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2022 Fukushima Medical University International Symposium on the Fukushima Health Management Survey
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1600-1620 March 5th, 2022

2-4 Non-communicable diseases and health support: a perspective from the Fukushima Health Management Survey

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Medical Science Center for the Fukushima Health Management Survey

Regimen

1. What is the Comprehensive Health Checkup (CHC)

2. Classical and emerging NCD risks based on CHC

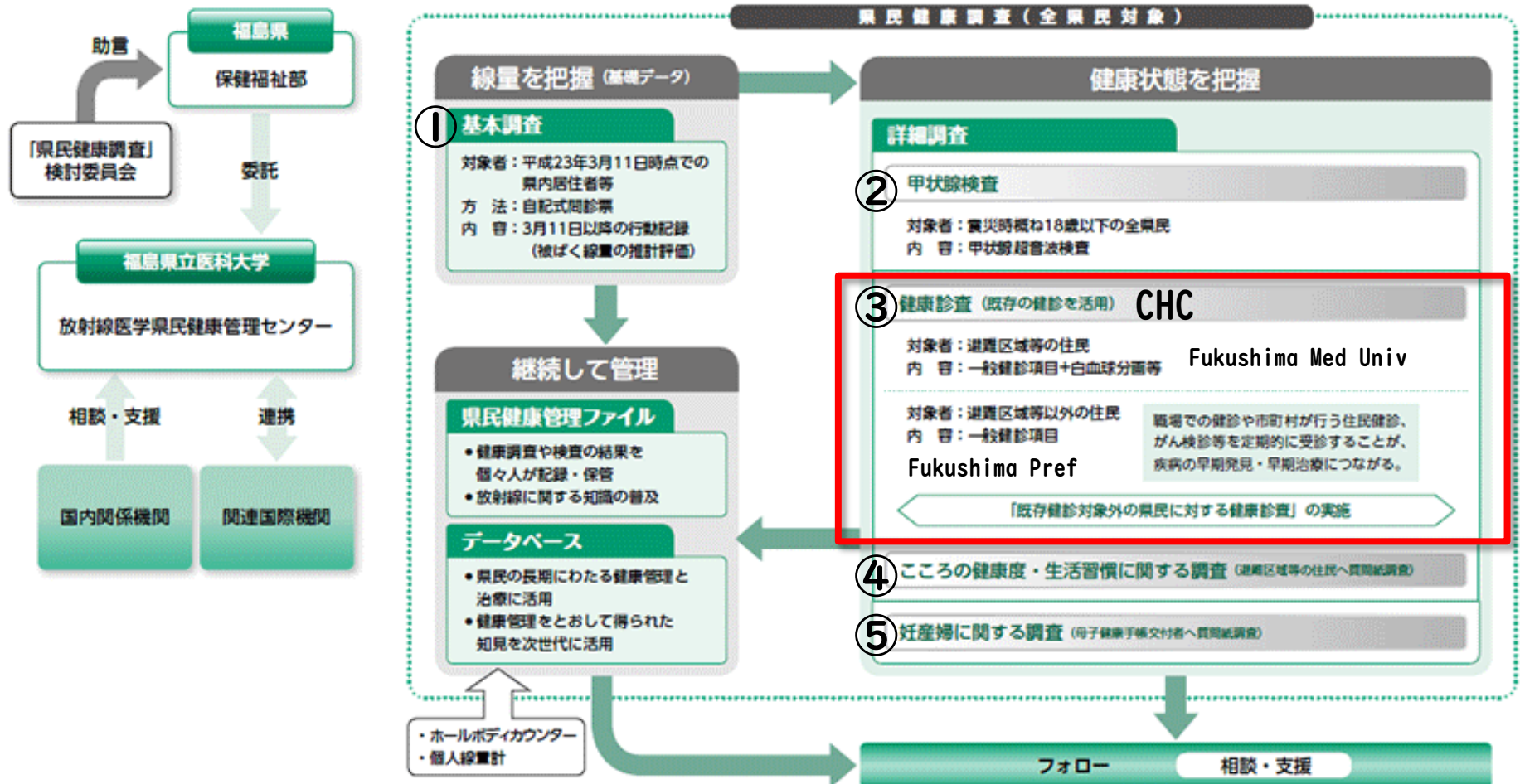
3. NCD risks and support

CHC: The Comprehensive Health Check

FHMS: of the Fukushima Health Management Survey

NCD: Noncommunicable diseases

FHMS includes 5 surveys



CHC: The Comprehensive Health Checkup

FHMS: of the Fukushima Health Management Survey

From website of the Center for Radiation Medicine and Community Health Management, Fukushima Medical University

CHC outline 1/2

CHC: The Comprehensive Health Check
FHMS: of the Fukushima Health Management
Survey

Age group	Checked items
Aged zero to 6 (babies and preschoolers)	Body height and weight [On request] Blood counts (red blood cell count, hematocrit, hemoglobin, platelet count, white blood cell count, and differential white blood cell count)
Aged 7 to 15 (first to ninth grade students)	Body height, weight, blood pressure, and blood counts (red blood cell count, hematocrit, hemoglobin, platelet count, white blood cell count, and differential white blood cell count) [On request] Blood biochemistry (AST, ALT, γ -GT, TG, HDL-C, LDL-C, HbA1c, blood sugar, serum creatinine, and uric acid)
Aged 16 or older	Body height, weight, waist circumference, blood pressure, and blood counts (red blood cell count, hematocrit, hemoglobin, platelet count, white blood cell count, and differential white blood cell count). Urinolysis (protein, sugar, and blood) Blood biochemistry (AST, ALT, γ -GT, TG, HDL-C, LDL-C, HbA1c, glucose, creatinine , eGFR , and uric acid) * Items in red letters are additional items that are not ordinarily checked in the specified health checkups.

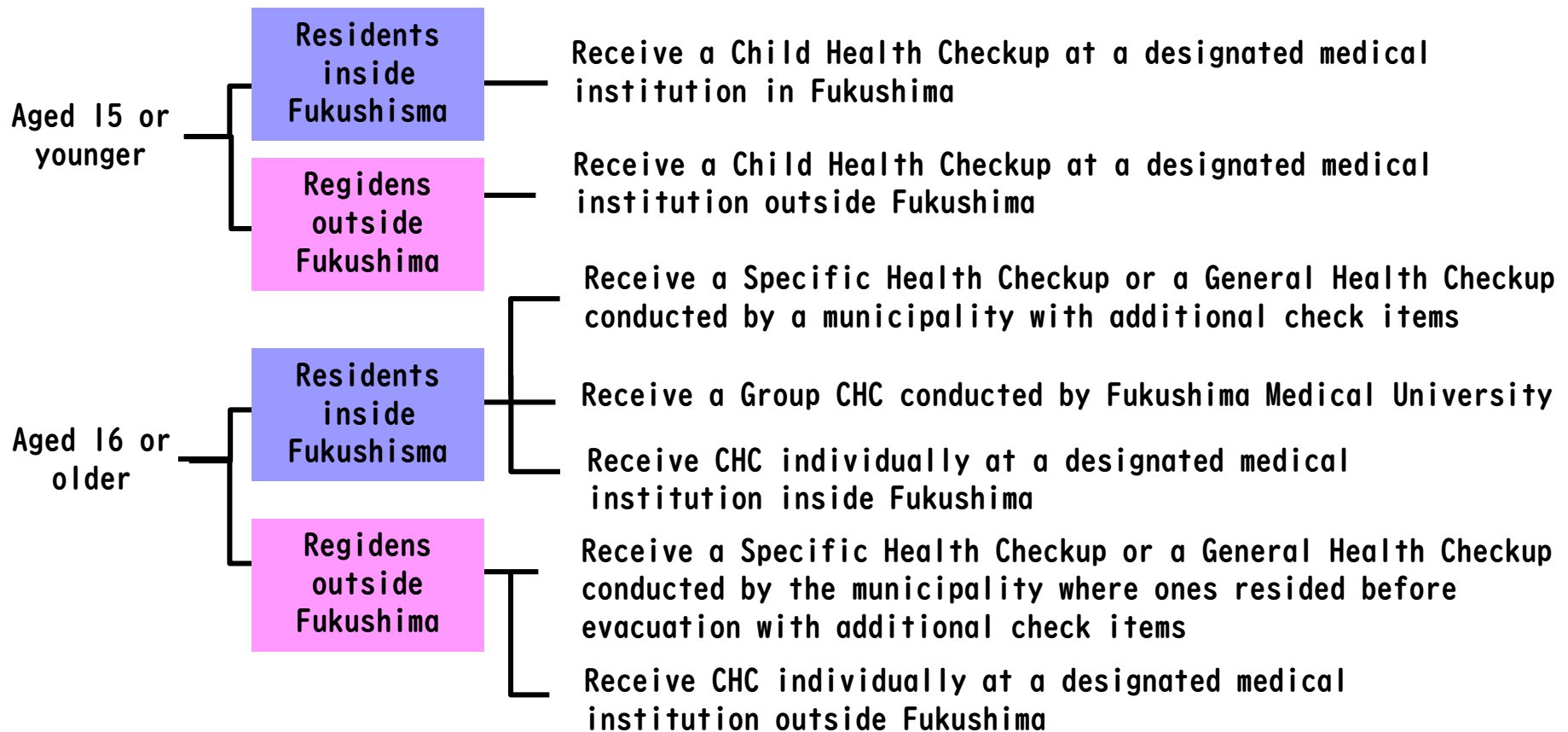
●Residents registered at covered areas* from 11 March 2011 to 1 April 2012 (also after moving out from the covered areas) ●Residents registered at evacuation areas as of 1 April of the examination year

*Covered areas: Hirono town, Naraha town, Tomioka town, Kawauchi village, Okuma town, Futaba town, Namie town, Katsurao village, Iitate village, Minami-soma city, Tamura city, Kawamata town, and parts of Date city

CHC outline 2/2

CHC is conducted by three options every year.

1. Receive a Specific Health Checkup or a General Health Checkup conducted by a municipality with additional check items
2. Receive a Group Health Checkup conducted by Fukushima Medical University
3. Individually receive CHC at one of the designated medical institutions



Regimen

1. What is Comprehensive Health Checkup (CHC)

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CHC: The Comprehensive Health Check

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NCD: Noncommunicable diseases

life-style related diseases

vs Noncommunicable diseases, NCDs

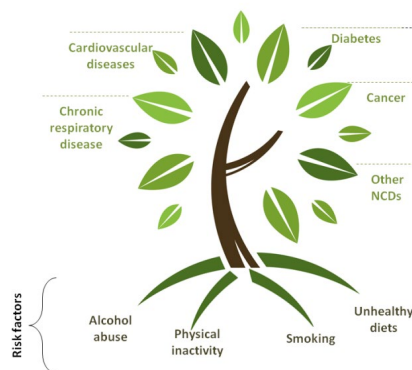


- Alternative name for adult diseases (MHLW Public Health Council, 1996)
- Defined as “a group of diseases in which lifestyle factors such as eating habits, exercise habits, rest, smoking, and drinking are involved in their onset and progression.”
- Health Promotion Act 2002: cancer and cardiovascular disease
- Health Japan 21: cancer, cardiovascular disease and diabetes

<https://is.gd/kEZ8bg>



- 2018 proposed by WHO
- Chronic disease caused by a complex combination of genetic, physical, environmental, and behavioral factors
- Cardiovascular disease, stroke, cancer, diabetes, chronic respiratory disease

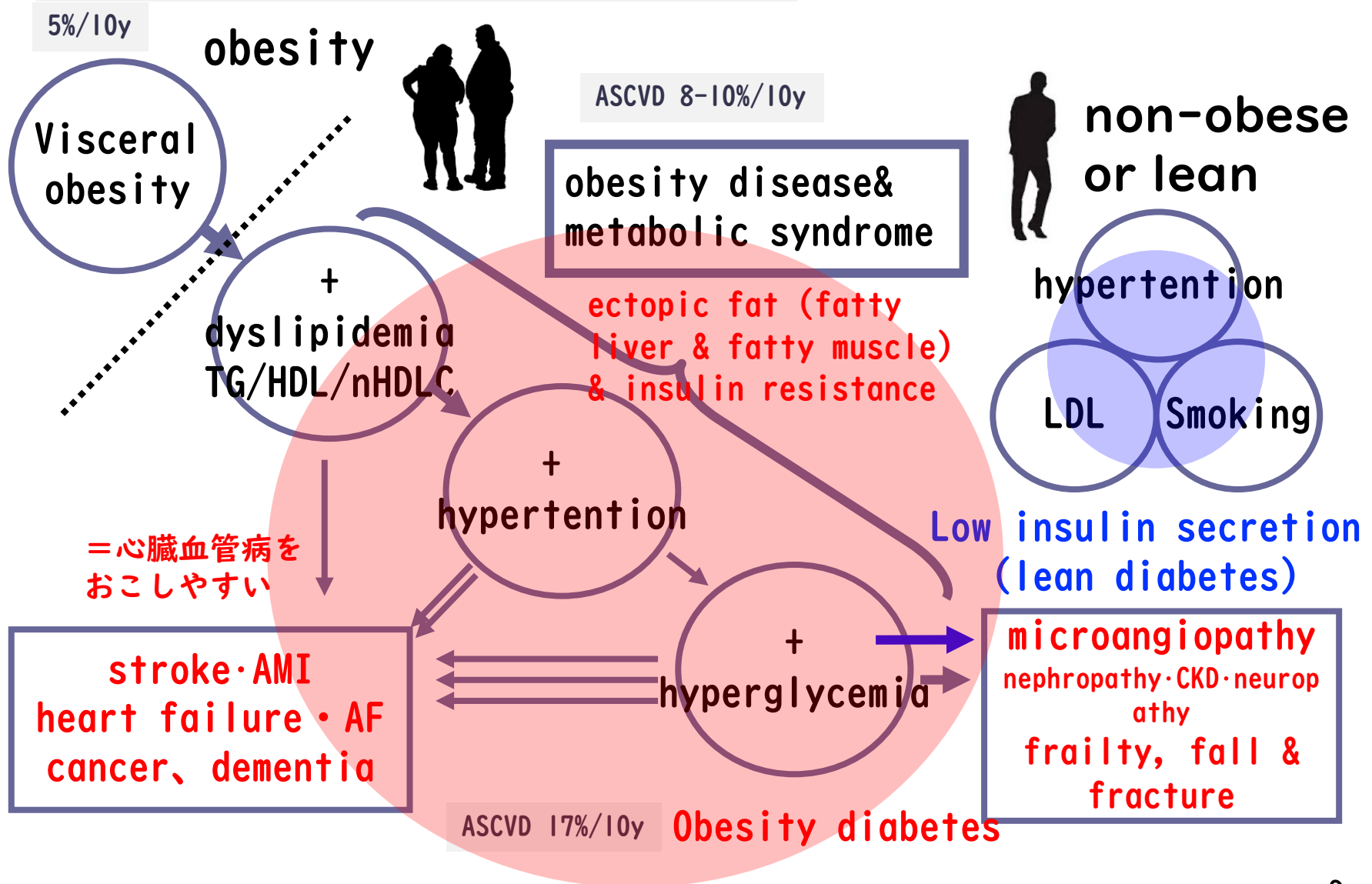


<https://is.gd/ZAwA3P>

NCD risks and NCD onset

ASCVD (Atherosclerotic cardiovascular disease)

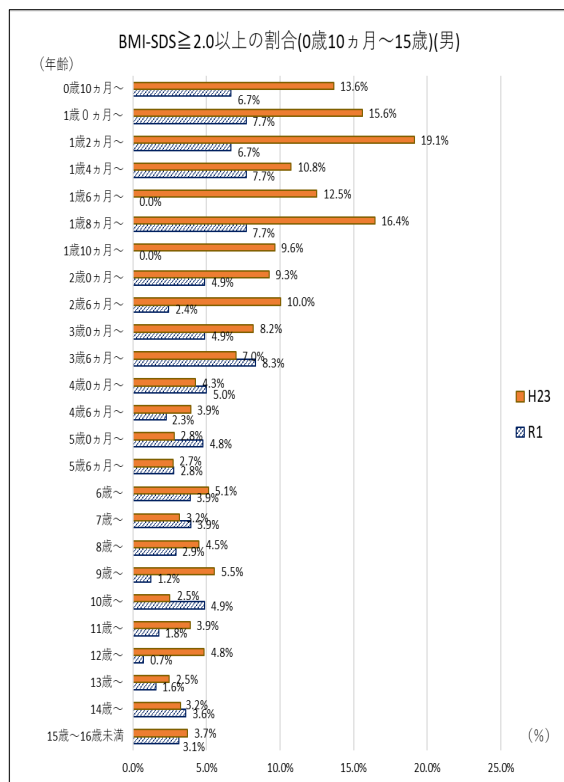
Shimabukuro 2009, 2013, 2021



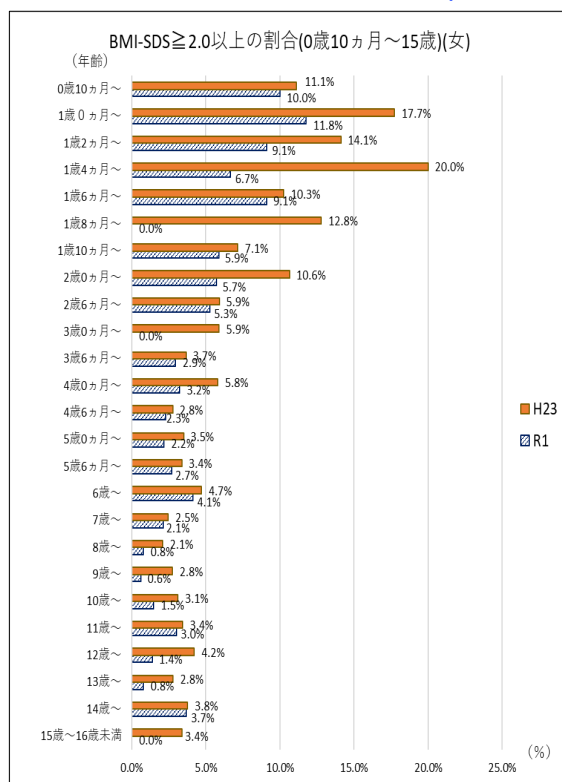
≤15y: CHC 10 years NCD risk

After the earthquake, a certain number of children presented with obesity, dyslipidemia, hyperuricemia, liver dysfunction, hypertension, and glucose intolerance. Obesity improved in the follow-up survey, but the improvement of lipid abnormalities in boys was delayed.

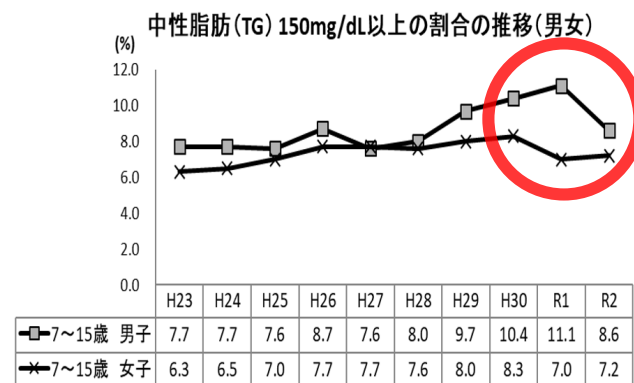
BMI-SD score ≥ 2 0-15y Boys



BMI-SD score ≥ 2 0-15y Girls



Triglyceride ≥ 150 Boys & Girls



Reference: The Japanese Society for Pediatric Endocrinology, The Japanese Association for Human Auxology
http://jspe.umin.jp/medical/chart_dl.html

$\geq 16y$: CHC 10 years NCD risk 1/2

- Obese people ($BMI \geq 25$) increased after the earthquake particularly among evacuees.
- The metabolic syndrome associated with aging, smoking cessation, and decreased physical activity being factors for both sexes. In women, post-traumatic stress disorder (PTSD) is also a factor.
- Impaired glucose tolerance ($HbA1c \geq 5.8\%$) and diabetes mellitus ($HbA1c \geq 6.5\%$) are increasing in all age groups.
- $eGFR \leq 60$ showed an increasing trend, particularly among those aged 40 to 64 (from 6.5% to 11.3%).
- Men with uric acid ≥ 7.9 mg/dL and women with ≥ 5.6 mg/dL are increasing in all age groups.

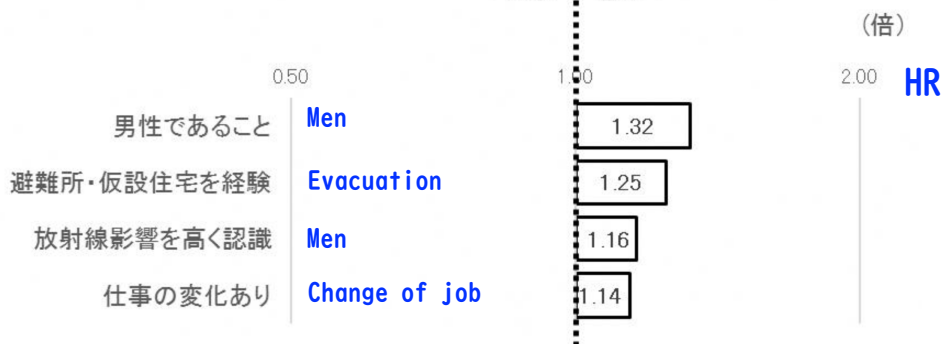
≥16y: CHC 10 years NCD risk 2/2

- The rate of liver dysfunction decreased from 29.9% to 27.1%. Factors contributing to the improvement were daily physical activity and improved frequency of breakfast intake.
- Polycythemia was increased after the earthquake. Factors associated with polycythemia were evacuation, not obesity, smoking nor hypertension.
- There was no difference in WBC counts and fractions within the evacuated areas (13 cities, towns, and villages), suggesting no direct effects of radiation within one year after the Fukushima Daiichi nuclear power plant accident.

Lifestyle and disaster-related factors on NCD risk: CHC 7y 1/2

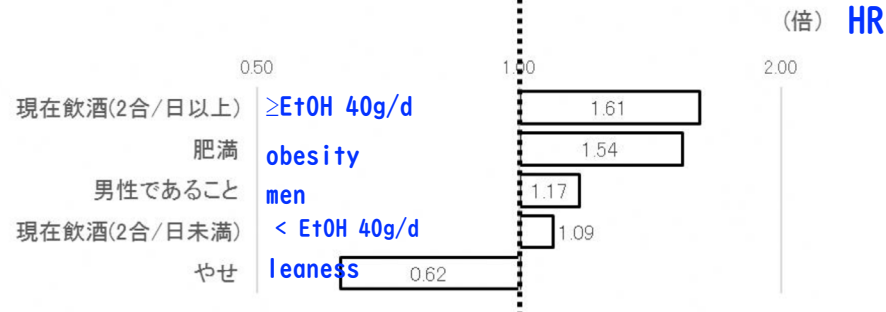
Obesity onset

肥満のリスク
decrease ←減少 増加→ increase



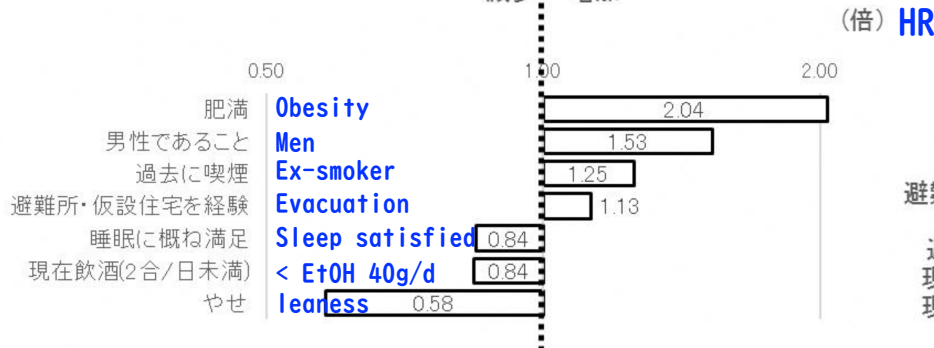
Hypertention onset

高血圧のリスク
decrease ←減少 増加→ increase



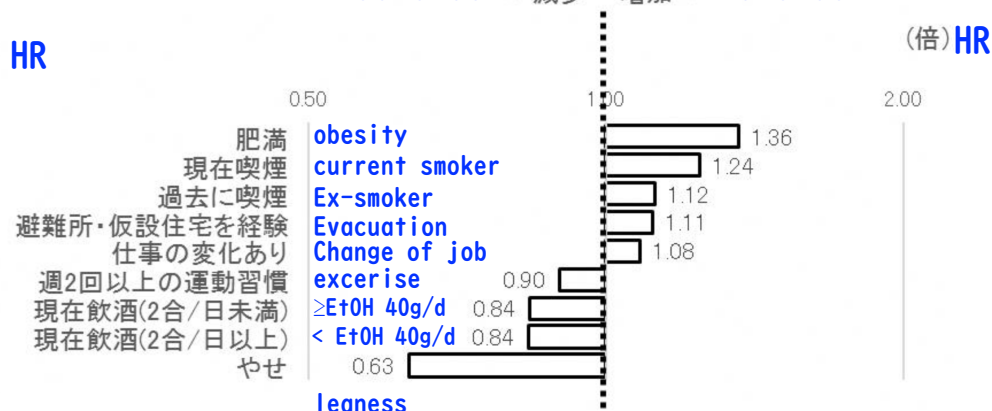
Diabetes onset

糖尿病型のリスク
decrease ←減少 増加→ increase

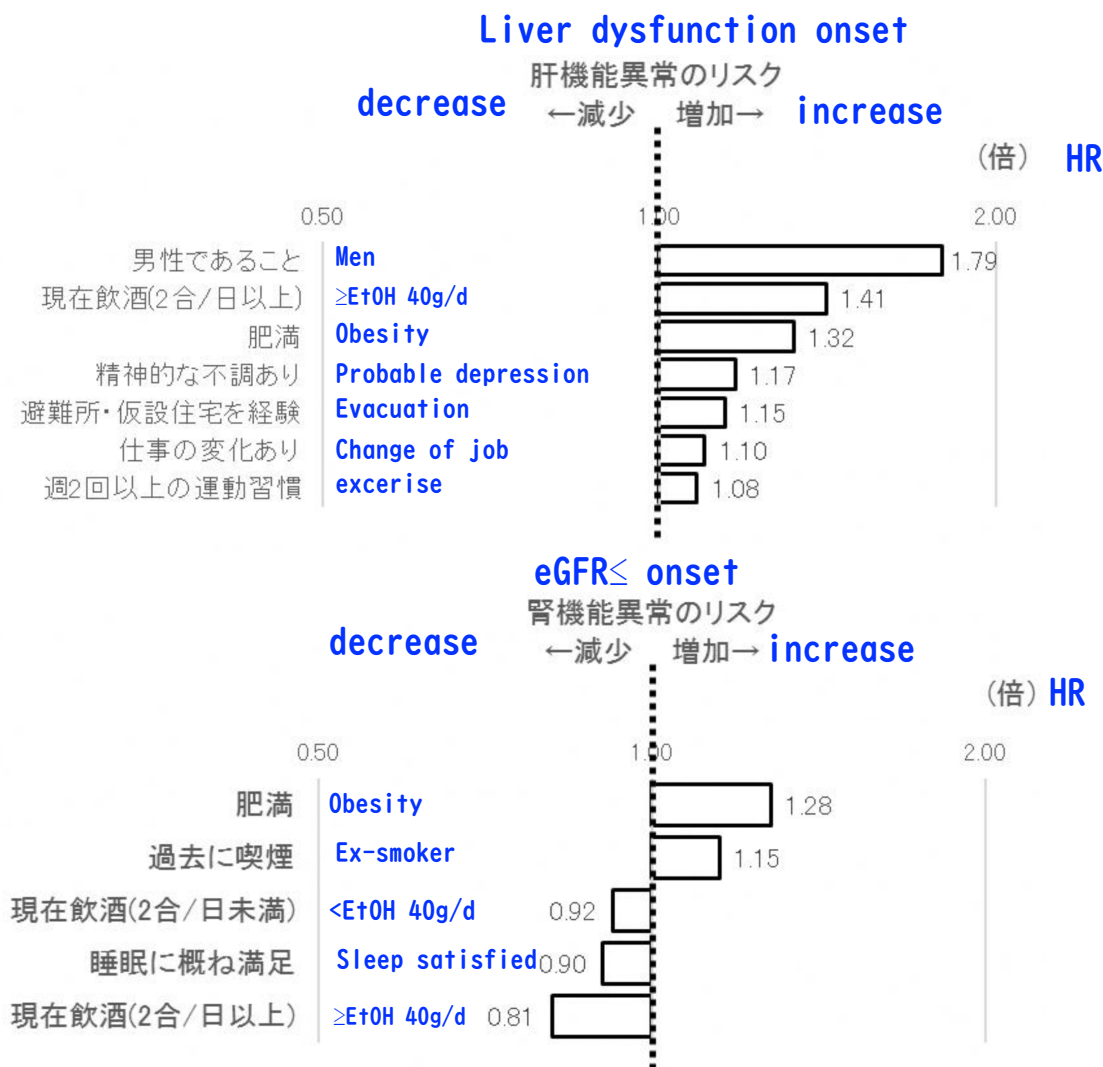


Dyslipidemia onset

脂質異常のリスク
decrease ←減少 増加→ increase



Lifestyle and disaster-related factors on NCD risk: CHC 7y 2/2



Lifestyle and disaster-related factors and NCD risk: CHC 7y ≥40y, men 10,120, women 13,961

↑ increase, ↓ decrease, empty not significant, - not analyzed	obeisty		leanness		hypertension		Diabetes mellitus		dyslipidemia		Liver dysfunction		CKD	
	M	W	M	W	M	W	M	W	M	W	M	W	M	W
Aging		↑	↑	↓	↑	↑	↑	↑		↑	↓	↑	↑	↑
Obesity	—	—	—	—	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Leanness	—	—	—	—	↓	↓		↓	↓	↓				
Excercise ≥ 2x/w									↓		↑			
Sleep satisfied								↓						
<EtOH 40g/d			↓		↑			↓	↓	↓				
≥EtOH 40g/d					↑	↑			↓		↑	↑	↓	
Current smoking			↑	↑			↑		↑					
Evacuation		↑			↑				↑	↑	↑	↑		
Change of job	↑		↓	↓			↑		↑		↑			
Probable depression											↑	↑		
PTSD symptoms														
Radiation concerns	↑													
Participation in recreation	↓		↓								↓			↑

Publications on CHC 34 accepted, 32 registered as of 2022-2-9

Risk factors

Ohira Asia Pac J Public Health 2017
Ohira J Nat Inst Pub Health 2018
Ma Nutrients 2020, 2021
Hayashi J Rad Res 2021
Sakai J Epidemiol 2021
Ohira J Epidemiol 2021
Ohira J Elsevier 2022

Diabetes mellitus

Satoh J Diabetes Research 2015
Satoh Diab Metab 2017

Obesity • metabolic Syn

Ohira Am J Prev Med 2016
Hashimoto J Ather Throm 2017
Uemura J Epidemiol 2021

Dyslipidemia

Satoh Int Med 2016
Satoh J Epidemiol 2021

Hyperuricemia

Hashimoto Clin Exp Nep 2020
Honda Nutr Metab Cardiovasc Dis 2021

Hypertention

Ohira Hypertension 2016
Nagai J Hypertension 2017

Chronic kidney Dis

Satoh Int Med 2016
Hayashi Clin Exp Nep 2017

Atrial fibrillation

Suzuki Int J Cardiol 2015
Suzuki Medicine 2021

Child

Kawasaki Fukushima J Med Sci 2014, 2015
Kawasaki Pediatr Int 2020

Liver dysfunction

Takahashi Sci Rep 2017
Takahashi J Epidemiol 2017
Takahashi Medicine 2018
Takahashi J Ather Throm 2020

Polycythemia • WBC

Sakai BMC Pub Heal 2014
Sakai J Epidemiol 2015
Sakai Pre Med Rep 2017
Sakai Medicine 2020

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Feedback from CHC

1. Notification of individual results
2. Preparation and distribution of individual analysis reports
3. Preparation and distribution of CHC leaflets
4. Planning of health seminars

Notification of individual results

検査項目				基準値	単位	結果
末梢血液像 (目視法)	好中球桿状核球			0.0~15.0	%	6.0
	好中球分葉核球			30.0~70.0	%	38.0
	好酸球			10.0以下	%	3.0
	好塩基球			3.0以下	%	1.0
	単球			12.0以下	%	7.0
	リンパ球			20.0~55.0	%	44.0
	異型リンパ球				%	1.0
	後骨髄球				%	1.0
	骨髄球				%	1.0
	前骨髄球				%	1.0
	芽球				%	1.0
	顆粒球系異常細胞				%	1.0
	形質細胞				%	1.0
	形質細胞様異常細胞				%	1.0
	単球様異常細胞				%	1.0
	リンパ芽球				%	1.0
	異常リンパ球				%	1.0
	リンパ球様異常細胞				%	1.0
	その他				%	1.0
	好中球過分葉核球				(+)	(+)
	好中球右方移動				(+)	(+)
	好中球左方移動				(+)	(+)
	偽ベルグ核異常				(+)	(+)
	顆粒球分裂像				(+)	(+)
	顆粒消失				(+)	(+)
	中毒性顆粒				(+)	(+)
	アウエル小体				(+)	(+)
	ファゴット細胞				(+)	(+)
	デーレ小体				(+)	(+)
	赤芽球				個/200W	1
	赤血球大小不同				(+)	(+)
	小赤血球				(+)	(+)

備考 空欄時

疾患別判定 A: 異常認めず B: 要指導 C: 要医療 D: 通院継続
項目別判定 ○: 基準範囲内 △: 軽度異常 ▲: 異常

通院中の疾病		糖尿病通院中					糖尿病通院中	
疾患別	判定	検査項目	基準値		単位	判定	結果	
身体計測	-	身長			cm		156.6	
		体重			kg		47.6	
		BMI (体格指数)	18.5~24.9		○	19.4		
血圧	D	収縮期 (最高) 血圧	129以下		mmHg	○	120	
		拡張期 (最低) 血圧	84以下		mmHg	○	80	
腎臓・尿路	A	血清クレアチニン (酵素法)	0.35~0.94		mg/dL	○	0.55	
		eGFR	60.0以上		単位	○	90.2	
		尿蛋白	(-)			○	(-)	
		尿潜血	(-)			○	(-)	
糖	D	血糖	(-)			○	(-)	
		血糖 (空腹時)	99以下		mg/dL	○	130	
		血糖 (随時)	139以下		mg/dL			
		HbA1c (NGSP)	5.5以下		%	Δ	5.6	
脂質	B	HDL-C	40以上		mg/dL	○	91	
		LDL-C (直接法)	119以下		mg/dL	Δ	120	
肝臓	A	TG (中性脂肪)	149以下		mg/dL	○	51	
		AST (GOT)	30以下		U/L	○	18	
		ALT (GPT)	30以下		U/L	○	14	
		γ-GT	50以下		U/L	○	8	
血液一般	C	赤血球数	3.70~5.49		×10 ¹² /μL	○	4.40	
		ヘモグロビン	12.1~15.9		g/dL	○	13.3	
		ヘマトクリット値	33.0~47.9		%	Δ	48.0	
		白血球数	4.0~9.5		×10 ⁹ /μL	▲	2.4	
		血小板数	130~369		×10 ⁹ /μL	○	239	
白血球分画 (機械値)	※	好中球	40.0~75.0		%		45.0	
		リンパ球	20.0~55.0		%		44.0	
		単球	12.0以下		%		7.0	
		好酸球	10.0以下		%		3.0	
		好塩基球	3.0以下		%		1.0	
痛風	A	尿酸	7.0以下		mg/dL	○	3.6	
※白血球分画の判定については、裏面をご覧ください。 ※食後時間は30分ごとの表記です。							備考	立時時

※白血球分画の判定については、裏面をご覧下さい。
※食後時間は30分ごとの表記です。

備考 空欄時

Preparation and distribution of individual analysis reports

〇〇における震災後7年間の健診成績の
推移に関する分析結果報告書

福島県立医科大学

放射線医学県民健康管理センター



Reports conference

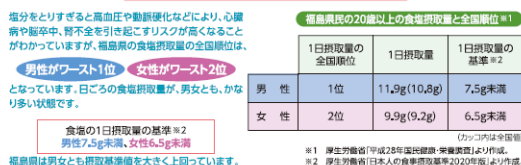
Preparation and distribution of CHC leaflets

A leaflet summarizing the outline of CHC is enclosed with the information for group and individual health checks. The themes of the leaflets are changed every year: “Lifestyle-related Diseases” in FY 2017, “Diabetes” in FY2018, “Metabolic Syndrome” in FY2019, and “Basics of Diet” in FY2020

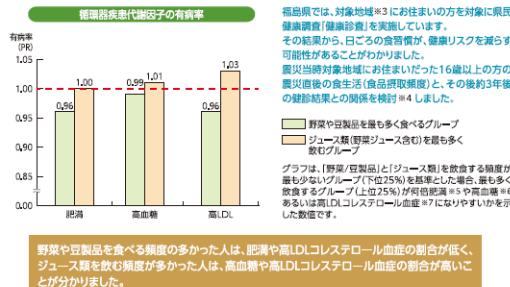
健康診査を受診して 健康状態を把握しよう!

「健康診査（健診）」は、元々うちに未来の大きな「病気の芽」を見つけることが目的です。
生活習慣によっては、それ自体が様々な「病気の芽」となってしまう場合もあります。
「病気の芽」をつくらないためにはどうしたらいいか。
「食の基本＝バランスがとれた食生活」からできる健康づくりについて一緒に学んでいきましょう。

福島県 の 状 況



県民健康調査からわかったこと



「食の基本＝バランスがとれた食生活」から 健康づくりをはじめよう

※食膳の指導を受けている方や健康に不安のある方が実践する際には、事前に医師と相談してください。

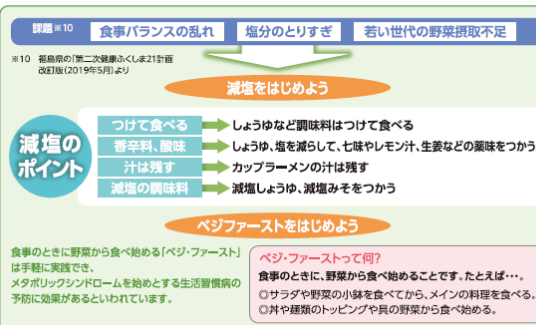
食の基本＝バランスがとれた食生活※1「主食・主菜・副菜」+「減塩」の実践

～生活習慣病※2の予防・改善が期待できます～

心身ともに健康を保つにはバランスがとれた食生活が大切ですが、ライフスタイルの多様化によりバランスの崩れや不規則な食生活になりがちで、生活習慣病の発症につながるリスクが懸念されています。生活習慣病は、食生活と密接に関係していることから、健康的な食生活「食の基本＝バランスがとれた食生活」を実践して健康づくりをはじめましょう。



※1 バランスがとれた食生活(主食・主菜・副菜)については、農林水産省のホームページ掲載の「パンフレット」等を参考に作成。
※2 生活習慣病は、高血圧、糖尿病、脂質異常症、生活習慣病の発症や悪化に関与する病気の総称をいいます。代表的な病気としては、がん、脳卒中、心臓病、糖尿病、脂質異常症などが挙げられます。
生活習慣病は、生活習慣の乱れが原因で発症する病気です。健康な生活習慣を身につけることが大切です。



健康づくりの2つのポイント

Point 1 「じっとしていない」を意識しよう ～日常生活で手軽にできること～

運動は消費エネルギーを増やす、脂肪を燃焼させる、脂肪を分解する、筋力量を増やす、などの効果があり、内臓脂肪を減らすのに効果的です。
内臓脂肪を減らすためには、激しい運動を行う必要はありません。
運動が苦手でも、じっとしている時間を減らすだけで十分効果が得られます。



※活動中の消費エネルギーが、じっとしているときよりも多くなります。まずは活動から始めてみましょう。
※無理をせず、自分のペースで行い、疲れた場合は活動を中止し、医師に相談しましょう。

Point 2 睡眠にも気を配ろう ～睡眠不足は肥満のもと～

睡眠も肥満と関係があります。
睡眠不足になると、食欲を高めるホルモン(グレリン)の分泌が増加する一方、逆に食欲を抑えるホルモン(レプチン)の分泌が減少します。
そのため、おなかがあきやすく、食欲が増してしまうため、肥満になりやすくなります。

睡眠不足 食欲増加 ↑ ホルモン UP
食欲抑制 ↓ ホルモン DOWN

良い睡眠を取るためのポイント

- アルコールの摂取は控える
- 寝る直前までスマートフォンやパソコンを使わない
- 起きたらまず日光を浴びる※1日3食規則正しく一休みのリズム
- 就寝前3～4時間以内の激しい運動を避ける

など、無理をせず、できることから始めていきましょう。

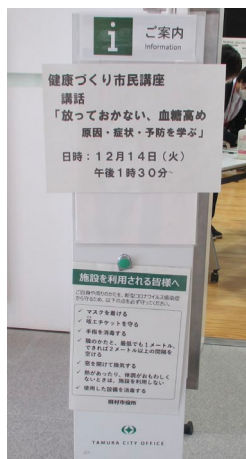
日々の健康づくりには、「ふくしま健民アプリ」を活用してはいかがでしょうか？

Planning of health seminars

Notice the importance of health checkups, behavioral changes, recommends appropriate responses to requiring intervention such as behavioral changes and/or visits to clinics.



Call for applications from 13 municipalities on: (1) Lecture by doctors (2) Consultation by nurses on the results of CHC reports (3) Blood pressure measurement (4) Blood glucose measurement (5) Health exercises (6) Lectures on mental health and lifestyle survey



Fiscal Year	Numbers	Visitors
2016	3 M 11 times	495
2017	6 M 42 times	2,379
2018	6 M 26 times	2,324
2010	6 M 38 times	3,334
2020	3 M 17 times*	—

M: municipality
* due to COVID19 pandemic

Role of CHC in 10 years

(summary) 1/2



1. Provide opportunities for health checkups

- This helped to secure the physical and mental health of residents who experienced major changes in their living environment after the earthquake.
- Opportunities to receive checkups for people between 16–39y, who have few opportunities by current health policy.

2. Close cooperation with municipalities

- Sharing of residents health information, cooperation via planning of health events and reports conference

3. Analysis of factors associated with physical and mental health after the earthquake

- Clarification and sharing of factors associated with physical and mental health

Role of CHC in 10 years

(summary) 2/2



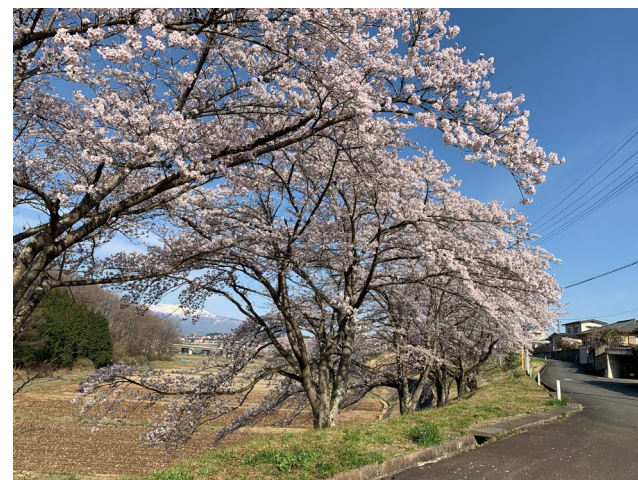
4. Impacts of feedback from CHC

- There was an improvement in risk (blood pressure and LDL cholesterol levels) due to increased health awareness among residents, improved lifestyle, and higher treatment rates. The results of the municipal health checkups were used for health measures..

5. Proposal from CHC

- After the earthquake, lifestyle and mental factors in lifestyle-related diseases were clarified, and proposals were made to municipalities and local residents on the importance of (1) physical activity and healthy diet, (2) mental health care, and (3) promotion of social participation.

Thank you for your attention



**Fukushima Medical University gardens
photos by Shimabukuro**

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