Post Seismic Event Health Concerns: An Epidemiological Perspective

John Kobayashi, MD, MPH
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johnk@uw.edu
What is Epidemiology?

epi = upon

demos = people

logos = study of

• The study of the distribution and determinants of diseases and conditions

• Investigation with an ecologic perspective
What is field epidemiology?

- The application of epidemiology under the following circumstances:
  - The problem is unexpected
  - An immediate response is frequently demanded
  - Epidemiologists frequently travel to the field and work there to solve the problem
  - The extent of the investigation is usually limited because a timely investigation is needed.
The Five W’s of Epidemiology

- What = Clinical
- Who = Person
- Where = Place
- When = Time
- Why / How = Cause, Risk factors, modes of transmission

Descriptive Epidemiology (Distribution) or Analytic Epidemiology (Determinants)
Epidemiologists’ role in disaster

• Initial phase (event)
  – Rapid assessment
  – Setting priorities

• Emergency phase (emergency response)
  – Simple and reactive surveillance
  – Outbreak investigation and response
  – Emergency priorities

• Post-emergency phase (rehabilitation and recovery)
  – Integrating surveillance and response systems into existing systems
  – Capacity strengthening
  – Implementing other priorities not addressed during emergency phase

Source: Dr. Thomas Grein (WHO)
Specimen transfer
Special groups
Health personnel
General population
Media
Clinical
Diagnostic
Decision
Infrastructure
Regulations
Vaccinations, etc.

Epidemiology
Clinicians
Coordination
Laboratory
Education
Authority
Vector Reservoir
Dead
Sick
Exposed
Prediction
Investigation
References: South Asian Tsunami, 2004

• Assessment of Health-Related Needs After Tsunami and Earthquake --- Three Districts, Aceh Province, Indonesia, July--August 2005 MMWR, February 3, 2006 / 55(04);93-97
  http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5504a1.htm

• Rapid Health Response, Assessment, and Surveillance After a Tsunami --- Thailand, 2004—2005. MMWR, January 28, 2005 / 54(03);61-64
  http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5403a1.htm
The Great East Japan Earthquake 2011: Health Impact and Recovery of Public Health Systems

47th Joint Committee Meeting
Japan-US Cooperative Medical Science Program

Hitoshi Oshitani
Tohoku University Graduate School of Medicine
Post Disaster Surveillance for Infectious Disease after the Great East Japan Earthquake 2011

JICWELS Seminar on 28 Feb 2012

Tomimasa SUNAGAWA (Japan)
(sunatomi@nih.go.jp)
On behalf of
Infectious Diseases Surveillance Center (IDSC)
National Institute of Infectious Disease (NIID), Japan
Human casualties
(by province / municipality, as of Aug 4, 2011)

Iwate Prefecture:
5,293 deaths, 2,172 missing

Miyagi Prefecture:
9,276 deaths, 2,434 missing

Fukushima Prefecture:
1,786 deaths, 178 missing

Total in Japan:
16,424 deaths, 4,787 missing

Majority of casualties occurred in 3 prefectures in Tohoku region
99.6 % (16,355 / 16,424) deaths
99.9 % (4,784 / 4787) missing
Cumulative deaths, missing, and injured from 11 March to 5 July 2011

WHO: Japan earthquake and Tsunami Situation Report No.35 (6 July 2011)
Ogatsu before 3.11.
Ogatsu before 3.11.
About 300 people died or are missing
Risk factors for infectious disease outbreaks after the Great East Japan Earthquake

Congestion

Poor Hygiene

Debris
Risk assessment for infectious diseases: Information source

• Official information
  – Routine surveillance
    • Notifiable and sentinel surveillance
    • Microbiological surveillance
  – Information from affected prefectures

• Unofficial information
  – Media/ rumor detected through internet
  – Personal communication
  -- Temporary surveillance in evacuation centers
The number of evacuees in evacuation centers from 11 March to 16 June, nationwide

WHO: Japan earthquake and Tsunami Situation Report No.35 (6 July 2011)
Some shelters contained more than 1,000 evacuees, but most of them were small.
Post-tsunami outbreak of influenza A at an evacuation center in Kesennuma city, Miyagi

- Outbreak occurred at a congested evacuation center (approx 1,000 evacuees) since 21 March.
- Many people lived in small spaces and few of them wore masks.
Gastroenteritis outbreak due to Norovirus among evacuees in a large-scaled evacuation center in Kooriya City, Fukushima

- The largest evacuation center in Fukushima
- Acute Gastroenteritis (n=208), Norovirus GII.4 detected
- FETP-Japan assisted investigation/advice on response
An alarming report:
imported cases of measles

Number of reported measles cases per week from 2008 to 2011 (36th wk)

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of reported cases</th>
<th>Week</th>
<th>(-%)</th>
<th>Week</th>
<th>(-%)</th>
<th>Week</th>
<th>(-%)</th>
<th>2011 (as of 36th wk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>n=11,012</td>
<td></td>
<td>-93%</td>
<td>2009</td>
<td>n=732</td>
<td>-39%</td>
<td>2010</td>
<td>n=455</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>totally -96%</td>
</tr>
</tbody>
</table>

During 15-20th week in 2011 (n=162),
- 47% were adults.
- 33 cases were proved to be imported cases;
e.g., France (D4), Philippines (D9)

Earthquake

SIA for 12-13 years, 17-18 years implemented

Source: Dr. T. Shimada (IDSC/NIID), modified
Syndromic surveillance conducted at evacuation centers

**Iwate prefecture:** Daily Surveillance for Outbreak Detecting conducted by Disaster Infection Control Assistance Team of Iwate (ICAT) using Galaxy-tablet in major evacuation centers between 13 April and 16 August 2011.

**Miyagi prefecture:** Initially, event-based information was collected. Later, collaboration with the IDSC/NIID system was mainly conducted by the Prefectural government until mid-October 2011.

**Fukushima prefecture:** Some public health centers and cities designated by ordinance collaborated with IDSC/NIID until the end of August 2011.

**Ibaraki prefecture:** An independent system was adapted from the IDSC/NIID system. IDSC helped summarize and feed back the results until mid-May 2011.
Syndromic surveillance at evacuation centers developed by IDSC/NIID

1. Disease onset
2. Data entry
3. Feedback (by graph, map, etc)

Evacuation Center

6. Response

5. Results

4. Analysis, assessment

IDSC/NIID

3. Feedback

Public Health Center

2. Data entry
3. Feedback

City/town office

3. Feedback

Prefectural government

6. Response

Information sharing by real-time

Source: Dr. Y. Ohkusa (IDSC)
Syndromic surveillance at evacuation centers developed by IDSC/NIID

- Objectives and flow of data:
  - Information sharing for prompt public health response
  - Data input by web/fax and summary feedback if needed

<table>
<thead>
<tr>
<th>Title</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Enteric</td>
<td>Acute gastroenteritis (e.g., diarrhea, bloody stool, vomiting, etc)</td>
</tr>
<tr>
<td>2 Influenza</td>
<td>Influenza, Influenza-like Illness</td>
</tr>
<tr>
<td>3 Respiratory</td>
<td>Acute Respiratory Infection other than influenza</td>
</tr>
<tr>
<td>4 Measles</td>
<td>Rash with fever (e.g., measles)/ vesicles (e.g., chickenpox)</td>
</tr>
<tr>
<td>5 Tetanus</td>
<td>Neurological symptom by tetanus, meningitis, encephalitis</td>
</tr>
<tr>
<td>6 Scabies</td>
<td>e.g., Scabies</td>
</tr>
<tr>
<td>7 Wound-associated</td>
<td>Wound-associated infection</td>
</tr>
<tr>
<td>8 Jaundice</td>
<td>Jaundice (e.g., Jaundice (e.g., hepatitis)</td>
</tr>
<tr>
<td>9 Death</td>
<td>Death</td>
</tr>
</tbody>
</table>

Source: Dr. Y. Ohkusa (IDSC)
Actual example of the feedback from IDSC/NIID (2)

- Acute Respiratory Syndrome (ARS) in an area covered by PHC A in Fukushima from 31 March to 31 May 2011-

- An ARS cluster was identified among the handicapped in an evacuation center.
  - A total of 30 cases including 3 hospital admissions, but no deaths were reported. No lab results were available.

- Recommendations for PHC A and the staff in the shelter:
  - Enforce droplet and contact precaution by wearing masks and thorough hand hygiene using alcoholic disinfectants.
  - Keep the proper number of residents per room by collaborating with other facilities to avoid crowded conditions.
Field Epidemiology Training Program of Japan,
Introductory Course, April 2011
Miniproject

- Work on an assigned topic
- The trainees are expected to collect and analyze information, and then develop conclusions and recommendations.
- Although the course facilitators supervise progress in the project, the trainees are strongly expected to lead the process.
- Make a presentation to FETP and IDSC staff before the closing ceremony of the class
Past Topics

• 2004 - Risks for people passing through automatic revolving doors
• 2005 - Cool Biz Make a Change?
• 2008 - Plastic, Paper, and Eco Bag Use
• 2009 - Public Health uses for Internet Social Networking Systems (Twitter, Facebook, Mixi, etc)
• 2010 - Surveillance and Prevention of Heat-related Morbidity and Mortality
Demographic Characteristics of the Victims of the Great East Japan Earthquake (GEJE)

2011 FETP Introductory Course Mini Project
Group B

Hiroyuki Tawara
Hiroto Ushizawa
Koji Nabae
Hidetetsu Hirokawa
Fumihiko Takeuchi
Mayumi Aminaka
Prior Tsunami Study

Figure 2
Age-band specific mortality among 3,533 internally displaced persons due to the 2004 Indian Ocean tsunami in Ampara district, Sri Lanka.

Women, Children and the Elderly had higher mortality.

<table>
<thead>
<tr>
<th>Location</th>
<th>Survival Rate</th>
<th>Seismic Intensity</th>
<th>Max Tsunami Height</th>
<th>Time to reach land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>First Wave</td>
</tr>
<tr>
<td>Rikuzen Takata</td>
<td>88.5%</td>
<td>6 lower</td>
<td>15.8m</td>
<td>2 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Miyako)</td>
</tr>
<tr>
<td>Ishinomaki</td>
<td>68.2%</td>
<td>6 lower</td>
<td>7.7 m</td>
<td>0 min</td>
</tr>
<tr>
<td>Minami Soma</td>
<td>82.4%</td>
<td>6 lower</td>
<td>8.9m</td>
<td>9 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(Soma)</td>
</tr>
</tbody>
</table>
Results 3-1
Age-stratified Attack Rate in Three Cities

![Graph showing relative risk (vs 30-39) for different age groups in three cities: Rikuzentakata City, Ishinomaki City, and Minamisouma City.](image)
OBJECTIVE

• Estimate the Number of Non-vaccinated People for Measles in the Stricken Area (in particular Iwate, Miyagi and Fukushima Prefectures)
Immunization Schedule, MR(Measles and Rubella) in Japan-1

- 2-shot strategy since Jun. 2006

1. 1 year old cohort

2. Preschool children (5-6y.o)
   During a preschool year (Apr.1 – Mar.31)
Vaccination Rate at the second period

To be achieved (95%)

Non-vaccinated population to be estimated

Ministry of Health, Labour and Welfare
Preparedness for Nankai Trough Earthquake in Japan

Mini-Project 2012
14th Introductory Course for FETP-J
Kanayama, Tabuchi, Utoyama
Maximum seismic intensity in Nankai Trough Earthquake

- 7: 10 prefectures
- 6 higher: 11 prefectures
- 6 lower: 3 prefectures
- 5 higher: 3 prefectures
- 5 lower: 3 prefectures
- 4: 3 prefectures
- 3 or less: 3 prefectures
## Great East Japan Earthquake in 2011

### (A) Tsunami type: extensive tsunami impact

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Maximum seismic intensity¹</th>
<th>Maximum tsunami height (m)²</th>
<th>Population³</th>
<th>Deaths⁴</th>
<th>Missing⁴</th>
<th>Injured⁴</th>
<th>Displaced⁵</th>
<th>Total affected population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iwate</td>
<td>6 lower</td>
<td>8.5</td>
<td>1,330,147</td>
<td>4,671</td>
<td>1,225</td>
<td>200</td>
<td>45,441</td>
<td>51,537</td>
</tr>
<tr>
<td>Miyagi</td>
<td>7</td>
<td>8.6</td>
<td>2,348,165</td>
<td>9,515</td>
<td>1,616</td>
<td>4,133</td>
<td>309,333</td>
<td>324,597</td>
</tr>
<tr>
<td>Fukushima</td>
<td>6 higher</td>
<td>9.3</td>
<td>2,029,064</td>
<td>1,605</td>
<td>214</td>
<td>182</td>
<td>102,882</td>
<td>104,883</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>5,707,376</td>
<td>15,791</td>
<td>3,055</td>
<td>4,515</td>
<td>457,656</td>
<td>481,017</td>
</tr>
</tbody>
</table>

### (B) Ibaraki type: moderate tsunami height, but significant number of the displaced

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Maximum seismic intensity¹</th>
<th>Maximum tsunami height (m)²</th>
<th>Population³</th>
<th>Deaths⁴</th>
<th>Missing⁴</th>
<th>Injured⁴</th>
<th>Displaced⁵</th>
<th>Total affected population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ibaraki</td>
<td>6 higher</td>
<td>4.0</td>
<td>2,969,770</td>
<td>24</td>
<td>1</td>
<td>709</td>
<td>4,504</td>
<td>5,238</td>
</tr>
</tbody>
</table>

### Affected rate (%)

- **8.4**
- **0.2**

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1. [Japan Meteorological Agency](http://www.seisvol.kishou.go.jp/eq/2011_03_11_tohoku/0311_shindo.pdf)
2. [Japan Meteorological Agency](http://www.seisvol.kishou.go.jp/eq/2011_03_11_tohoku/tsunami_jp.pdf)
4. [Reports from National Police Agency](http://www.npa.go.jp/archive/keibi/biki/higaijokyo.pdf), as of April 25, 2011
## Nankai Trough Earthquake in 20XX

### (A) Tsunami type

<table>
<thead>
<tr>
<th>Prefecture</th>
<th>Maximum seismic intensity$^6$</th>
<th>Maximum tsunami height (m)$^7$</th>
<th>Population$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiba</td>
<td>5 higher</td>
<td>9.3</td>
<td>6,216,289</td>
</tr>
<tr>
<td>Kanagawa</td>
<td>6 lower</td>
<td>9.2</td>
<td>9,048,331</td>
</tr>
<tr>
<td>Shizuoka</td>
<td>7</td>
<td>25.3</td>
<td>3,765,007</td>
</tr>
<tr>
<td>Aichi</td>
<td>7</td>
<td>20.5</td>
<td>7,410,719</td>
</tr>
<tr>
<td>Mie</td>
<td>7</td>
<td>24.9</td>
<td>1,854,724</td>
</tr>
<tr>
<td>Hyogo</td>
<td>7</td>
<td>9.0</td>
<td>5,588,133</td>
</tr>
<tr>
<td>Wakayama</td>
<td>7</td>
<td>18.3</td>
<td>1,002,198</td>
</tr>
<tr>
<td>Tokushima</td>
<td>7</td>
<td>20.3</td>
<td>785,491</td>
</tr>
<tr>
<td>Ehime</td>
<td>7</td>
<td>17.3</td>
<td>1,431,493</td>
</tr>
<tr>
<td>Kochi</td>
<td>7</td>
<td>34.4</td>
<td>764,456</td>
</tr>
<tr>
<td>Oita</td>
<td>6 higher</td>
<td>14.4</td>
<td>1,196,529</td>
</tr>
<tr>
<td>Miyazaki</td>
<td>7</td>
<td>15.8</td>
<td>1,135,233</td>
</tr>
<tr>
<td>Kagoshima</td>
<td>6 lower</td>
<td>12.9</td>
<td>1,706,242</td>
</tr>
</tbody>
</table>

**Total** | | **41,904,845** |

**Estimated affected population (A)**  
3,531,736

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$^3$ Ministry of International Affairs Census 2010  
$^6$ Prediction by the Assessment Committee of Nankai Trough Earthquake  
$^7$ Prediction by the Assessment Committee of Nankai Trough Earthquake  
Purpose of this project:

To improve epidemiologic surveillance system that should be conducted after the disaster in order to minimize disease burden among affected people

Methods:

- Collect reports of surveillance systems in 2011 that were published by NIID and local authorities for public health through their web sites.
- Evaluate surveillance systems in 2011 against attributes of surveillance system; in particular, (1) representativeness, (2) data quality, and (3) timeliness
- Present recommendations for better surveillance