

研究計画書

宮城県の震災前後における周産期予後に関する研究

1. 目的

大震災の強いストレスが宮城県の妊産婦に及ぼした影響（流早産、胎児発育への影響など）を緊急的に調査するため、大震災直後に宮城県内医療機関の分娩記録から収集した匿名化データ、および各機関における妊娠合併症罹患患者数データを統計解析し、震災前後の詳細な統計解析を行うことで、将来の災害対策・妊産婦のフォローアップへの有用な基礎データを提供することを目的としている。広く国内外に周知すると共に、災害時の妊産婦の支援体制を行政に提言する。

2. 対象

対象データ：宮城県内の分娩取扱い医療機関 46 施設より収集した調査票（46 件）
調査票の内容：2010 年、および 2011 年における 1 月 1 日から 12 月 31 日の期間における、本学病院を含む宮城県内分娩取扱い施設（46 施設）における助産録データ（各年約 18,000 件）、および同施設における妊娠合併症罹患患者数データ（46 施設）

3. 方法

- (1) 平成 24 年 11 月から平成 25 年 1 月の期間に、宮城県内の分娩取扱い施設の長に口頭で同意を得て収集した調査票を対象とする。収集方法は、当施設から各機関へ調査票を送付し、助産録データから必要項目（個人情報以外の分娩日、分娩週数、出血量、児の出生体重、性別などの産科情報のみ。）を転記し、当施設に返送していただいた。また、上記施設に対し、妊娠合併症調査票を送付し、罹患患者数を記入・返送していただいた。
- (2) 今回、収集した匿名化データを当施設に於いて統合的に統計解析を行い、早産率、低出生体重率などの地域特性等を明らかにし、大震災による周産期短期予後を検討する。当施設では個人情報データを取り扱わない。
- (3) 今回の解析・成果発表・論文作成にあたり、先に同意を得ていた産婦人科部長、診療所院長に対して、説明文書及び同意書を送付し諾否を確認する。

①収集情報

分娩情報：分娩日年月日

分娩時刻

在胎週数

分娩様式（経膈分娩、吸引分娩、帝王切開術など）

分娩時出血量

新生児情報：性別

体重

アプガースコア（1分値/5分値）

出生時異常所見

②統計解析項目（以下項目の震災前後の比較、および時系列解析を施設別、地域別に行う）

分娩数

早産数、早産率

低出生体重児数、低出生体重児率

平均出血量、分娩様式の変化

平均出生体重、性別比、アプガースコア分布、新生児異常の有無

上記項目における時系列および地域別・施設別解析

③妊娠合併症の月別罹患患者数データをもとに下記統計解析を行う。

異所性妊娠・流産・早産・妊娠高血圧症候群・胎盤位置異常（前置胎盤など）

これらの罹患患者数の時系列及び地域別・施設別解析

4. 個人情報の保護の方法

県内分娩取り扱い施設から収集するデータには個人情報は含まれないが、データの保全に関しては、当該研究にのみ使用するとし、学会・論文発表の際にはデータの扱いには十分な配慮を講じる。

5. インフォームドコンセントのための手続き

本研究は人体から採取された資料などを用いないため、データ元である妊婦さんの同意を得る代わりに、東北大学病院産婦人科HPにて研究内容を幅広く周知することで情報公開を行う。

6. 研究組織

研究責任者：

菅原 準一 東北大学 東北メディカル・メガバンク機構 教授（全体統括）

研究分担者：

岩間 憲之 東北大学病院 産科 医員（統計解析）

齋藤 昌利 東北大学病院 産科 院内講師（解析統括）

杉山 隆 東北大学病院 周産母子センター 特命教授（統計解析）

7. 研究協力施設

(1) 病院

公立刈田総合病院
みやぎ県南中核病院
スズキ記念病院
東北大学病院
宮城県立こども病院
東北公済病院
仙台医療センター
光ヶ丘スベルマン病院
仙台市立病院
仙台赤十字病院
坂総合病院
松島病院
大崎市民病院
石巻赤十字病院
気仙沼市立病院

(2) 診療所

鈴木医院
ウイメンズクリニック金上
宮上クリニック
毛利産婦人科医院
永井産婦人科
桜ヒルズウイメンズクリニック
長池産婦人科
結城産婦人科医院
T's レディースクリニック
佐々木悦子産科婦人科クリニック
吉田レディースクリニック
S・Sレディースクリニック
大井産婦人科
いけの産婦人科小児科医院
遠藤マタニティクリニック
ウイメンズクリニック利府

新富谷S・Sレディースクリニック
メリーレディースクリニック
春ウィメンズクリニック
はらや・ゆうマタニティクリニック
桂高森S・Sレディースクリニック
中川産婦人科
わんや産婦人科
関井レディースクリニック
ささき産婦人科クリニック
結城産婦人科佐沼分院
あべクリニック産科婦人科
齋藤産婦人科医院

(3) 助産所

とも子助産院
森のおひさま助産院
ははこっこ助産院

7. お問い合わせ

菅原 準一

東北大学 東北メディカル・メガバンク機構 地域医療支援部門 母児医科学分野

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同意書

平成 27 年 月 日

東北大学 東北メディカル・メガバンク機構長 殿

施設名

施設長名

印

当施設は、「宮城県の震災前後における周産期予後に関する研究」に協力するにあたり、以下の内容について説明を受け、十分に理解した上で、自由意思により本研究に協力することに同意します。

記

研究の意義・目的について

研究の方法について

調査内容は本研究の目的以外に使用しないこと

参加協力は任意であること、また、協力しなくても不利益はないこと

厚生労働科学研究費補助金の助成を受けていること

平成 27 年 7 月吉日

〇〇〇病院

院長 〇〇 〇〇 先生

平成 27 年度厚生労働科学研究費補助金
成育疾患克服等次世代育成基盤研究事業
「東日本大震災被災地の小児保健に関する調査研究」班
研究分担者 菅原 準一

分娩統計調査に関するご協力のお願い

拝啓 時下ますますご清祥の段、お喜び申し上げます。平素は当研究班調査研究にご協力を賜り、厚くお礼申し上げます。

さて、平成 24 年 11 月から平成 25 年 1 月の期間に、貴施設の産婦人科科長（もしくは施設長）に同意を得て、助産録をもとに平成 22 年・23 年の産科匿名化データを収集させていただきました。今回、これらのデータを対象として統計学的に解析を行うにあたり、さらに詳細な分娩情報が必要となりました。本調査において、大災害時が周産期予後に与える影響を明らかにし、学会・論文発表を行うと共に災害時の妊産褥婦の支援体制を行政に提言することを目的としております。

つきましては、本調査の趣旨をご理解いただき、同封の CD-RW 内 Excel ファイルにご入力の上、9 月 11 日（金）までに同封の返信用封筒にてご返送くださいますようお願い申し上げます。
(ご入力いただく項目は、セルを黄色で塗りつぶしております。)

なお、頂戴した分娩情報につきましては、当大学で適切に管理し、本調査の目的以外には使用いたしません。また、得られたデータと個々の施設が結びつくような研究結果の公表もいたしません。

本調査は、平成 27 年度厚生労働科学研究費補助金、成育疾患克服等次世代育成基盤研究事業「東日本大震災被災地の小児保健に関する調査研究」の助成を受けて行っております。

敬具

《研究に関するお問合せ》

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災害時周産期医療統計調査

宮城県における震災前後の周産期予後に関する研究

解析対象：

宮城県内分娩取扱い施設（46施設）における助産録データ
2010年、および2011年における1月1日－12月31日の分娩症例

収集情報：

分娩年月日
分娩時刻
在胎週数
分娩様式（経膣分娩、吸引分娩、帝王切開術など）
分娩時出血量

新生児情報：性別

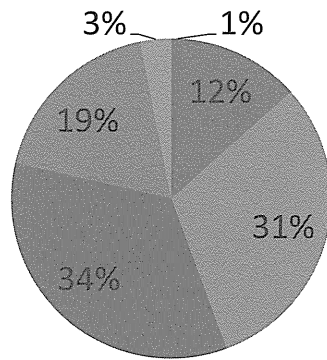
体重

アプガースコア（1分値/5分値）

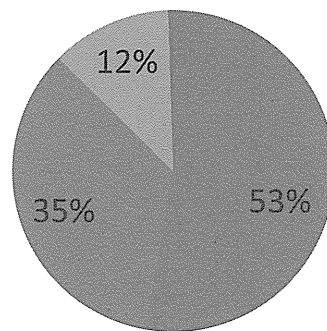
出生時異常所見

東北大学東北メディカル・メガバンク機構倫理委員会承認（2014－21）

基礎特性 (母体)

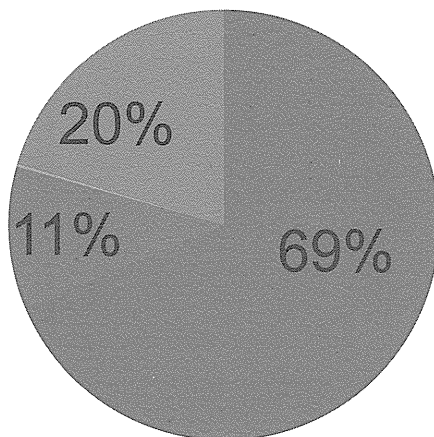


- <20 歳 (%)
- 20-24.9 歳 (%)
- 25-29.9 歳 (%)
- 30-34.9 歳 (%)
- 35-39.9 歳 (%)
- ≥40 歳 (%)



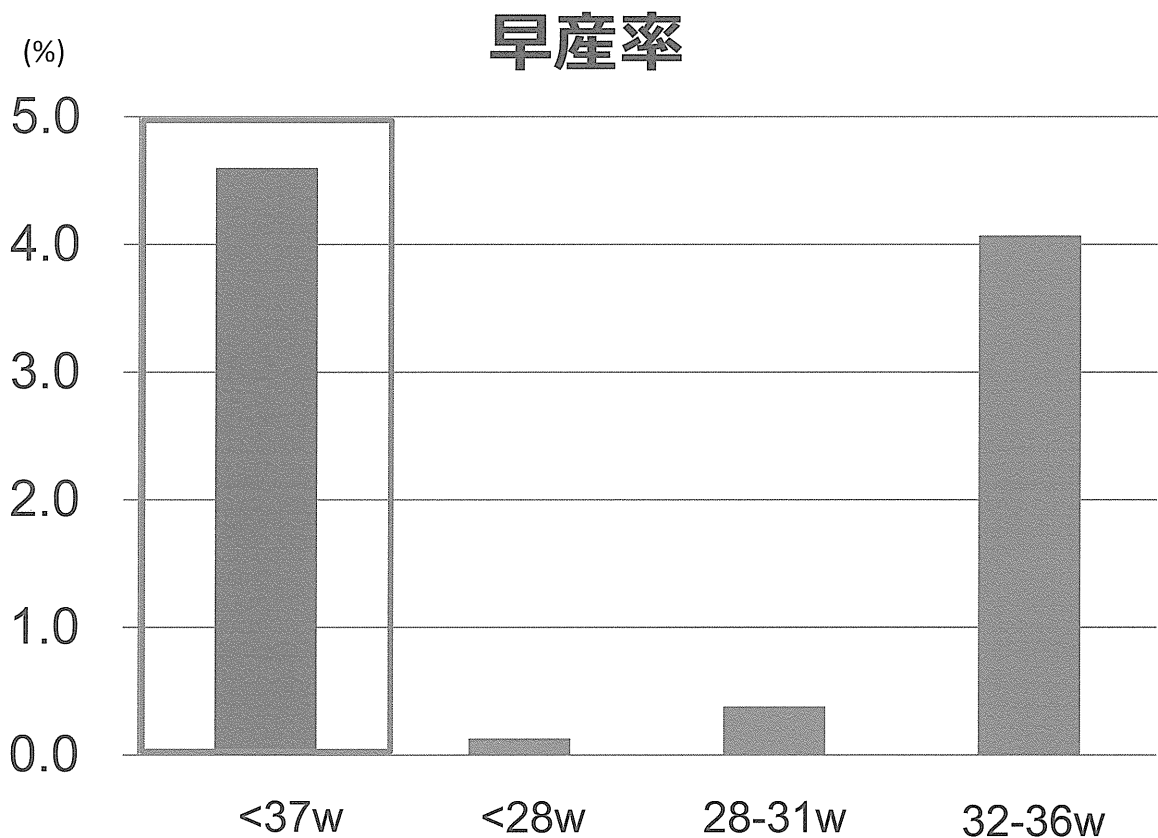
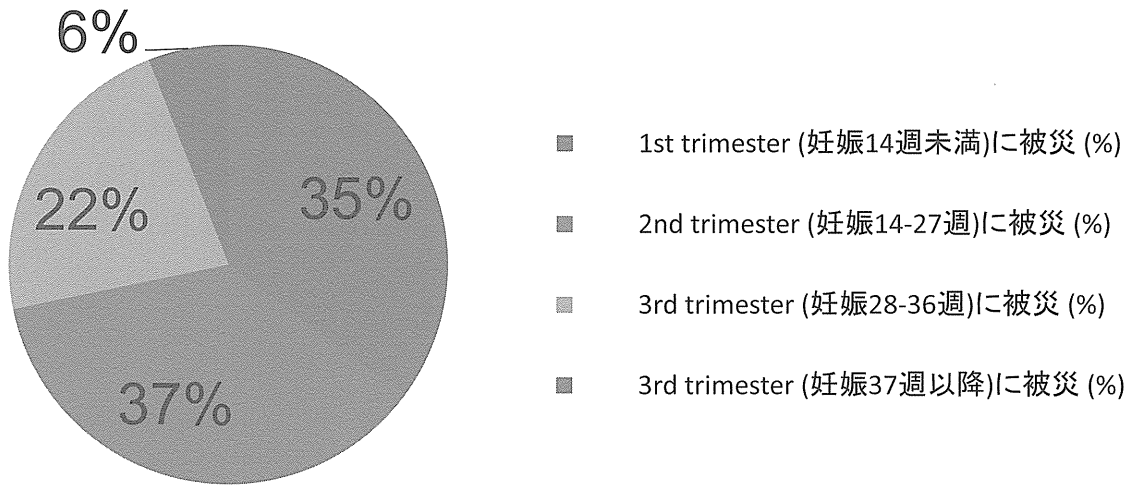
- 1次医療機関 (%)
- 2次医療機関 (%)
- 3次医療機関 (%)
- 助産院 (%)

基礎特性 (分娩様式)



- 自然分娩 (%)
- 吸引分娩 (%)
- 鉗子分娩 (%)
- 骨盤位牽出術 (%)
- 帝王切開分娩 (%)

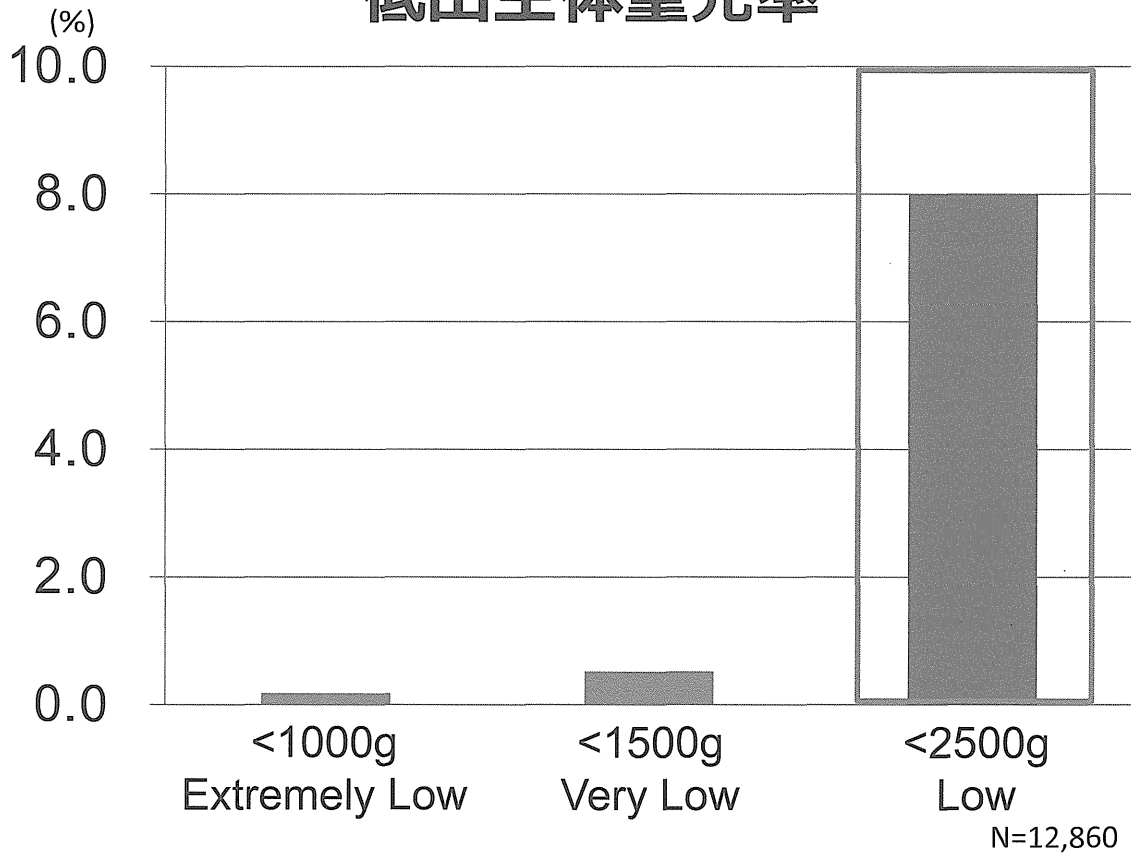
基礎特性（被災時期）



* 2012年早産率は、5.4%（宮城県周産期医療統計）

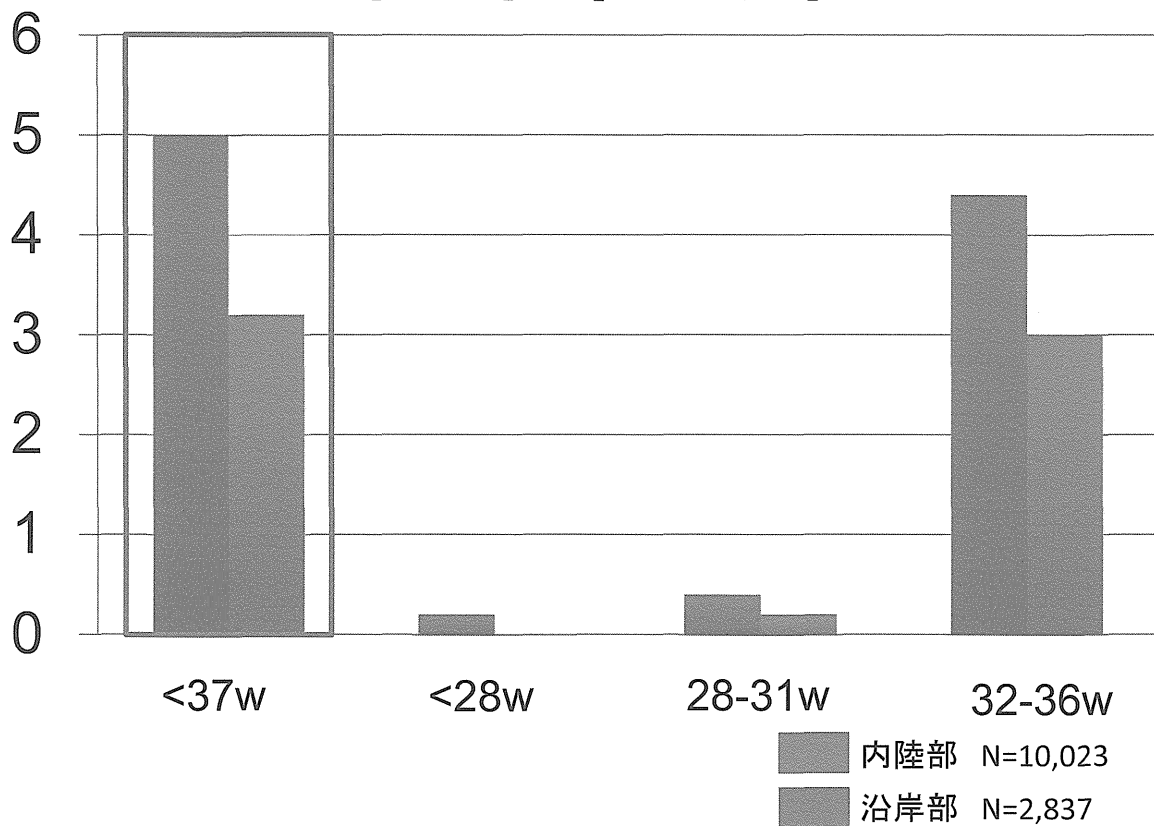
N=12,860

低出生体重児率

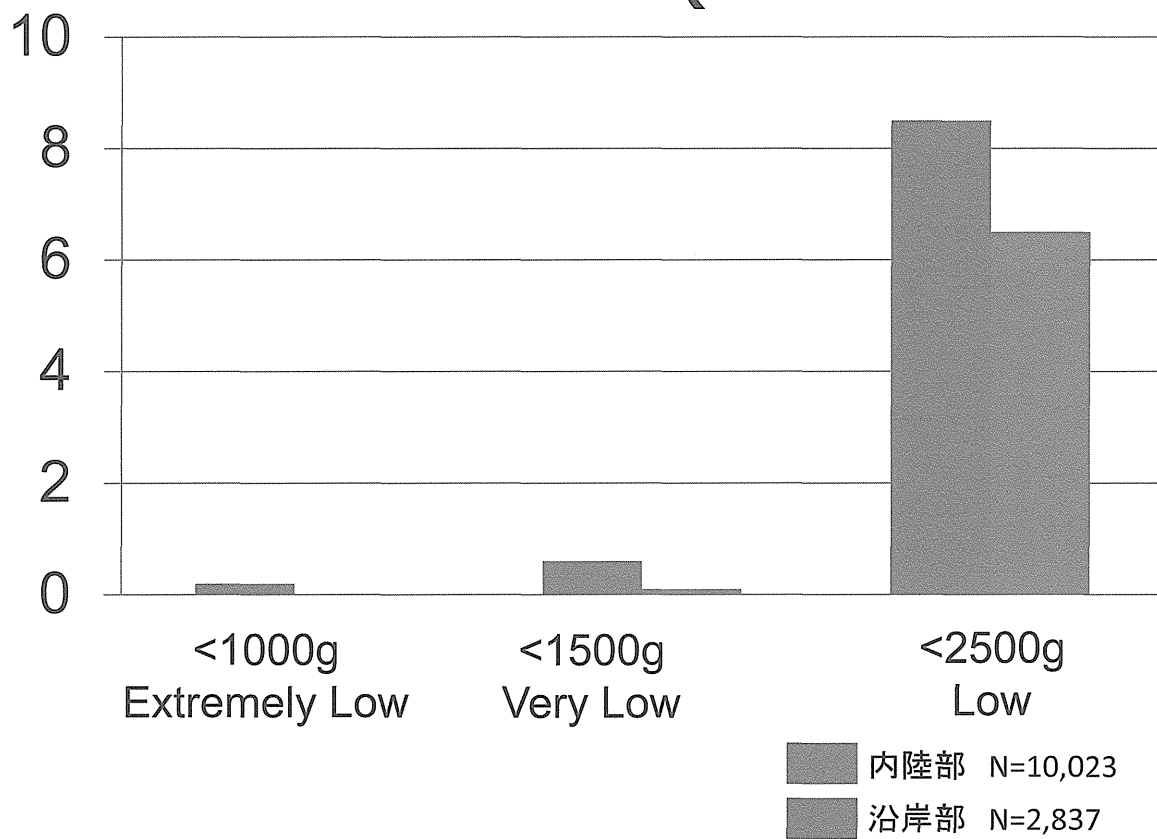


* 2012年低出生体重児率は、9.3%（宮城県周産期医療統計）

早産率（地域別）



低出生体重児率(地域別)



Ⅲ. 研究成果の刊行に関する一覧表

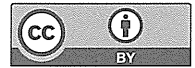
研究成果の刊行に関する一覧表

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Hiroko Matsubara 他 13	Design of the Nationwide Nursery School Survey on Child Health Throughout the Great East Japan Earthquake	Journal of Epidemiology	26 (2)	98-104	2016
石川 健, 千田勝一	災害から子どもたちをどう守るか:危機管理の観点から.	チャイルドヘルス	18	57-59	2015
湧向 透, 大木智春, 石川 健, 千田勝一, 三浦義孝, 江原伯陽, 岩田欧介, 松石豊次郎, 和田和子, 中村安秀	東日本大震災(2011)の被災地における ロタウイルスワクチン無料接種事業の 効果.	日本小児科学会 雑誌	119	1087-1094	2015
井田孔明, 清水直樹, 奥山真紀子, 呉 繁夫, 田中総一郎, 田中英高, 田村正徳, 千田勝一, 中村安秀, 湧向 透, 桃井伸緒, 細矢光亮, 玉井 浩	東日本大震災での経験をもとに検討し た日本小児科学会の行うべき大災害に 対する支援計画の総括.	日本小児科学会 雑誌	119	1159-1178	2015
Takeo Fujiwara, Rie Mizukil, Takahiro Miki, ClaudeChemtob	Association between facial expression and PTSD symptoms among young children exposed to the Great East Japan Earthquake: A pilot stud y	Frontiers in Psychology	6	1534	2015

IV. 研究成果の刊行物・別冊

Study Profile



Design of the Nationwide Nursery School Survey on Child Health Throughout the Great East Japan Earthquake

Hiroko Matsubara¹, Mami Ishikuro^{2,3}, Masahiro Kikuya^{2,3}, Shoichi Chida⁴, Mitsuaki Hosoya⁵, Atsushi Ono⁵, Noriko Kato⁶, Susumu Yokoya⁷, Toshiaki Tanaka⁸, Tsuyoshi Isojima⁹, Zentarō Yamagata¹⁰, Soichiro Tanaka¹¹, Shinichi Kuriyama^{1,2,3}, and Shigeo Kure^{2,11}

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ABSTRACT

Background: The Great East Japan Earthquake inflicted severe damage on the Pacific coastal areas of northeast Japan. Although possible health impacts on aged or handicapped populations have been highlighted, little is known about how the serious disaster affected preschool children's health. We conducted a nationwide nursery school survey to investigate preschool children's physical development and health status throughout the disaster.

Methods: The survey was conducted from September to December 2012. We mailed three kinds of questionnaires to nursery schools in all 47 prefectures in Japan. Questionnaire "A" addressed nursery school information, and questionnaires "B1" and "B2" addressed individuals' data. Our targets were children who were born from April 2, 2004, to April 1, 2005 (those who did not experience the disaster during their preschool days) and children who were born from April 2, 2006, to April 1, 2007 (those who experienced the disaster during their preschool days). The questionnaire inquired about disaster experiences, anthropometric measurements, and presence of diseases.

Results: In total, 3624 nursery schools from all 47 prefectures participated in the survey. We established two nationwide retrospective cohorts of preschool children; 53 747 children who were born from April 2, 2004, to April 1, 2005, and 69 004 children who were born from April 2, 2006, to April 1, 2007. Among the latter cohort, 1003 were reported to have specific personal experiences with the disaster.

Conclusions: With the large dataset, we expect to yield comprehensive study results about preschool children's physical development and health status throughout the disaster.

Key words: natural disaster; preschool children; physical development; children's health; retrospective cohort

INTRODUCTION

The Great East Japan Earthquake, which occurred on March 11, 2011, was beyond our experience in modern Japanese history. The massive 9.0 magnitude earthquake was the largest quake ever recorded in Japan, and the following giant tsunami inflicted severe damage on the Pacific coastal areas

of northeast Japan.¹⁻⁵ The number of deaths and missing persons due to the disaster was 18 412 across Iwate, Miyagi, and Fukushima Prefectures (Figure 1).⁶ Furthermore, the earthquake caused a nuclear alert in the vicinity of the Fukushima Daiichi Nuclear Power Plant.⁷⁻¹⁰

Previous studies have reported health issues among the survivors and have focused attention on vulnerable

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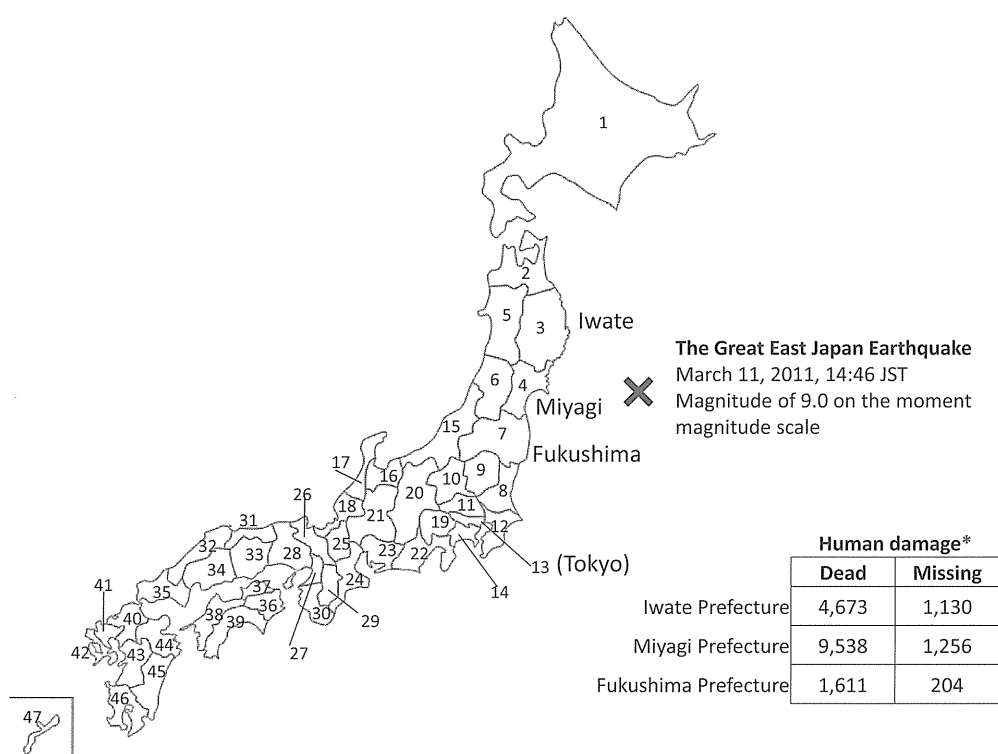


Figure 1. Geographic location affected by the Great East Japan Earthquake.

The numbers on the map indicate prefecture codes corresponding to those in Table 1, Table 2, and Table 4.

*The human damage number shows dead and missing persons in Iwate, Miyagi, and Fukushima Prefectures that were the most seriously affected by the Great East Japan Earthquake (The numbers are cited from Japan Meteorological Agency and National Police Agency).

populations, including the elderly, disabled, and hospitalized patients.^{11–15} Children are also vulnerable, but there has been little research documenting their health after the disaster.

In order to investigate the possible health impacts of the devastating natural disaster on preschool children, we conducted a nationwide nursery school survey. The survey should provide comprehensive and valuable epidemiological evidence of the impact of the disaster on preschool children, focusing on the differences in physical development before and after the disaster and assessing the extent to which experiencing the disaster, including environmental changes due to the disaster, may influence children's health. This paper describes the design of the survey and the results of data collection.

METHODS

Survey design and population

We collected data on nursery school children not only from the most seriously affected areas of Iwate, Miyagi, and Fukushima Prefectures, but also from other areas across Japan. In the present survey, the prefectures indicate the location of the nursery schools that children were attending at the time of the survey. Prior to the survey, invitation letters were distributed to 23 711 authorized nursery schools,¹⁶ and

4266 (18%) nursery schools expressed interest in participating in the survey. From September to December 2012, we mailed three kinds of questionnaires to the 4266 nursery schools, and nursery teachers completed the questionnaires and mailed them back to the coordination office at Tohoku University.

The new school term in Japan starts on April 1, and a class consists of children who are born from April 2 to April 1 of the following year.¹⁷ We targeted children who were born in two classes: children who were born from April 2, 2004, to April 1, 2005, who were in the 5-year-old class of 2010 and did not experience the disaster during their preschool days; and children who were born from April 2, 2006, to April 1, 2007, who were in the 5-year-old class of 2012 and experienced the disaster during their preschool days (47 to 59 months of age when the disaster occurred). We defined the former group of children as a historical control group (Figure 2).

Measurements

Questionnaire "A" addressed information on each nursery school: name of the nursery school, whether or not the nursery school was affected by the disaster, and the damage sustained in the disaster (collapse of the building, tsunami, fire, relocation of the nursery school, and others), if affected. Additionally, we asked for teachers' subjective opinion

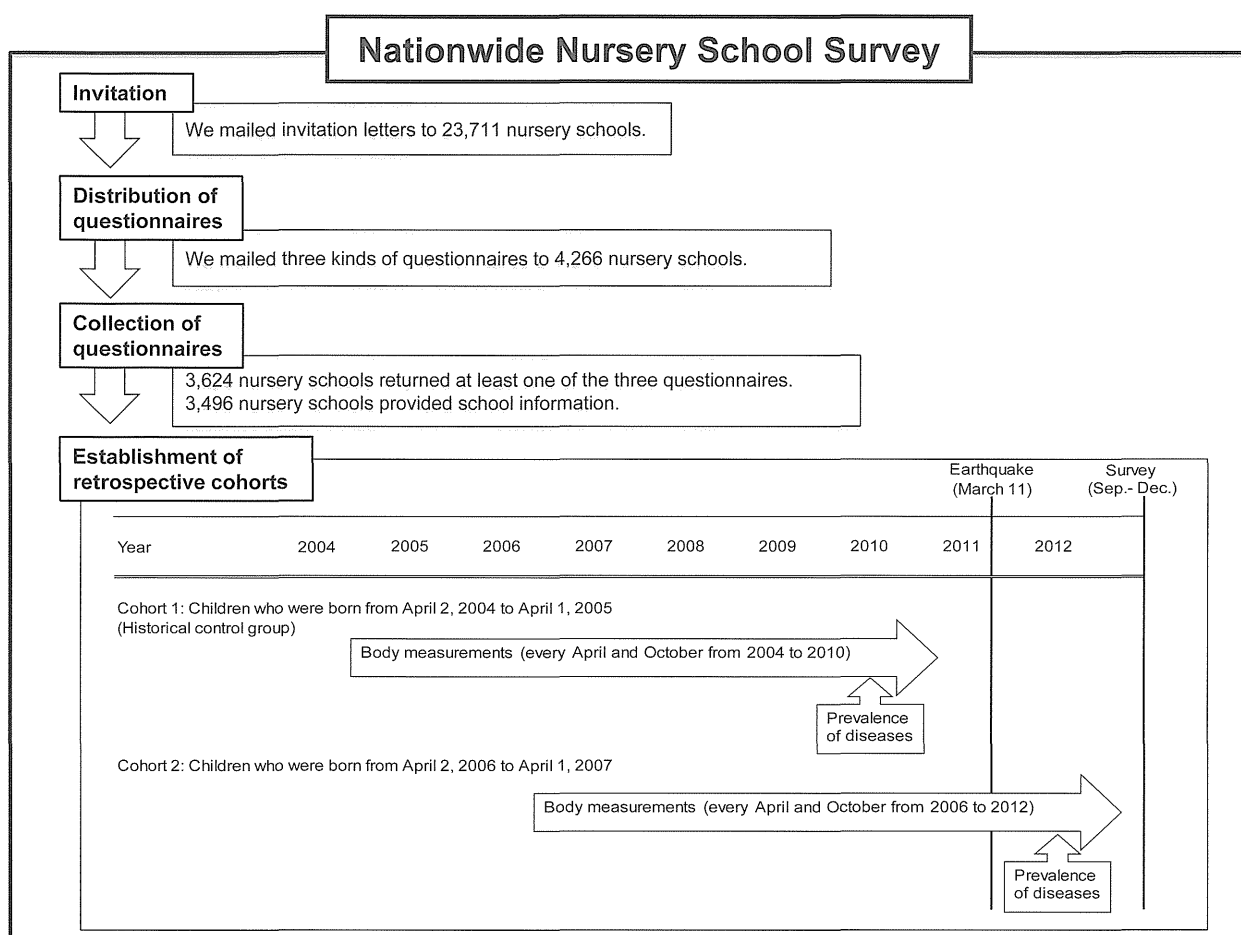


Figure 2. Flow of the Nationwide Nursery School Survey

through the question: “Do you think that experiencing the disaster influenced children’s development?” with an open-ended question about possible factors that might affect children’s development (eAppendix 1).

Questionnaires “B1” and “B2” addressed individual data on children who were born from April 2, 2004, to April 1, 2005 and those who were born from April 2, 2006, to April 1, 2007, respectively. Both anonymous questionnaires included questions about sex, year and month of birth, presence of diseases diagnosed by medical doctors (kidney disease, heart disease, atopic dermatitis, bronchial asthma, and others), history of moving in and moving out, and anthropometric measurements. According to the guidelines for childcare in nursery school, all nursery schools have to periodically perform physical measurements (generally every month) using a measurement procedure recommended by the Ministry of Health, Labour and Welfare.¹⁸ Considering the seasonal variation in growth, we retrospectively collected individuals’ height and weight measured in April and October for a maximum of 7 years. Additionally, we inquired about personal disaster experience with the following options: collapse of house, tsunami, fire, moving house, evacuation center, and death of a family member (eAppendix 2 and eAppendix 3).

Ethical considerations

The survey protocol was approved by the institutional review board of Tohoku University. We collected only existing data, so we did not obtain informed consent from participants in either cohort. In accordance with the national Ethical Guidelines for Epidemiological Research, we disclosed information regarding the survey in two ways: we announced the conduct of the survey to parents using a poster displayed in each nursery school, and we disclosed the survey information, including the significance, objective, and methods of the survey, to the public on the website of Tohoku University’s School of Medicine at <http://www.med.tohoku.ac.jp/public/ekigaku2013.html>. Parents had the right to opt out.

RESULTS

As shown in Table 1, nursery schools from all 47 prefectures participated in the survey. Of the nursery schools that agreed to participate in the survey, 3624 returned at least one of the three questionnaires. We acquired school information from 3495 nursery schools. We obtained individuals’ data for 54 558 children who were born from April 2, 2004, to April 1,

Table 1. Proportion of nursery schools that participated in the survey

Prefecture Code	Prefecture Name	Number of nursery schools		Proportion
		Target (<i>n</i> = 23 711)	Participation ^b (<i>n</i> = 3624)	
1	Hokkaido	855	139	16%
2	Aomori	470	108	23%
3	Iwate ^a	359	81	23%
4	Miyagi ^a	346	132	38%
5	Akita	254	88	35%
6	Yamagata	241	42	17%
7	Fukushima ^a	317	97	31%
8	Ibaraki	489	53	11%
9	Tochigi	353	79	22%
10	Gunma	418	62	15%
11	Saitama	993	164	17%
12	Chiba	790	142	18%
13	Tokyo	1855	204	11%
14	Kanagawa	1142	120	11%
15	Niigata	709	156	22%
16	Toyama	303	62	20%
17	Ishikawa	361	50	14%
18	Fukui	272	40	15%
19	Yamanashi	231	37	16%
20	Nagano	586	60	10%
21	Gifu	425	42	10%
22	Shizuoka	510	98	19%
23	Aichi	1209	237	20%
24	Mie	477	77	16%
25	Shiga	208	21	10%
26	Kyoto	481	23	5%
27	Osaka	1236	95	8%
28	Hyogo	893	77	9%
29	Nara	192	25	13%
30	Wakayama	210	10	5%
31	Tottori	191	29	15%
32	Shimane	286	45	16%
33	Okayama	403	106	26%
34	Hiroshima	615	132	21%
35	Yamaguchi	310	53	17%
36	Tokushima	216	13	6%
37	Kagawa	209	41	20%
38	Ehime	320	49	15%
39	Kochi	258	44	17%
40	Fukuoka	905	144	16%
41	Saga	248	23	9%
42	Nagasaki	438	67	15%
43	Kumamoto	587	88	15%
44	Oita	280	37	13%
45	Miyazaki	394	66	17%
46	Kagoshima	473	48	10%
47	Okinawa	393	18	5%

^aThe three prefectures that were most severely affected by the earthquake include Iwate, Miyagi, and Fukushima Prefectures.

^bWe defined participation as returning at least one questionnaire from Questionnaire "A," Questionnaire "B1," and Questionnaire "B2."

2005 (historical controls), and 69 702 children who were born from April 2, 2006, to April 1, 2007 (exposed children). As an initial data cleaning step, we excluded data on children who were born in a different year and those whose anthropometric measurements were not provided, leaving totals of 53 747 historical controls and 69 004 exposed children eligible for the initial dataset (Table 2).

Table 3 briefly summarizes the characteristics of each cohort. The two cohorts were similar in distributions of sex, birth month, and presence of diseases diagnosed by medical doctors. Among children who experienced the disaster during

Table 2. Number of completed questionnaires returned from nursery schools

Prefecture Code	Prefecture Name	Questionnaire A:	Questionnaire B1:	Questionnaire B2:
		Questions regarding nursery school (<i>n</i> = 3495) ^b	Questions for children born from April 2, 2004 to April 1, 2005 (<i>n</i> = 53 747)	Questions for children born from April 2, 2006 to April 1, 2007 (<i>n</i> = 69 004)
1	Hokkaido	137	1665	2087
2	Aomori	105	1135	1485
3	Iwate ^a	78	906	1248
4	Miyagi ^a	126	1804	2390
5	Akita	87	1463	1745
6	Yamagata	41	628	748
7	Fukushima ^a	97	1004	1557
8	Ibaraki	53	770	1137
9	Tochigi	77	1116	1519
10	Gunma	61	1180	1223
11	Saitama	155	2429	3235
12	Chiba	138	2488	3228
13	Tokyo	190	2573	4019
14	Kanagawa	118	2031	2551
15	Niigata	154	2020	3008
16	Toyama	61	1068	1092
17	Ishikawa	49	903	999
18	Fukui	39	408	580
19	Yamanashi	37	720	706
20	Nagano	55	1143	1292
21	Gifu	42	927	1096
22	Shizuoka	90	1886	2146
23	Aichi	231	5121	5588
24	Mie	73	1112	1437
25	Shiga	21	427	535
26	Kyoto	22	407	458
27	Osaka	91	1611	2273
28	Hyogo	72	1013	1464
29	Nara	25	334	500
30	Wakayama	9	178	201
31	Tottori	29	354	577
32	Shimane	45	482	699
33	Okayama	104	1778	2105
34	Hiroshima	125	2522	2982
35	Yamaguchi	51	534	853
36	Tokushima	12	157	156
37	Kagawa	40	462	753
38	Ehime	48	508	615
39	Kochi	43	653	763
40	Fukuoka	139	2571	3145
41	Saga	22	354	418
42	Nagasaki	65	647	770
43	Kumamoto	80	995	1336
44	Oita	36	311	467
45	Miyazaki	59	415	905
46	Kagoshima	46	452	774
47	Okinawa	17	82	139

^aThe three prefectures that were most severely affected by the earthquake include Iwate, Miyagi, and Fukushima Prefectures.

^bTotal number was not equal to 3624 as described in Table 1 because 129 nursery schools did not return Questionnaire "A."

their preschool days, 1003 (1.5%) were reported to have specific personal experiences with the disaster.

Table 4 presents the residential distribution of children with personal disaster experiences based on the location of the nursery schools that children were attending at the time of the survey. While 732 children (73.0%) were residing in Iwate, Miyagi, and Fukushima Prefectures, 271 (27.0%) were residing in various parts of the country other than the three affected prefectures.

Table 3. Characteristics of nursery school children

	Children born from April 2, 2004 to April 1, 2005		Children born from April 2, 2006 to April 1, 2007		<i>P</i>
	<i>n</i>	%	<i>n</i>	%	
Sex					0.31
Boy	27 823	51.8%	35 536	51.5%	
Girl	25 449	47.3%	32 884	47.7%	
Missing	475	0.9%	584	0.8%	
Birth month					0.58
April	4556	8.5%	5657	8.2%	
May	4562	8.5%	5968	8.6%	
June	4404	8.2%	5733	8.3%	
July	4748	8.8%	5992	8.7%	
August	4676	8.7%	5946	8.6%	
September	4680	8.7%	6028	8.7%	
October	4405	8.2%	5693	8.3%	
November	4294	8.0%	5642	8.2%	
December	4361	8.1%	5682	8.2%	
January	4482	8.3%	5680	8.2%	
February	3771	7.0%	4801	7.0%	
March	4221	7.9%	5528	8.0%	
April (following year)	110	0.2%	114	0.2%	
Missing	477	0.9%	540	0.8%	
Presence of diseases diagnosed by medical doctors					0.28
No	44 380	82.6%	58 462	84.7%	
Yes	6064	11.3%	7832	11.4%	
Unknown	307	0.6%	342	0.5%	
Missing	2996	5.6%	2368	3.4%	
Experience of the disaster					
No	N/A		62 244	90.2%	
Yes	N/A		1003	1.5%	
Missing	N/A		5757	8.3%	
(Specific experience)					
Collapse of house			366		
Tsunami			224		
Fire			3		
Moving house			189		
Evacuation center			279		
Death of family member			31		

Differences in sex, birth month, and presence of diseases between two cohorts were tested by chi-square tests.

DISCUSSION

The present survey is the first nationwide survey to investigate how the Great East Japan Earthquake affected preschool children's physical development and health status. The main strength of the present survey is the large amount of data we acquired. With the cooperation of 3624 nursery schools all over Japan, we established nationwide retrospective cohorts of 53 747 children who were born from April 1, 2004, to April 2, 2005, and 69 004 children who were born from April 1, 2006, to April 2, 2007. These cohorts represent 4.9% and 6.3% of the number of births in Japan during the same period, respectively.¹⁹

Preschool education in Japan is mainly provided either by nursery schools, which are governed by the Child Welfare Act and operate under the supervision of municipal governments,^{16,20,21} or by kindergartens, which are governed by the School Education Act²²; a nursery school is a childcare and educational facility that cares for children ranging from newborn infants to preschool children, whereas a kindergarten

Table 4. Residential distribution of children with personal disaster experiences

Prefecture	Code	Name	Disaster experience	
			No (<i>n</i> = 62 244)	Yes (<i>n</i> = 1003)
1	Hokkaido		1911	4
2	Aomori		1372	14
3	Iwate ^a		1094	96
4	Miyagi ^a		1727	351
5	Akita		1650	8
6	Yamagata		665	31
7	Fukushima ^a		1116	285
8	Ibaraki		983	78
9	Tochigi		1395	6
10	Gunma		1101	5
11	Saitama		2942	11
12	Chiba		2987	41
13	Tokyo		3825	10
14	Kanagawa		2357	4
15	Niigata		2709	12
16	Toyama		984	0
17	Ishikawa		868	1
18	Fukui		551	0
19	Yamanashi		669	2
20	Nagano		1136	4
21	Gifu		985	0
22	Shizuoka		1966	3
23	Aichi		4974	7
24	Mie		1258	1
25	Shiga		489	1
26	Kyoto		402	0
27	Osaka		2063	2
28	Hyogo		1342	2
29	Nara		489	1
30	Wakayama		198	0
31	Tottori		552	1
32	Shimane		669	0
33	Okayama		1996	3
34	Hiroshima		2627	1
35	Yamaguchi		761	0
36	Tokushima		134	1
37	Kagawa		735	0
38	Ehime		571	1
39	Kochi		680	1
40	Fukuoka		2875	9
41	Saga		360	0
42	Nagasaki		702	0
43	Kumamoto		1229	3
44	Oita		442	1
45	Miyazaki		841	1
46	Kagoshima		729	1
47	Okinawa		133	0
	Three most affected prefectures ^a		3937	732
	Others		58 287	271

^aThe three prefectures that were most severely affected by the earthquake include Iwate, Miyagi, and Fukushima Prefectures.

offers early childhood education for children aged 3 to 5 years. Because nursery schools care for children for a longer period than kindergartens, we targeted nursery school children and obtained longitudinal data of physical measurements. Generalizability should be interpreted with caution. However, it has been reported that more than 40% of Japanese preschool children aged 3 years and older currently attend nursery schools and that the number of nursery school children has been increasing,^{16,23} so nursery school children may be sufficiently representative.

In addition, all nursery school teachers have paid close attention to children's physical development by conducting periodic body measurements. They graduated from schools designated by the Ministry of Health, Labour and Welfare as educational institutions for nursery teachers, passed a national examination, and registered in the nursery teachers' registry.²¹ Therefore, the anthropomorphic measurements obtained by such qualified teachers may be sufficiently reliable and accurate.

Ochi et al suggested that evaluations of the health impacts of disasters need baseline data from before the events.¹¹ We therefore retrospectively collected nursery school children's anthropometric measurements for a maximum of 14 times. Specifically, for children who experienced the disaster during their preschool days, we obtained their height and weight measured in April and October between 2006 and 2012, including 10 measurements before the disaster and four measurements after the disaster. Thus, the data reflect childhood physical development trajectories before and after the disaster.

We observed preschool children who had personal experiences with the disaster not only in Iwate, Miyagi, and Fukushima Prefectures, which were devastated by the disaster, but also in other areas all over Japan. Among 1003 children who were reported to have specific disaster experiences, 271 (27.0%) were residing outside of the affected prefectures. Because we conducted a nationwide survey, we collected valuable data, including data on children who might have moved from the affected areas.

In conclusion, by comprehensively examining the results from the present survey, we aim to provide valuable epidemiological evidence that may not only shed light on the impact of the Great East Japan Earthquake disaster on preschool children's physical development and health, but may also provide specific suggestions for response to the next mega-disaster worldwide.

ONLINE ONLY MATERIALS

eAppendix 1. Questionnaire A (Nursery school information).

eAppendix 2. Questionnaire B1 (Children who were born from April 2, 2004 to April 1, 2005).

eAppendix 3. Questionnaire B2 (Children who were born from April 2, 2006 to April 1, 2007).

Abstract in Japanese.

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Conflicts of interest: None declared.

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