The basic data for residents aged 16 years or older who received a comprehensive health check examinations in 2011-2012 as a part of the Fukushima Health Management Survey after the great East Japan earthquake

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[Original Article]

THE BASIC DATA FOR RESIDENTS AGED 16 YEARS OR OLDER WHO RECEIVED A COMPREHENSIVE HEALTH CHECK EXAMINATIONS IN 2011–2012 AS A PART OF THE FUKUSHIMA HEALTH MANAGEMENT SURVEY AFTER THE GREAT EAST JAPAN EARTHQUAKE

YUKIHIKO KAWASAKI[1)3)], MITSUAKI HOSOYA[1)3)], SEIJI YASUMURA[1)4)], TETSUYA OHIRA[1)2)], HIROAKI SATOH[1)5)], HITOSHI SUZUKI[1)6)], AKIRA SAKAI[1)7)], AKIRA OHTSURU[1)8)], ATSUSHI TAKAHASHI[1)9)], KOTARO OZASA[10)], GEN KOBASHI[11)], KENJI KAMIYA[1)12)], SHUNICHI YAMASHITA[1)13)], MASAFUMI ABE[1)], and THE FUKUSHIMA HEALTH MANAGEMENT SURVEY GROUP

[1)]*Radiation Medical Science Center for the Fukushima Health Management Survey, Fukushima Medical University, Fukushima, Japan,* [2)]*Department of Epidemiology, Fukushima Medical University, Fukushima, Japan,* [3)]*Department of Pediatrics, Fukushima Medical University, Fukushima, Japan,* [4)]*Department of Public Health, Fukushima Medical University, Fukushima, Japan,* [5)]*Department of Nephrology, Hypertension, Diabetology, and Endocrinology, Fukushima Medical University, Fukushima, Japan,* [6)]*Department of Cardiology and Hematology, Fukushima Medical University, Fukushima, Japan,* [7)]*Department of Radiation Life Sciences, Fukushima Medical University, Fukushima, Japan,* [8)]*Department of Radiation Health Management, Fukushima Medical University, Fukushima, Japan,* [9)]*Department of Gastroenterology and Rheumatology, Fukushima Medical University, Fukushima, Japan,* [10)]*Department of Epidemiology, The Radiation Effects Research Foundation, Hiroshima, Japan,* [11)]*Department of Planning and Management, National Institute of Radiological Sciences, Chiba, Japan,* [12)]*Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima, Japan,* [13)]*University of Nagasaki, Nagasaki, Japan*

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Abstract : Aim : To assist in the long-term health management of residents and evaluate health impacts after the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant accident in Fukushima Prefecture, the Fukushima prefectural government decided to conduct the Fukushima Health Management Survey. This report describes the results for residents aged 16 years or older who received the health check examinations and evaluates the data obtained from 2011 and 2012.

Methods : The target group consisted of residents aged 16 years or older who had lived in the evacuation zone. The health check examinations were performed on receipt of an application for a health check examination from any of the residents. The examinations, including measurements of height, weight, abdominal circumference/body mass index (BMI), blood pressure, biochemical laboratory findings, and peripheral blood findings, were performed as required.

Results : 1) A total of 56,399 (30.9%) and 47,009 (25.4%) residents aged 16 years or older received health checks in 2011 and 2012, respectively. 2) In both years, a number of male and female residents in the 16–39 year age group were found to suffer obesity, hyperlipidemia, hyperuricemia, or liver dysfunction, and the prevalence of obesity and hyperlipidemia among residents increased with age. Furthermore, the proportion of residents with hypertension, glucose metabolic abnormalities or renal dysfunction was higher in those aged 40 years or older. 3) The frequencies of obesity, hypertension and hyperlipidemia among residents in 2012 were lower than those in 2011. However, the prevalence of liver dysfunction, hyperuricemia, glucose metabolic abnormalities and renal dysfunction among residents was higher in 2012 than in 2011.

Corresponding author : Yukihiko Kawasaki E-mail : kyuki@fmu.ac.jp
https://www.jstage.jst.go.jp/browse/fms http://www.fmu.ac.jp/home/lib/F-igaku/

Conclusions : These results suggested the number of residents who had lived in the evacuation zone with obesity, hyperlipidemia, hyperuricemia, liver dysfunction, hypertension, glucose metabolic abnormalities, or renal dysfunction increased with age in all age groups. Therefore, we think that it is necessary to continue with health check examinations for these residents in order to ameliorate lifestyle-related disease.

Key words : health check, Fukushima Health Management Survey, The Great East Japan Earthquake, child, adult

INTRODUCTION

The Pacific coast of the northern area of Japan was struck by the most destructive earthquake ever recorded in the history of Japan at 14 : 46 (Japan Standard Time) on March 11, 2011[1,2]. The epicenter was in the Pacific Ocean approximately 130 kilometers east of the Tohoku coastline, and the hypocenter was at a depth of approximately 32 kilometers below sea level. This earthquake had a magnitude of 9.0 on the Richter scale[3]. It was the most powerful earthquake ever known to have hit Japan, and one of the 5 most powerful earthquakes in the world since modern record-keeping began in 1900[4]. The large-scale tsunami that ensued consisted of a maximum tide level of 9.3 m and a maximum run-up height of 40.5 m, which were the highest levels ever recorded in Japan[5]. A total of 15,886 people were killed and 2,620 were still missing as of May 9, 2014. In Fukushima Prefecture, 1,609 people were confirmed killed and 207 remain missing. In addition, a later tsunami hit the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Plant, causing a radiation hazard. Due to the accident that occurred at the Fukushima Daiichi Nuclear Power Plant, residents of all ages living in the evacuation zone-, a government-designated area around the nuclear power plant in Fukushima prefecture, were evacuated.

The Fukushima prefectural government decided to conduct what it called the Fukushima Health Management Survey to assist in the long-term health management of residents and to evaluate the health impacts of the accident. The Radiation Medical Science Center for the Fukushima Health Management Survey was established in Fukushima Medical University to carry out the survey (Fig. 1). The ongoing basic survey was begun at the end of

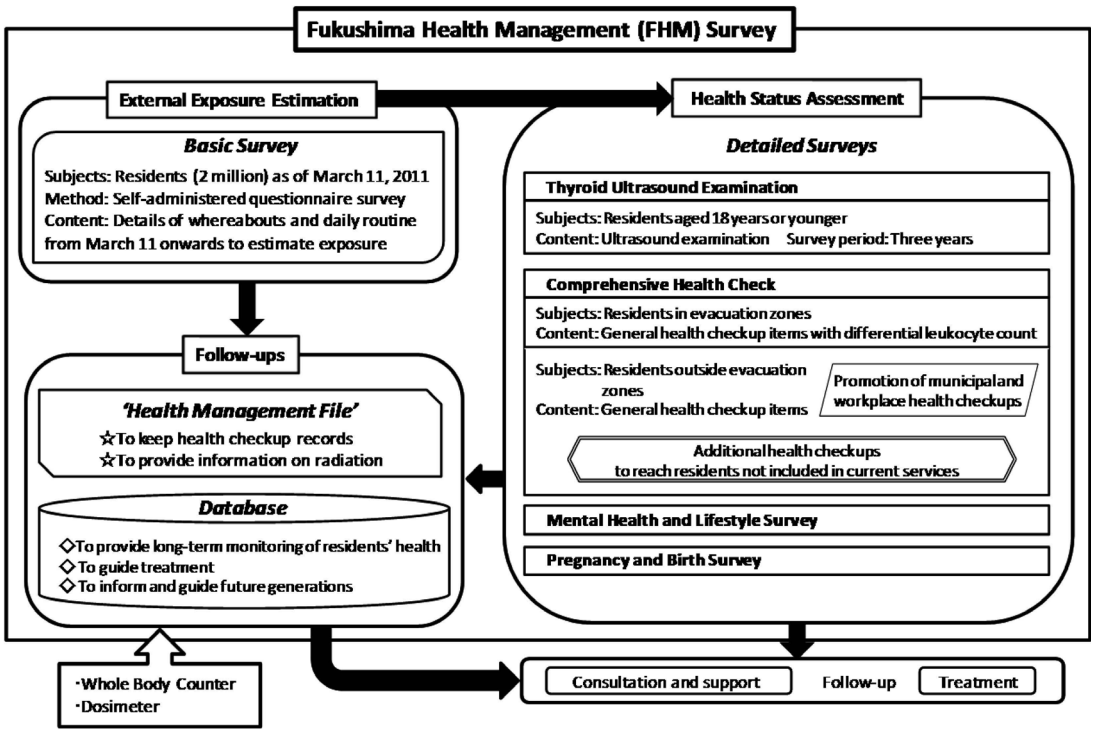

Fig. 1. Framework of the Fukushima Health Management Survey.

June, 2011 to estimate external exposure doses in Fukushima Prefecture at the time of the accident. In addition, we decided on the sequential implementation of detailed surveys of forced evacuees who had lived in the evacuation zone.

Many evacuees from the government-designated evacuation zone were forced to change their lifestyle, exercise patterns, and other personal habits. Some could not receive adequate health checks, and some experienced anxiety regarding their health status. The Comprehensive Health Check (CHC) attempted to review data regarding their health, assess the incidence of various diseases, and improve their health status. We investigated whether these factors had a significant effect on their health management. This report describes and analyzes the basic data for residents aged 16 years or older who received the comprehensive health check.

METHODS

The study was carried out under the auspices of the Committee for Human Experiments at the Fukushima Medical University School. The target group and methods employed in the CHC were described previously by Yasumura *et al*.[6]. Briefly, the CHC was intended to provide health examinations for people of all ages who were officially registered residents of the government-designated evacuation zone at the time of the earthquake.

Target group

The target group consisted of residents who had lived in the government designated evacuation zone ; i.e., Hironomachi, Naraha-machi, Tomioka-machi, Kawamata-machi Kawauchi-mura, Okuma-machi, Futaba-machi, Namie-machi, Kazurao-mura, Iitate-mura, Minami-soma City, Tamura City, Iitate-mura, and the part of Date city specifically recommended for evacuation.

The following items have been added to the Special Health Checkup performed as a part of the Municipal National Health Insurance system, which is performed for adults aged 40 years or older in the prefecture. For people not participating in the Special Health Checkup, the meeting places for CHCs have been held a total of 104 times at 29 locations since January 2012. The meeting places for CHCs have also been held outside the prefecture, with the cooperation of the Japan Anti-Tuberculosis Association, at 827 member institutions of the Japan Municipal Hospital Association, the Japan National Health Insurance Clinics and Hospitals Association, the All-Japan Federation of Social Insurance Associations, and the Japan Red Cross Society.

Evaluation items

In addition to assessing the effects of radiation, additional variables were specified according to age in order to assess health, prevent lifestyle-related diseases, and identify or treat diseases at an early stage (Table 2). Residents were evaluated according to items in the Specific Health Examination, which was based on the Assurance of Medical Care for Elderly People Act (Act No. 80, 1982). The examination includes measurements of height, weight, abdominal circumference, body mass index (BMI), blood pressure, aspartate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyl transpeptidase (γ-GTP), triglyceride (TG), high-density lipoprotein-cholesterol (HDL-C), low-density lipoprotein-cholesterol (LDL-C), hemoglobin A1c (HbA1c), fasting plasma glucose concentration, and urine testing (protein and sugar). Additional items for assessment include red blood cell (RBC) count, hematocrit (Hct), hemoglobin (Hb), platelet count, white blood cell (WBC) count, serum creatinine (Cr), estimated glomerular filtration rate (eGFR), uric acid (UA), and urine testing for occult blood.

Definitions

BMI was defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). Obesity was defined as a BMI of more than 25 in our report. Hypertension was defined as a systolic blood pressure of more than 140 mmHg, or diastolic blood pressure of more than 90 mmHg. Anemia was defined as a Hb level of less than 12 g/dl in males ; and less than 11g/dl in females, base on the recommendations of our Health Check Committee in the Radiation Medical Science Center for the Fukushima Health Management Survey. Liver dysfunction was defined as an AST of more than 31 U/l, ALT of more than 31 U/l or γ-GTP of more than 51 U/l. Renal dysfunction was defined as a serum creatinine level of more than 1.35 mg/dl in males, and more than 1.15 mg/dl in females, or an eGFR value of less than 50 ml/min/1.73 m^2, based on the recommendations of our Health Check Committee. Hyperuricemia was defined as a serum uric acid level of more than 8.0 mg/dl and hyperlipidemia was defined as an LDL-C of more than 140 mmHg or as a TG of more than 150 mg/dl., while hyperglycemia was diagnosed on the basis of a blood glucose level of more than 110 mg/dl, again according the recommendations of our Health Check Committee.

Table 1. The number of residents who had lived in the evacuation zone

	Date City	Tamura City	Minamisoma City	Kawamata Machi	Hirono Machi	Naraha Machi	Tomioka Machi
16–39 years	743	10,348	17,890	3,748	1,545	2,034	4,650
40–64 years	1,092	14,376	24,225	5,412	1,903	2,799	5,475
65 years	936	11,722	18,354	4,954	1,283	2,040	3,392

	Kawauchi Mura	Okuma Machi	Futaba Machi	Namie Machi	Katsurao Machi	Iitate Machi
16–39 years	563	3,515	1,804	5,407	361	1,589
40–64 years	1,041	3,830	2,358	7,408	518	2,261
65 years	1,004	2,206	1,818	5,402	495	1,875

Statistics

Data are expressed as the mean values.

RESULTS

1) Baseline characteristics of residents who had lived in the evacuation zone (Table 1)

In 2011, 56,399 (30.9%) of the residents (182,370) aged 16 years or older had received health checks, whereas 47,009 (25.4%) of those aged 16 years or older received health checks in 2012.

2) Obesity and blood pressure of residents who had lived in the evacuation zone (Table 3)

Among adolescents and adults examined in 2011, the prevalence obesity in the male residents was 29.8% in the 16–39 year, 41.6% in the 40–64 year, and 39.1% in the 65 years or above age group, and the prevalence in the female residents was 17.2% in the 16–39 year, 28.4% in the 40–64 year, and 35.4% in the 65 years or above age group. In 2012, the prevalence of obesity in the male residents was about 30.7% in the 16–39 year, 40.3% in the 40–64 year, and 36.5% in the 65 years or above age group, while in the female residents it was 17.1% in the 16–39 year, 29.3% in the 40–64 year, and 34.2% in the 65 years or above age groups. The prevalence of obesity in the male residents aged 40 years or above in 2012 was lower than that in 2011, while the prevalence of obesity in the female residents aged 65 years or above in 2012 was lower than that in 2011.

With regard to blood pressure, in 2011, the prevalence of high systolic BP or high diastolic BP in the male residents was 5.8% and 6.6% in the 16–39 year, 27.5% and 24.1% in the 40–64 year, and 43.1% and 17.9% in the 65 years or above age groups, while in the female residents it was 1.6% and 1.7% in the 16–39 year, 19.1% and 12.2 % in the 40–64 year, and 40.4% and 12.6% in the 65 years or above age groups, respectively. In 2012, the preva-

Table 2. Items included in the comprehensive health check

Age, y	Items
0- 6	Height, weight, blood count (RBC, Hct, HB, platelets, WBC, WBC count)
7-15	Height, weight, blood count (RBC, Hct, HB, platelets, WBC, WBC count) If requested by patient: Blood chemistry (AST, ALT, γ-GTP, TG, HDL-C, LDL-C, HbA1c, FBG, S-Cr, eGFR, UA)
≧16	Height, weight abdominal circumference/BMI, BP Blood count (RBC, Hct, HB, Platelet, WBC count) Blood chemistry (AST, ALT, γ-GTP, TG, HDL-C, LDL-C, HbA1c, FBS, S-Cr, eGFR, UA) Urinary testing (protein, sugar, blood)

Abbreviations: γ-GTP, γ-glutamyl transpeptidase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; BP, blood pressure; eGFR, estimated glomerular filtration rate; FBG, fasting blood glucose; LDL-C, low-density lipoprotein-cholesterol; HbA1c, hemoglobin A1c; Hb, hemoglobin; Hct, hematocrit; HDL-C, high-density lipoprotein-cholesterol; RBC, red blood cells; S-Cr, serum creatinine; TG, triglyceride; UA, uric acid; WBC, white blood cells.

Table 3. BMI and blood pressure of residents who had lived in the evacuation zone

2011

BMI (male)				
age	n	means	＜18	≧25
16～39	5,963	23.5	4.7%	29.8%
40～64	9,560	24.6	1.1%	41.6%
65～	7,498	24.2	1.8%	39.1%

BMI (female)				
age	n	means	＜18	≧25
16～39	8,798	21.9	10.2%	17.2%
40～64	14,077	23.3	4.0%	28.4%
65～	9,219	23.9	3.1%	35.4%

2012

BMI (male)				
age	n	means	＜18	≧25
16～39	3,230	23.6	5.2%	30.7%
40～64	7,716	24.5	1.2%	40.3%
65～	8,475	24.0	2.0%	36.4%

BMI (female)				
age	n	means	＜18	≧25
16～39	5,248	21.9	11.1%	17.1%
40～64	11,835	23.4	4.1%	29.2%
65～	10,157	23.8	3.4%	34.3%

A 【BMI】

2011

Abdominal circumference (cm) (male)			
age	n	means	≧85
16～39	867	82.2	37.3%
40～64	9,546	86.6	56.0%
65～	4,649	86.5	58.2%

Abdominal circumference (cm) (female)			
age	n	means	≧90
16～39	1,603	75.8	9.5%
40～64	14,055	81.9	19.5%
65～	5,615	84.4	26.7%

2012

Abdominal circumference (cm) (male)			
age	n	means	≧85
16～39	732	81.4	36.3%
40～64	7,704	86.6	56.2%
65～	5,415	86.2	56.4%

Abdominal circumference (cm) (female)			
age	n	means	≧90
16～39	1,239	75.4	8.6%
40～64	11,802	82.3	20.8%
65～	6,444	84.3	26.6%

B 【Abdominal circumference】

2011

Systolic BP (mmHg) (male)			
age	n	means	≧140
16～39	5,963	118.8	5.8%
40～64	9,559	130.8	27.5%
65～	7,497	137.2	43.1%

Systolic BP (mmHg) (female)			
age	n	means	≧140
16～39	8,794	110.2	1.6%
40～64	14,074	125.7	19.1%
65～	9,229	136.1	40.4%

2012

Systolic BP (mmHg) (male)			
age	n	means	≧140
16～39	3,230	117.6	4.9%
40～64	7,716	128.2	21.5%
65～	8,479	133.8	34.2%

Systolic BP (mmHg) (female)			
age	n	means	≧140
16～39	5,250	108.8	1.3%
40～64	11,835	123.2	14.9%
65～	10,163	132.7	31.8%

C 【Systolic BP】

2011

Diastolic BP (mmHg) (male)			
age	n	means	≧90
16～39	5,963	72.3	6.6%
40～64	9,559	81.8	24.1%
65～	7,497	79.7	17.9%

Diastolic BP (mmHg) (female)			
age	n	means	≧90
16～39	8,794	66.7	1.7%
40～64	14,074	76.8	12.2%
65～	9,229	77.7	12.6%

2012

Diastolic BP (mmHg) (male)			
age	n	means	≧90
16～39	3,230	70.7	4.8%
40～64	7,716	79.9	18.5%
65～	8,479	77.4	12.5%

Diastolic BP (mmHg) (female)			
age	n	means	≧90
16～39	5,248	65.8	1.5%
40～64	11,835	75.0	9.6%
65～	10,163	75.4	8.7%

D 【Diastolic BP】

lence of high systolic BP or high diastolic BP in the male residents was 4.9% and 4.8% in the 16–39 year, 21.6% and 18.5% in the 40–64 year, and 34.2% and 12.5% in the 65 years or above age groups, while in the female residents it was 1.3% and 1.5% in the 16–39 year, 14.9% and 9.6 % in the 40–64 year, and 31.8% and 8.7% in the 65 years or above age groups, respectively. In addition, the prevalence of hypertension in both the male and female residents in 2012 was lower than that in male and female residents in 2011 in all age groups.

3) Peripheral blood data of residents who had lived in the evacuation zone (Table 4, 5)

In 2011, the prevalence of anemia in the male residents was 0.3% in the 16–39 year, 0.8% in the 40–64 year, and 3.1% in the 65 years or above age groups, while that in the female residents was 5.7% in the 16–39 year, 5.6% in the 40–64 year, and 2.7% in the 65 year or above age groups. Similarly, the

Table 4. RBC counts, Hg, Hct, and platelet counts of residents who had lived in the evacuation zone

2011

RBC counts (10^6/μl) (male)					
age	n	means	≦3.69	≦3.99	≧5.80
16～39	5,966	5.21	0.0%	0.1%	4.4%
40～64	9,562	4.96	0.4%	1.3%	1.6%
65～	7,495	4.74	1.5%	5.3%	1.1%

RBC counts (10^6/μl) (female)					
age	n	means	≦3.39	≦3.69	≧5.50
16～39	8,791	4.58	0.0%	0.7%	0.5%
40～64	14,087	4.54	0.2%	0.8%	0.4%
65～	9,228	4.42	0.8%	3.3%	0.4%

2012

RBC counts (10^6/μl) (male)					
age	n	means	≦3.69	≦3.99	≧5.80
16～39	3,230	5.17	—	0.1%	3.5%
40～64	7,717	4.88	0.7%	2.0%	1.6%
65～	8,476	4.63	2.9%	8.5%	0.9%

RBC counts (10^6/μl) (female)					
age	n	means	≦3.39	≦3.69	≧5.50
16～39	5,249	4.49	0.2%	1.0%	0.4%
40～64	11,835	4.44	0.3%	1.5%	0.4%
65～	10,160	4.30	1.5%	6.7%	0.2%

A 【RBC counts】

2011

Hb (g/dL) (male)					
age	n	means	≦12.0	≦13.0	≧18.0
16～39	5,966	15.9	0.3%	0.6%	1.7%
40～64	9,562	15.5	0.8%	2.4%	1.5%
65～	7,495	14.9	3.1%	8.8%	1.4%

Hb (g/dL) (female)					
age	n	means	≦11.0	≦12.0	≧16.0
16～39	8,791	13.3	5.7%	13.2%	0.4%
40～64	14,087	13.4	5.6%	11.4%	1.0%
65～	9,228	13.5	2.7%	10.5%	1.0%

2012

Hb (g/dL) (male)					
age	n	means	≦12.0	≦13.0	≧18.0
16～39	3,230	15.7	0.2%	0.5%	1.0%
40～64	7,717	15.2	0.9%	3.5%	1.2%
65～	8,476	14.6	4.0%	12.8%	0.8%

Hb (g/dL) (female)					
age	n	means	≦11.0	≦12.0	≧16.0
16～39	5,249	13.1	6.0%	15.3%	0.4%
40～64	11,835	13.2	5.0%	12.5%	0.7%
65～	10,160	13.1	3.7%	15.4%	0.4%

B 【Hb】

2011

Hct (%) (male)					
age	n	means	≦35.9	≦37.9	≧55.0
16～39	5,966	46.7	0.2%	0.3%	0.1%
40～64	9,562	45.8	0.6%	1.3%	0.2%
65～	7,495	44.3	2.2%	4.8%	0.3%

Hct (%) (female)					
age	n	means	≦28.9	≦32.9	≧48.0
16～39	8,791	40.3	0.4%	2.3%	0.2%
40～64	14,087	40.7	0.6%	2.9%	0.6%
65～	9,228	40.8	0.2%	1.2%	0.9%

2012

Hct (%) (male)					
age	n	means	≦35.9	≦37.9	≧55.0
16～39	3,230	46.8	0.1%	0.2%	0.2%
40～64	7,717	45.8	0.6%	1.3%	0.4%
65～	8,476	44.2	2.6%	6.1%	0.4%

Hct (%) (female)					
age	n	means	≦28.9	≦32.9	≧48.0
16～39	5,250	40.2	0.3%	2.2%	0.4%
40～64	11,835	40.7	0.4%	2.2%	1.0%
65～	10,160	40.5	0.3%	1.7%	0.9%

C 【Hct】

2011

Platelet counts (10^3/μl) (male)						
age	n	means	≦89	≦129	≧370	≧450
16～39	5,951	252.7	0.0%	0.2%	2.4%	0.2%
40～64	9,495	242.4	0.3%	1.2%	2.1%	0.3%
65～	7,412	220.7	0.2%	2.7%	1.4%	0.4%

Platelet counts (10^3/μl) (female)						
age	n	means	≦89	≦129	≧370	≧450
16～39	8,752	271.6	0.0%	0.2%	5.9%	1.0%
40～64	13,984	262.2	0.2%	0.6%	4.9%	0.9%
65～	9,123	239.2	0.3%	1.2%	2.0%	0.3%

2012

Platelet counts (10^3/μl) (male)						
age	n	means	≦89	≦129	≧370	≧450
16～39	3,225	249.4	—	0.3%	1.6%	0.1%
40～64	7,691	237.3	0.4%	1.4%	2.0%	0.3%
65～	8,439	213.8	0.4%	3.5%	0.9%	0.3%

Platelet counts (10^3/μl) (female)						
age	n	means	≦89	≦129	≧370	≧450
16～39	5,242	261.7	0.1%	0.4%	4.2%	0.7%
40～64	11,794	249.9	0.2%	0.8%	3.1%	0.4%
65～	10,124	228.2	0.4%	2.1%	1.5%	0.3%

D 【Platelet counts】

Table 5. WBC counts, including neutrophils counts, lymphocytes counts, basophils counts, monocyte counts, and eosinophils counts ; of residents who had lived in the evacuation zone

2011

WBC counts (10^3/μl) (male)						
age	n	means	≦2.9	≦3.9	≧9.6	≧11.1
16～39	5,966	6.3	0.3%	4.6%	4.6%	1.6%
40～64	9,562	6.4	0.3%	4.0%	5.1%	1.8%
65～	7,495	6.2	0.3%	4.8%	3.1%	1.1%

WBC counts (10^3/μl) (female)						
age	n	means	≦2.9	≦3.9	≧9.6	≧11.1
16～39	8,791	6.0	0.9%	7.6%	3.8%	1.3%
40～64	14,087	5.6	1.1%	11.1%	1.6%	0.5%
65～	9,228	5.8	0.9%	8.5%	1.7%	0.5%

2012

WBC counts (10^3/μl) (male)						
age	n	means	≦2.9	≦3.9	≧9.6	≧11.1
16～39	3,230	6.1	0.4%	5.3%	4.1%	1.6%
40～64	7,717	6.2	0.3%	5.1%	4.3%	1.4%
65～	8,476	6.0	0.5%	6.1%	2.4%	0.7%

WBC counts (10^3/μl) (female)						
age	n	means	≦2.9	≦3.9	≧9.6	≧11.1
16～39	5,250	5.9	0.9%	9.4%	3.4%	1.1%
40～64	11,834	5.5	1.3%	12.6%	1.5%	0.4%
65～	10,161	5.5	1.0%	10.2%	1.2%	0.4%

A 【 WBC counts 】

2011

Neutrophils counts (/μl) (male)			
age	n	means	≦500
16～39	5,962	3,428	—
40～64	9,559	3,494	0.0%
65～	7,495	3,423	0.0%

Neutrophils counts (/μl) (female)			
age	n	means	≦500
16～39	8,784	3,490	—
40～64	14,084	3,085	0.0%
65～	9,224	3,156	0.0%

2012

Neutrophils counts (/μl) (male)			
age	n	means	≦500
16～39	3,219	3,397	—
40～64	7,687	3,467	—
65～	8,435	3,360	—

Neutrophils counts (/μl) (female)			
age	n	means	≦500
16～39	5,236	3,461	—
40～64	11,786	3,048	—
65～	10,112	3,074	0.0%

B 【 Neutrophils counts 】

2011

Lymphocyte counts (/μl) (male)			
age	n	means	≦500
16～39	5,962	2,232	0.0%
40～64	9,559	2,278	—
65～	7,495	2,172	0.0%

Lymphocyte counts (/μl) (female)			
age	n	means	≦500
16～39	8,784	2,018	0.0%
40～64	14,084	2,021	0.0%
65～	9,224	2,137	0.0%

2012

Lymphocyte counts (/μl) (male)			
age	n	means	≦500
16～39	3,219	2,136	—
40～64	7,687	2,138	0.0%
65～	8,435	2,013	0.0%

Lymphocyte counts (/μl) (female)			
age	n	means	≦500
16～39	5,236	1,920	—
40～64	11,786	1,949	0.1%
65～	10,112	1,994	0.0%

C 【 Lymphocyte counts 】

2011

Basophils counts (/μl) (male)		
age	n	means
16～39	5,962	31
40～64	9,559	32
65～	7,495	29

Basophils counts (/μl) (female)		
age	n	means
16～39	8,784	28
40～64	14,084	28
65～	9,224	27

2012

Basophils counts (/μl) (male)		
age	n	means
16～39	3,219	40
40～64	7,687	43
65～	8,435	41

Basophils counts (/μl) (female)		
age	n	means
16～39	5,236	37
40～64	11,786	37
65～	10,112	36

D 【 Basophils counts 】

2011

Monocyte counts (/μl) (male)		
age	n	means
16～39	5,962	361
40～64	9,559	363
65～	7,495	366

Monocyte counts (/μl) (female)		
age	n	means
16～39	8,784	322
40～64	14,084	289
65～	9,224	301

2012

Monocyte counts (/μl) (male)		
age	n	means
16～39	3,219	353
40～64	7,687	362
65～	8,435	368

Monocyte counts (/μl) (female)		
age	n	means
16～39	5,236	314
40～64	11,786	289
65～	10,112	303

E 【 Monocyte counts 】

2011

Eosinophils counts (/μl) (male)		
age	n	means
16～39	5,962	201
40～64	9,559	190
65～	7,495	179

Eosinophils counts (/μl) (female)		
age	n	means
16～39	8,784	158
40～64	14,084	139
65～	9,224	133

2012

Eosinophils counts (/μl) (male)		
age	n	means
16～39	3,219	210
40～64	7,687	188
65～	8,435	174

Eosinophils counts (/μl) (female)		
age	n	means
16～39	5,236	162
40～64	11,786	139
65～	10,112	131

F 【 Eosinophils counts 】

prevalence of anemia in the male residents in 2012 was 0.2% in the 16–39 year, 0.9% in the 40–64 year, and 4.0% in the 65 years or above age group, while that in female residents was 6.1% in the 16–39 year, 5.0% in the 40–64 year, and 3.7% in the 65 years or above age groups. The prevalence of anemia in the male residents aged 65 years or above in 2012 was higher than that in 2011, and that in the female residents in the 16–39 year and in the 65 years or above age groups in 2012 was higher than the respective figures for 2011. There were no differences in peripheral WBC counts, including neutrophils and lymphocytes, or platelet counts among age groups or between males and females in either 2011 or 2012.

4) Biochemical laboratory findings for residents who had lived in the evacuation zone (Table 6–9)

With regard to lipid function, the prevalence of high LDL–C or high TG values in the male residents in 2011 was 21.0% and 19.0% in the 16–39 year, 34.2% and 31.5% in the 40–64 year, and 24.6%, and 23.1% in the 65 years or above age groups, and the

Table 6. LDL–C, triglyceride, and HLD–C values of residents who had lived in the evacuation zone

2011

HDL-C (mg/dL) (male)			
age	n	means	<40
16～39	5,966	56.2	7.5%
40～64	9,562	55.7	10.6%
65～	7,496	54.2	13.3%

HDL-C (mg/dL) (female)			
age	n	means	<40
16～39	8,791	66.1	1.7%
40～64	14,089	65.3	2.5%
65～	9,229	60.4	4.6%

2012

HDL-C (mg/dL) (male)			
age	n	means	<40
16～39	3,230	55.9	8.1%
40～64	7,716	55.6	11.6%
65～	8,476	54.0	13.0%

HDL-C (mg/dL) (female)			
age	n	means	<40
16～39	5,249	65.7	1.9%
40～64	11,835	64.1	3.0%
65～	10,162	59.8	5.1%

A 【HDL-C】

2011

Triglyceride (mg/dL) (male)				
age	n	means	≧150	≧300
16～39	5,966	109.3	19.0%	3.2%
40～64	9,562	142.3	31.5%	6.0%
65～	7,496	119.6	23.1%	2.5%

Triglyceride (mg/dL) (female)				
age	n	means	≧150	≧300
16～39	8,791	74.3	6.2%	0.6%
40～64	14,089	101.1	14.4%	1.3%
65～	9,229	110.7	18.1%	1.0%

2012

Triglyceride (mg/dL) (male)				
age	n	means	≧150	≧300
16～39	3,230	111.7	19.9%	3.0%
40～64	7,717	140.0	32.0%	5.9%
65～	8,476	115.3	20.5%	2.2%

Triglyceride (mg/dL) (female)				
age	n	means	≧150	≧300
16～39	5,250	75.8	6.7%	0.7%
40～64	11,835	102.0	14.6%	1.4%
65～	10,162	107.1	15.7%	1.0%

B 【Triglyceride】

2011

LDL-C (mg/dL) (male)				
age	n	means	≧120	≧140
16～39	5,966	114.6	40.2%	21.0%
40～64	9,562	126.9	57.8%	34.2%
65～	7,496	118.6	48.0%	24.6%

LDL-C (mg/dL) (female)				
age	n	means	≧120	≧140
16～39	8,791	107.0	29.6%	12.4%
40～64	14,089	130.9	61.1%	37.0%
65～	9,229	126.4	56.7%	31.7%

2012

LDL-C (mg/dL) (male)				
age	n	means	≧120	≧140
16～39	3,230	114.2	39.0%	21.2%
40～64	7,716	123.7	53.6%	29.6%
65～	8,476	113.8	41.8%	18.4%

LDL-C (mg/dL) (female)				
age	n	means	≧120	≧140
16～39	5,249	106.3	28.9%	12.3%
40～64	11,834	127.6	57.6%	32.9%
65～	10,162	121.6	50.8%	25.6%

C 【LDL-C】

Table 7. Liver function and uric acid levels of residents who had lived in the evacuation zone

2011

AST (U/l) (male)				
age	n	means	≧31	≧51
16～39	5,966	24.2	15.3%	3.8%
40～64	9,562	26.9	21.4%	4.3%
65～	7,496	27.2	23.0%	3.7%

AST (U/l) (female)				
age	n	means	≧31	≧51
16～39	8,791	18.2	3.4%	0.8%
40～64	14,089	22.3	9.7%	1.8%
65～	9,229	24.5	13.4%	2.2%

2012

AST (U/l) (male)				
age	n	means	≧31	≧51
16～39	3,229	24.6	16.6%	3.3%
40～64	7,717	27.6	23.7%	4.4%
65～	8,476	27.8	25.1%	3.6%

AST (U/l) (female)				
age	n	means	≧31	≧51
16～39	5,250	18.5	3.8%	0.9%
40～64	11,835	22.8	10.6%	2.1%
65～	10,162	25.2	14.8%	2.2%

A 【AST】

2011

ALT (U/l) (male)				
age	n	means	≧31	≧51
16～39	5,966	31.4	31.0%	14.1%
40～64	9,562	30.3	32.8%	11.3%
65～	7,496	23.5	18.8%	5.2%

ALT (U/l) (female)				
age	n	means	≧31	≧51
16～39	8,791	15.3	5.6%	2.2%
40～64	14,089	20.5	12.7%	3.9%
65～	9,229	18.8	9.5%	2.6%

2012

ALT (U/l) (male)				
age	n	means	≧31	≧51
16～39	3,230	31.8	33.6%	14.7%
40～64	7,717	30.7	33.8%	11.6%
65～	8,476	24.0	19.5%	4.9%

ALT (U/l) (female)				
age	n	means	≧31	≧51
16～39	5,250	15.7	6.5%	2.3%
40～64	11,835	20.8	13.3%	4.2%
65～	10,162	19.5	9.8%	2.6%

B 【ALT】

2011

γ-GT (U/l) (male)				
age	n	means	≧51	≧101
16～39	5,966	37.2	17.2%	5.4%
40～64	9,562	58.8	35.6%	12.3%
65～	7,496	44.2	22.4%	6.9%

γ-GT (U/l) (female)				
age	n	means	≧51	≧101
16～39	8,791	17.3	2.5%	0.5%
40～64	14,089	26.8	9.3%	2.1%
65～	9,229	23.6	6.0%	1.1%

2012

γ-GT (U/l) (male)				
age	n	means	≧51	≧101
16～39	3,230	38.0	18.5%	5.4%
40～64	7,717	60.7	36.9%	12.8%
65～	8,476	44.1	23.1%	6.7%

γ-GT (U/l) (female)				
age	n	means	≧51	≧101
16～39	5,250	17.9	2.8%	0.6%
40～64	11,835	27.3	9.7%	2.4%
65～	10,162	24.4	6.5%	1.5%

C 【γ-GT】

2011

Uric acid (mg/dL) (male)				
age	n	means	≧7.1	≧8.0
16～39	5,966	6.0	18.5%	6.5%
40～64	9,562	5.9	18.1%	6.2%
65～	7,496	5.7	14.4%	4.9%

Uric acid (mg/dL) (female)				
age	n	means	≧7.1	≧8.0
16～39	8,791	4.2	0.7%	0.2%
40～64	14,089	4.3	1.1%	0.3%
65～	9,229	4.5	2.1%	0.6%

2012

Uric acid (mg/dL) (male)				
age	n	means	≧7.1	≧8.0
16～39	3,230	6.1	20.3%	6.8%
40～64	7,717	6.0	20.9%	7.3%
65～	8,475	5.8	16.0%	5.9%

Uric acid (mg/dL) (female)				
age	n	means	≧7.1	≧8.0
16～39	5,250	4.3	0.7%	0.2%
40～64	11,835	4.4	1.5%	0.4%
65～	10,162	4.6	2.6%	0.8%

D 【Uric acid】

prevalence in the female residents was 12.4% and 6.2% in the 16–39 year, 37.0% and 14.4% in the 40–64 year, and 31.7% and 18.1% in the 65 years or above age groups, respectively. In 2012, the prevalence of high LDL-C or high TG values was 21.2% and 19.9% in the 16–39 year and was 29.6% and 32.0% in the 40–64 year, 18.4%, and 20.5% in the 65 years or age groups, respectively, in males, and 12.3% and 6.7% in the 16–39 year and was about 32.9% and 14.6% in the 40–64 year, 25.6%, and 15.7% in the 65 years or above age groups, respectively, in females. The prevalence of hyperlipidemia in the 40–64 year and the 65 years or above age groups in both males and females in 2012 was slightly lower than in the respective age groups in 2011 (Table 6).

In terms of liver function, in 2011, the prevalence of high AST, ALT, and γ-GTP values in males was 15.3%, 31.0% and 17.2% in the 16–39 year, 21.4%, 32.8%, and 35.6% in the 40–64 year, and 23.0%, 18.8% and 22.4% in the 65 years or above age groups, and 3.4%, 5.6% and 2.5% in the 16–39 year, 9.7%, 12.7%, and 9.3% in the 40–64 year, and 13.4%, 9.5% and 6.0% in the 65 years or above age groups, respectively, in females. In 2012, the prevalence in males was 16.6%, 33.6% and 18.5% in the 16–39 year, 23.7%, 33.8%, and 36.9% in the 40–64 year, and 25.1%, 19.5% and 23.1% in the 65 years or above age groups, while in females it was 3.8%, 6.5% and 2.8% in the 16–39 year, 10.6%, 13.3%, and 9.7% in the 40–64 year, and 14.8%, 9.8% and 6.5% in the 65 years or above age groups, respectively. The prevalence of high AST or ALT values in males aged 16–39 years, 40–64 years, and 65 years or above in 2012 was slightly increased compared to the frequencies observed in 2011, and the prevalence of high AST or ALT values in women aged 16–39 years, 40–64 years, or 65 years or above in 2012 was slightly increased compared to the values observed in 2011. On the other hand, the prevalence of high γ-GTP values in male residents aged 40–64 years and in the female residents aged 40–64 years and 65 years or above in 2012 was slightly increased compared to the values observed in 2011 (Table 7).

The prevalence of hyperuricemia in the male residents in 2011 was 6.5% in the 16–39 year, 6.2% in the 40–64 year and 4.9% in the 65 years or above age groups, and that in female was 0.2% in the 16–39 year, 0.3% in the 40–64 year and 0.6% in the 65 years or above age groups. The 2012 data reveal that the prevalence of hyperuricemia in the male residents was 6.8% in the 16–39 year, 7.3% in the 40–64 year and 5.9% in the 65 years or above age groups, while in women it was 0.2% in the 16–39 year, 0.4% in the 40–64 year and 0.8% in the 65 years or above age groups. Hyperuricemia was more common in males aged 16–39 years, 40–64 years, and 65 years or above in both 2011 and 2012. The prevalence of hyperuricemia in the 40–64 year, and 65 years or above age groups in males and in the 40–64 year and the 65 years or above age groups in females in 2012 was slightly increased compared to the values in 2011 (Table 7).

With regard urinary glucose, fasting plasma glu-

Table 8. Urinary glucose, fasting blood sugar, and HbA1c levels of residents who had lived in the evacuation zone

2011

Urinary glucose (male)		
age	n	≧(1+)
16～39	5,963	1.1%
40～64	9,558	4.9%
65～	7,486	5.0%

Urinary glucose (female)		
age	n	≧(1+)
16～39	8,679	0.5%
40～64	14,020	1.3%
65～	9,192	1.7%

2012

Urinary glucose (male)		
age	n	≧(1+)
16～39	3,228	1.0%
40～64	7,709	4.1%
65～	8,463	3.7%

Urinary glucose (female)		
age	n	≧(1+)
16～39	5,172	0.5%
40～64	11,805	1.0%
65～	10,143	1.1%

A 【 Urinary glucose 】

2011

Fasting blood sugar (mg/dL) (male)					
age	n	means	≧110	≧130	≧160
16～39	5,204	91.1	2.9%	1.2%	0.7%
40～64	8,370	104.6	22.5%	9.0%	3.8%
65～	6,575	108.2	31.7%	11.9%	3.8%

Fasting blood sugar (mg/dL) (female)					
age	n	means	≧110	≧130	≧160
16～39	7,725	87.6	1.2%	0.5%	0.3%
40～64	12,657	96.8	10.3%	3.5%	1.7%
65～	8,169	103.3	21.6%	7.4%	2.5%

2012

Fasting blood sugar (mg/dL) (male)					
age	n	means	≧110	≧130	≧160
16～39	2,744	90.0	2.7%	1.1%	0.7%
40～64	6,639	103.2	21.5%	8.7%	3.3%
65～	7,189	105.2	26.7%	9.7%	2.8%

Fasting blood sugar (mg/dL) (female)					
age	n	means	≧110	≧130	≧160
16～39	4,545	86.8	1.4%	0.6%	0.5%
40～64	10,401	95.5	9.5%	3.1%	1.2%
65～	8,666	100.6	17.8%	5.6%	1.5%

B 【 Fasting plasma glucose concentration 】

2011

HbA1c (%) (NGSP) (male)					
age	n	means	≧6.0	≧7.0	≧8.0
16～39	5,966	5.1	2.1%	1.0%	0.7%
40～64	9,562	5.5	16.1%	5.7%	2.6%
65～	7,496	5.7	22.4%	5.9%	2.2%

HbA1c (%) (NGSP) (female)					
age	n	means	≧6.0	≧7.0	≧8.0
16～39	8,789	5.1	1.2%	0.5%	0.3%
40～64	14,088	5.4	8.9%	2.6%	1.2%
65～	9,227	5.6	15.8%	3.7%	1.4%

2012

HbA1c (%) (NGSP) (male)					
age	n	means	≧6.0	≧7.0	≧8.0
16～39	3,229	5.2	2.6%	0.7%	0.5%
40～64	7,717	5.6	17.2%	5.1%	2.3%
65～	8,476	5.7	22.9%	5.1%	1.6%

HbA1c (%) (NGSP) (female)					
age	n	means	≧6.0	≧7.0	≧8.0
16～39	5,249	5.2	1.6%	0.6%	0.5%
40～64	11,835	5.5	10.6%	2.4%	1.0%
65～	10,162	5.6	18.2%	3.0%	1.1%

C 【 HbA1c (NGSP) 】

cose concentration, and HbA1c levels, the prevalence of positive urinary glucose (urinary glucose≧1+) in males was 1.1% in the 16–39 year, 4.9% in the 40–64 year and 5.0% in the 65 years or above age groups, and 0.5% in the 16–39 year, 1.3% in the 40–64 year and 1.7% in the 65 years or above age groups in females in 2011. In 2012, the prevalence was 1.0%, 4.1% and 3.7%, respectively, in males, and 0.5%, 1.0%, 1.1%, respectively, in females. Further, in 2011, the prevalence of high fasting plasma glucose concentration or HbA1c values (≧6.0%) was 2.9% and 2.1% in the 16–39 year, 22.5% and 16.1% in the 40–64 year and 31.7% and 22.4% in the 65 years or above age groups, respectively, in males, and 1.2% and 1.2%, 10.3% and 8.9%, and 21.6% and 15.8%, respectively, in females. In 2012, high fasting plasma glucose concentration and HbA1c values (≧6.0%) were observed in 2.7% and 2.6% of males in the 16–39 year, 21.5% and 17.2% in the 40–64 year and 26.7% and 22.9% in the 65 years or above age groups, with the respective values among females being 1.4% and 1.6% in the 16–39 year, 9.5% and 10.6% in the 40–64 year, and 17.8% and 18.2% in the 65 years or above age groups, respectively. The prevalence of high HbA1c values in the 16–39 year, 40–64 year, and 65 years or above age groups for both men and women in 2012 were slightly increased compared to the values recorded in 2011 (Table 8).

The data for urinalysis, in 2011 revealed that the prevalence of proteinuria (≧1+) or occult hematuria (≧1+) in males was 1.1% and 1.2% in the 16–39 year, 2.2% and 3.5% in the 40–64 year, 3.5% and 5.5% in the 65 years or above age groups, whereas in female it was 1.1% and 10.8% in the 16–39 year, 0.8% and 9.6% in the 40–64 year, and 1.5% and 8.9% in the 65 years or above age groups. In 2012, the prevalence was 2.2% and 1.4% in the 16–39 year, 2.6% and 3.6% in the 40–64 year and 3.8% and 4.9% in the 65 years or above age groups in males and 2.2% and 10.9% in the 16–39 year, 1.1% and 8.8% in the 40–64 year, and 1.8% and 8.5% in the 65 years or above age groups in females.

As to renal function, the prevalence of high serum creatinine or low eGFR values was 0.1% and 0.1% in the 16–39 year, 0.8% and 1.5% in the 40–64 year and 2.5% and 8.7% in the 65 years or above age groups in the male residents in 2011, and 0.0% and 0.1% in the 16–39 year, 0.3% and 0.9% in the 40–64 year, and 1.3% and 9.2% in the 65 years or above age groups in the female residents. In 2012, the prevalence of high serum creatinine or low eGFR values was 0.1% and 0.1% in the 16–39 year, 0.9% and 1.7% in the 40–64 year and 2.9% and 9.3% in the 65 years or above age groups, respectively, in males, and 0.0% and 0.0% in the 16–39 year, 0.3% and 1.1% in the 40–64 year, and 1.6% and 9.9% in the 65 years or above age groups, respectively, in females. The prevalence of high serum creatinine and low eGFR values in males and females in the 65 years or above

Table 9. Urinalysis and renal function of residents who had lived in the evacuation zone

2011

Urinary protein (male)		
age	n	≧(1+)
16～39	5,963	1.1%
40～64	9,557	2.2%
65～	7,486	3.5%

Urinary protein (female)		
age	n	≧(1+)
16～39	8,679	1.1%
40～64	14,020	0.8%
65～	9,192	1.5%

2012

Urinary protein (male)		
age	n	≧(1+)
16～39	3,228	2.2%
40～64	7,709	2.6%
65～	8,463	3.8%

Urinary protein (female)		
age	n	≧(1+)
16～39	5,172	2.2%
40～64	11,806	1.1%
65～	10,143	1.8%

A 【Urinary protein】

2011

Occult hematuria (male)		
age	n	≧(1+)
16～39	5,960	1.2%
40～64	9,558	3.5%
65～	7,486	5.5%

Occult hematuria (female)		
age	n	≧(1+)
16～39	8,670	10.8%
40～64	14,013	9.6%
65～	9,192	8.9%

2012

Occult hematuria (male)		
age	n	≧(1+)
16～39	3,228	1.4%
40～64	7,707	3.6%
65～	8,459	4.9%

Occult hematuria (female)		
age	n	≧(1+)
16～39	5,172	10.9%
40～64	11,803	8.9%
65～	10,133	8.5%

B 【Occult hematuria】

2011

Serum creatinine (mg/dL) (male)				
age	n	means	≧1.15	≧1.35
16～39	5,965	0.83	0.4%	0.1%
40～64	9,562	0.86	2.4%	0.8%
65～	7,496	0.91	7.6%	2.5%

Serum creatinine (mg/dL) (female)				
age	n	means	≧0.98	≧1.15
16～39	8,790	0.62	0.2%	0.0%
40～64	14,089	0.64	0.8%	0.3%
65～	9,228	0.69	4.4%	1.3%

2012

Serum creatinine (mg/dL) (male)				
age	n	means	≧1.15	≧1.35
16～39	3,230	0.83	0.4%	0.1%
40～64	7,717	0.86	2.7%	0.9%
65～	8,475	0.91	8.3%	2.9%

Serum creatinine (mg/dL) (female)				
age	n	means	≧0.98	≧1.15
16～39	5,248	0.61	0.1%	—
40～64	11,832	0.65	0.8%	0.3%
65～	10,160	0.69	4.5%	1.6%

C 【Serum creatinine】

2011

eGFR (ml/min/1.73m²) (male)				
age	n	means	<50	<60
16～39	5,964	95.1	0.1%	0.3%
40～64	9,562	76.2	1.5%	7.7%
65～	7,496	67.1	8.7%	27.1%

eGFR (ml/min/1.73m²) (female)				
age	n	means	<50	<60
16～39	8,789	97.0	0.1%	0.2%
40～64	14,089	77.3	0.9%	6.0%
65～	9,228	66.2	9.2%	29.7%

2012

eGFR (ml/min/1.73m²) (male)				
age	n	means	<50	<60
16～39	3,230	95.4	0.1%	0.3%
40～64	7,717	76.1	1.7%	8.6%
65～	8,475	66.9	9.3%	28.5%

eGFR (ml/min/1.73m²) (female)				
age	n	means	<50	<60
16～39	5,248	96.8	0.0%	0.2%
40～64	11,832	75.8	1.1%	8.5%
65～	10,160	65.6	9.9%	32.4%

D 【eGFR】

age groups in 2012 was slightly increased compared to the values recorded in 2011 (Table 9).

DISCUSSION

The total number of residents of all ages who were living in the evacuation zone in Fukushima prefecture at the time of the earthquake was about 210,000. These evacuees from the government-designated evacuation zone were forced to change their lifestyle, diet, exercise patterns, and other personal habits. Some could not receive adequate health checks, and some experienced anxiety regarding their health. Thus, the Fukushima prefectural government decided to conduct what they termed the Fukushima Health Management Survey to assist in the long-term health management of residents and to evaluate the health impact. There have been no reports on the health check examinations for residents who had lived in evacuation zones.

The laboratory findings revealed that, in 2011, some males and females aged 16 years or older demonstrated obesity or hyperlipidemia, and the prevalence of obesity or hyperlipidemia was seen to increase with age. Some males aged 16 years or older were found to have hyperuricemia and liver dysfunction, and the prevalence of hyperuricemia and liver dysfunction also increased with age. Furthermore, the prevalence of hypertension, glucose metabolic abnormalities and renal dysfunction was found to increase in those aged 40 years or older. We think that these findings might be associated with changes in the residents' lifestyle, diet, exercise patterns, mental stress levels, sleep patterns, and other personal habits.

The 2012 data revealed that some males and females 16 years or older experienced obesity or hyperlipidemia, and the prevalence of obesity or hyperlipidemia increased with age. A number of males aged 16 years or older were found to have residents with hyperuricemia and liver dysfunction, while the prevalence of hyperuricemia and liver dysfunction was seen to increase with age. Furthermore, the numbers of males and females with hypertension, glucose metabolic abnormalities, and renal dysfunction increased in the population aged 40 years or older. These findings for 2012 were similar to those for 2011. A comparison of laboratory findings between 2011 and 2012 revealed that the prevalence of obesity, hypertension and hyperlipidemia was lower in 2012 than in 2011. However, the prevalence of liver dysfunction, hyperuricemia, glucose metabolic abnormalities and renal dysfunction was higher in 2012 than in 2011. There were no differences in the peripheral WBC counts, including neutrophils and lymphocytes, or platelet counts between 2011 and 2012. These changes in obesity, hypertension, and hyperlipidemia suggest that the target population's lifestyle and diet, exercise patterns, mental stress levels, and sleep patterns were all slightly improved. However, the prevalence of liv-

er dysfunction, hyperuricemia, and renal dysfunction increased, indicating that it is necessary to continue our observation of these residents through health check examinations and to use the data obtained in improving their lifestyle.

Lifestyle-related disease including obesity is a major health problem, and its incidence is increasing worldwide[7]. In Japan, the prevalence of obesity has been consistently increasing in men, whereas it has been stable over the last 10 years in women, according to the annual reports of the National Nutrition Survey, Japan. At present, the prevalence of overweight is 30.9% in men and 22.7% in women aged 20 years or older[8]. Thus, to evaluate the health impact more precisely, it is necessary to compare the number of people with lifestyle-related disease between the population living in the evacuation zone and the general population.

The frequency of residents aged 16 years or older who received health checks in 2011 was 30.9%, while that in 2012 was only 25.4%. The frequency of residents who received health checks in 2012 was lower than that in 2011, and these findings might indicate a lack of interest in the health checks provided by the Fukushima Health Management Survey. We think that the decrease in residents who received health checks might affect the results of our study, and it is necessary to maintain interest in these health checks through advertising and better education.

As to the limitations of our study, there was no change in the residents targeted for health checks between 2011 and 2012, but residents receiving the health checks, the time when they received the checks, and the medical institutions varied between 2011 and 2012. Thus, we could not simply compare the data from 2011 and 2012 using statistical analysis. To evaluate the health impact more precisely, it is necessary to evaluate changes in the health status of the residents receiving the health checks in both 2011 and 2012 on the basis of the results of the health checks. Furthermore, it is necessary to accumulate laboratory data for comprehensive health checks over a long-term follow-up period and to consider the prevention of each disease, including lifestyle-related diseases.

In conclusion, the results suggested the number patients with obesity, hyperlipidemia, hyperuricemia, liver dysfunction, hypertension, glucose metabolic abnormalities, or renal dysfunction in residents who had lived in the evacuation zone increased with age. Therefore, we think that it is necessary to persist with the health check examinations for these residents in order to ameliorate the observed lifestyle-related diseases.

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APPENDIX

The Fukushima Health Management Survey Group

Hitoshi Ohto, Masafumi Abe, Shunichi Yamashita, Kenji Kamiya, Seiji Yasumura, Mitsuaki Hosoya, Akira Ohtsuru, Akira Sakai, Shinichi Suzuki, Hirooki Yabe, Masaharu Maeda, Shirou Matsui, Keiya Fujimori, Tetsuo Ishikawa, Tetsuya Ohira, Tsuyoshi Watanabe, Hiroaki Satoh, Hitoshi Suzuki, Yukihiko Kawasaki, Atsushi Takahashi, Kotaro Ozasa, Gen Kobashi, Shigeatsu Hashimoto, Satoru Suzuki, Toshihiko Fukushima, Sanae Midorikawa, Hiromi Shimura,Hirofumi Mashiko, Aya Goto, Kenneth Eric Nollet, Shinichi Niwa, Hideto Takahashi, and Yoshisada Shibata

CONFLICT OF INTEREST

We have no conflicting interests affecting the present study.

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