出した。YLDは投与対象患者のYLD（入院維持群と入院要治療群のYLD）の合計である。オッズ比はコクランライブラリーのメタアナリシスのオッズ比である。割引率はACR評価基準による改善度を質的補正するもので，ACR20ならば0.2，ACR50ならば0.5，ACR70ならば0.7である。

2） レフルノミド導入による医療費の変化

⊿医療費＝⊿YLD×効果単価（万円/YLD）

により算出した。さらに，投与対象患者数（入院維持群と入院要治療群の患者数）の合計で除して，1患者当たりの医療費の変化を算出した。

（6） 感度分析

以下の要因の変動が1患者当たりの医療費の変化の推計値に与える影響を評価した。

1） 投与対象患者数

RA患者のうちレフルノミドの投与対象の割合を5～50%の範囲で動かした。

2） 治療効果

オッズ比を0.1～0.6の範囲で動かした。

3） 効果単価

先述の厚生省研究班による日本の疾病負担の推計から，1993年の日本のDALYの合計は12,759.4千であり，YLDはYLD/YLL比＝1を仮定して算出された[10]。そこで，YLD/YLL比を1/5～5の範囲で動かした。

III 結　果

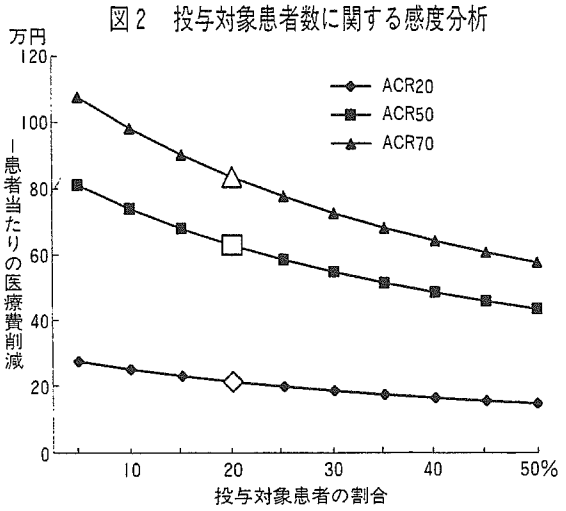
RA患者数は，2000年311,348人，2010年356,793人であり，10年間当たり14.6%の増加が見込まれた。2000年時点において，軽症（通院群）は246,588人（79.2%），中等症（入院維持群）は38,296人（12.3%），重症（入院要治療群）は26,456人（8.5%）であり，レフルノミドの投与対象患者数は64,760人（20.8%）になると推計された。

RAのYLDは，軽症（通院群）が29,774YLD，中等症（入院維持群）が11,947YLD，重症（入院要治療群）が12,454YLDであり，合わせて54,175YLDにのぼり，レフルノミドの投与対象患者YLDは24,401YLD（全体の45%）になると推計された。

レフルノミド導入によるYLDの減少は，ACR20を指標にしたとき3,172YLD（5.8%減），ACR50を指標にしたとき9,394YLD（17.3%減），ACR70を指標したとき12,469YLD（23.0%減）になると推計された。全体および1患者当たりの医療費の削減は，ACR20を指標にしたとき136億円，21.0万円，ACR50を指標にしたとき403億円，62.2万円，ACR70を指標にしたとき535億円，82.6万円になると推計された。

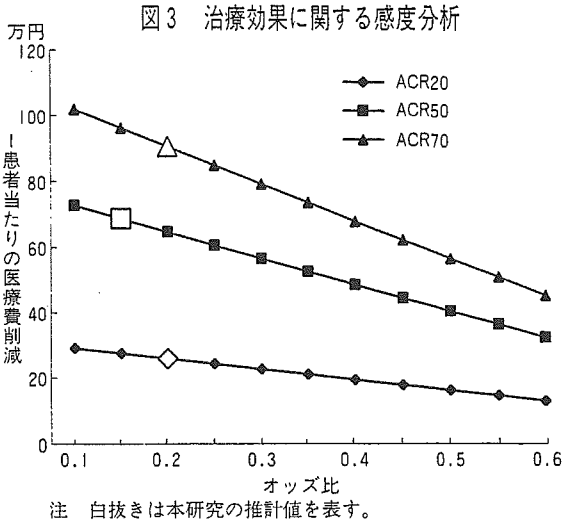
感度分析の結果を図2～4に示した。投与対象患者数（図2）については，投与対象患者数が少ない（すなわち，投与対象の割合が小さい）ほど1患者当たりの医療費の削減が大きかった。投与対象の割合を10%（31,135人）まで下げる

図2　投与対象患者数に関する感度分析



注　白抜きは本研究の推計値を表す。

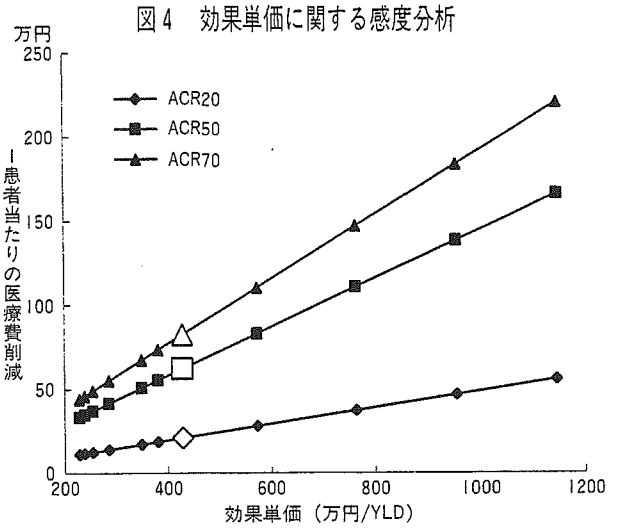
図3　治療効果に関する感度分析



注　白抜きは本研究の推計値を表す。

と1患者当たりの医療費の削減は25.0～98.2万円，さらに5％（15,567人）まで下げると同医療費の削減は27.4～107.6万円になった。治療効果（図3）については，治療効果が大きい（すなわち，オッズ比が小さい）ほど1患者当たりの医療費の削減が大きかった。効果単価（図4）については，効果単価が大きいほど1患者当たりの医療費の削減が大きかった。医療政策的観点から操作しうる要因は投与対象患者数であるが，上記の推計値は比較的安定した数値であることが確認された。

図4　効果単価に関する感度分析



注　白抜きは本研究の推計値を表す。

Ⅳ 考　　察

本研究では，レフルノミドを例にあげ，RAの新規治療薬導入による医療経済効果を「マクロ経済的」観点から試算した。レフルノミド導入による1患者当たりの医療費の削減は，ACR20を指標にしたとき21.0万円，ACR50を指標にしたとき62.2万円，ACR70を指標にしたとき82.6万円になると推計された。従来の治療とレフルノミドによる治療の差額がこれら数値を超えなければ，レフルノミド導入を推進する根拠になる。レフルノミドの薬価は1患者当たり12.3万円である[14]。さらに，モニタリングの費用や副作用のスクリーニングの費用などの必要経費を考慮すべきであるが，レフルノミドを用いた際の治療コストの多くはレフルノミドの薬価によるという報告[15]もあり，概してレフルノミド導入の経済的妥当性が示された。

本研究は，以下のような仮定の下で行われた。第1に，レフルノミドの投与対象は中等症以上の患者である。そのため，レフルノミドの投与対象患者数はリウマチ登録医の評価による中等症以上（入院維持群と入院要治療群）の割合から算出した。第2に，現状の治療はプラセボ投与群同等（NSAIDsやステロイドによる治療）である。そのため，レフルノミドの治療効果はプラセボ投与群を対照にしたオッズ比を参照した。第3に，効果単価は一定である。第1の仮定に関して，レフルノミドの投与対象の割合は報告されていない。リウマチ登録医の評価から，RA

患者は軽症化する方向にあると考えられ[9]，レフルノミドの投与対象患者数は実際より多く見積もられたかもしれない。第2の仮定に関して，NSAIDsやステロイドのほか，メソトレキセートなどのDMARDsが使用されており，レフルノミドの治療効果は実際より多く見積もられたかもしれない。第3の仮定に関して，物価の上昇を受けて，効果単価は実際より少なく見積もられたかもしれない。すなわち，本研究はレフルノミド導入による医療経済効果を過大あるいは過小評価している可能性がある。しかし，感度分析の結果から，本研究の推計値は比較的安定した数値であることが確認されており，十分，参考するに値するエビデンスであると考えられた。

感度分析の結果によれば，医療政策的観点から費用対効果を高めるために，投与対象を吟味して，投与対象患者数を絞り込む必要があると考えられた。欧米諸国は数年前からレフルノミドを導入しているが，メソトレキセート無効例を中心にして使用されている。ガイドラインを提示して，投与対象を明確にすることが1つの解決策になるかもしれない。

本研究の特徴は，既存の統計資料を用いた推計によりマクロ的医療経済効果を評価した点にある。すなわち，YLDを指標にしたことで，質的調整したアウトカムが得られ，YLDと国民医療費から算出した効果単価を用いて国家単位の新規治療薬導入の効果を検討することができた。さらに，疾患内の重症度を補正したことで，評価の妥当性を高めることができた。本研究の手法は，各種疾病，各種治療法の医療経済効果をマクロ経済的観点から試算するために応用可能である。医療保険財政がひっ迫している中で，新規治療薬の保険適応を認めるべきかが議論されているが，判断の根拠になる新規治療薬導入による医療経済効果の評価は十分行われていない。本研究の手法を応用することで，数多くのエビデンスを提供されることが期待される。

V 結　論

モニタリングの費用や副作用のスクリーニングの費用などの必要経費を考慮すべきであるが，概してレフルノミド導入の経済的妥当性が示された。本研究の手法は，各種疾病，各種治療法の医療経済効果をマクロ経済的観点から試算するために応用可能である。

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〈原著〉

高感度CRPの動脈硬化リスク指標としての検討

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要旨　炎症性変化を高感度CRPで定量的に評価するため，動脈硬化のリスク要因とCRPの変動との関連を検討した。

対象者は某百貨店の30歳から59歳の男性従業員のうち2年連続して健康診断を受診している者1,484名（平均年齢46.3±8.0歳）とした。

CRP2.0mg/ℓを基準値とし，改善率・悪化率を算出し，2年間連続してリスク要因（高血圧，高尿酸，耐糖能異常，高脂血症）を保有していた者とまったく保有していない者とを比較した。

その結果，高血圧リスク保有者ではCRP改善率が健常者と比して有意に低かった（$p<0.05$）。

また，高血圧，高尿酸，耐糖能異常，高脂血症，喫煙の所見を有する者はCRPの悪化率が高値であった。

これはリスク要因を保有している場合，動脈硬化性変化が持続しており，炎症性変化であるCRPが低下しにくいことを示唆している。

はじめに

ライフスタイルの欧米化，肥満者の増加，喫煙率が低下していないことなどにより，今後の動脈硬化性疾患の発生率が増加すると予想され，わが国でも動脈硬化性疾患の予防が重要な課題となっている[1]。すでに多くの疫学的研究で動脈硬化と健康リスク要因の関連（喫煙，血圧，総コレステロール）が明らかにされて，一次予防が行われつつある。しかしながら，超音波断層装置による頸動脈の肥厚度を測定する一部の画像診断[2]を除いて，動脈硬化の進展を早期に発見する指標が現在のところ十分であるとはいえない。近年，CRPが高感度で測定できるようになり，動脈硬化の指標として注目されるようになってきた[3-5]。高感度CRPは健康診断などで簡便に測定でき，定量的に評価できる方法として有用であるため，健常者を対象にした血圧・喫煙との関係について数多くの報告がある[6-9]。しかし，CRPは変動が大きく，経年的に評価した報告はほとんどない。

そこで今回，同一人を2年間継続して測定したデータをもとに，高感度CRPを用いて炎症性変化の定量的評価を明らかにするため，CRPの経時的な評価と健康リスク要因について検討を

High-sensitive CRP as the indicator for arteriosclerosis change

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