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Epidemiological Assessment of Fires in the Philippines, 2010–2012

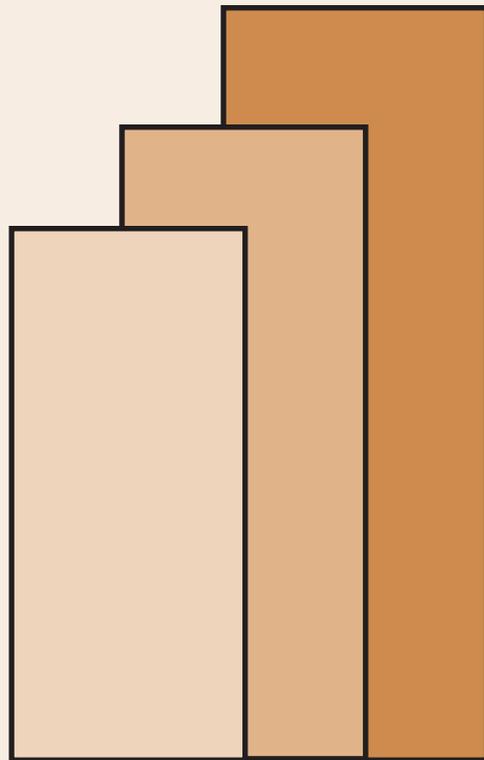
Gloria Nenita V. Velasco

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**EPIDEMIOLOGICAL ASSESSMENT OF FIRES IN THE
PHILIPPINES, 2010 – 2012**

Gloria Nenita V. Velasco, MD

Philippine Institute for Development Studies

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ABSTRACT

Fires are the most costly preventable emergency in the Philippines but are relatively unstudied. A 2012 study done by the Department of Health – Health Emergency Management Staff (DOH-HEMS) revealed that fires constituted 39% of all events reported to the Health Emergency Alert Reporting System (HEARS) from 2005 to 2009 and caused 263 deaths and 749 injuries. The epidemiology of fires and fire-related casualties in the Philippines from 2010 to 2012 was assessed. All fires reported in the HEARS of the DOH-HEMS during that period were included in the study. Fires were a greater problem from 2010 to 2012 and affected the same geographic locations. A total of 883 fires and 824 fire-related casualties were reported, majority of which occurred in Metro Manila. Fires occurred throughout November to March, were more frequent from midnight to 3 AM, and most often involved residential areas. No improvement in the fire situation was noted for 2010 to 2012. There is a need to review present local and national efforts at fire prevention and control. Further research and analysis of causes and determinants of fires would provide more useful information for fire prevention policy and planning in the Philippines.

Keywords: fires, fire-related casualties, fire prevention, fire control, emergencies, Health Emergency Management Staff (HEMS), Health Emergency Alert Reporting System (HEARS), Health Emergency Alert Reporting System Plus Report (HEARS Plus Report), Revised Fire Code of the Philippines, Bureau of Fire Protection (BFP)

EPIDEMIOLOGICAL ASSESSMENT OF FIRES IN THE PHILIPPINES, 2010 – 2012

Gloria Nenita V. Velasco, MD¹

1. Introduction

The economic and human costs of fires are great. In 2012, the World Fire Statistics Commission (WFSC) estimated that the annual cost of fire losses around the world was 1 percent of global GDP. This is equivalent to billions of dollars in direct losses due to damaged property. However, other costs of fires include direct costs (e.g. health care management of burns) and indirect costs (e.g., lost wages, prolonged care for deformities and trauma, and commitment of family resources), which are just as significant but are difficult to measure (World Health Organization [WHO], 2012). Indirect costs are often imprecisely measured because of the intrinsic inaccuracy of methods used to calculate them (WFSC, 2012). Nevertheless, whether direct or indirect, the economic costs of fires are a significant burden.

The human cost of fires is a global public health concern (WHO, 2012). The effects of fires on people are two-fold: direct physical harm that causes deaths and injuries such as burns, and psychological and emotional trauma (WFSC, 2012). Although many countries have experienced an improved long-term trend in terms of fire-related deaths due in large part to enhanced fire prevention efforts, low- and middle-income countries continue to have a high incidence of fire-related deaths and injuries (WFSC, 2012; WHO, 2012). According to the Center of Fire Statistics of the International Association of Fire and Rescue Services, there were 70,000 to 80,000 fire deaths and 500,000 to 800,000 fire injuries at the beginning of the 21st century (Brushlinksy, Wagner & Hall, 2006).

Only one previous study has been conducted on fires and fire-related casualties in the Philippines. In 2012, the Health Emergency Management Staff (HEMS) of the Department of Health (DOH) carried out an epidemiologic assessment of all health-related emergencies and disasters that were reported through its Health Emergency Alert Reporting System (HEARS) from 2005 to 2009. Fires were just one of the health-related events that were assessed. The investigators determined that fires constituted 39% (or 885) of all events reported in the HEARS, caused 263 deaths and 749 injuries, and affected 133,674 individuals.

2. Background

The HEMS is the health sector's leader in health emergency response. Its efforts however are not only limited to responding to emergencies and disasters. It, more importantly, promotes and supports disaster preparedness, which significantly reduces the effects and impact of disasters.

The HEMS identifies and monitors all health-related events through the HEARS, of which the main output is the HEARS Plus Report. The system was institutionalized in 1995 through Department Circular 181-b s.1995, but reporting templates were only standardized in 2007. These reports are prepared on a daily basis for the Office of the Secretary and other stakeholders in health emergency management. Health-related events are identified through the use of quad-media sources (e.g. television, radio, internet, and printed newspapers). Initial reports of these events are validated with the relevant Bureau of Fire

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Protection (BFP) office and Center for Health Development prior to their inclusion in a HEARS Plus Report.

3. Rationale

Fires and fire-related casualties are relatively unstudied in the Philippines but are perceived to be a continual problem. The recent enactment of Republic Act 9514, or the Revised Fire Code, in 2009 was intended to enhance the BFP's capacity to address the problem of fires. Though it may be premature to assess the Act's impact, it is timely to gain knowledge on the current situation of fires and fire-related casualties.

This research project was conducted with the intention of describing the incidence of fires and fire-related casualties in the Philippines for the years 2010 to 2012. The information obtained through this study may be used to guide future research, planning, and policy activities relevant to disaster preparedness and prevention activities of local government units, the BFP, the DOH, and other involved agencies.

4. Research Problem

Fires continue to be a problem in the Philippines but an assessment of the situation for the years 2010 to 2012 has not yet been done. The purpose of this study was to assess the epidemiology of fires and fire-related casualties in the Philippines.

5. Objectives

General Objective

To assess the epidemiology of fires and fire-related casualties in the Philippines from 2010 to 2012

Specific Objectives

1. To describe the incidence of fires in the Philippines occurring from 2010 to 2012 in terms of the following:
 - a. Month
 - b. Time of day
 - c. Cause
 - d. Area affected
 - e. Geographic location
2. To determine the average duration of fires in the Philippines occurring from 2010 to 2012
3. To describe the incidence of fire-related casualties occurring from 2010 to 2012 in terms of the following:
 - a. Month
 - b. Time of day
 - c. Cause
 - d. Area affected

- e. Geographic location
4. To determine the following effects due to fires occurring from 2010 to 2012:
- a. Number of individuals affected
 - b. Number of families affected
 - c. Cost of damage

6. Limitations

- a. The study was based entirely on the HEARS Plus Reports generated by the Operations Center (OpCen) of the Response Division of HEMS from 2010 to 2012.
- b. Only fires identified and monitored by the HEMS were included in this study. Other fires that may have been identified, responded to, and monitored by the BFP were not included.
- c. No cross-validation was done with other reports or databases of HEMS or of any other agency or organization.
- d. No comparisons were made with other events in the Philippines (e.g., transportation accidents, typhoons, and earthquakes).

7. Methodology

All fires reported in the HEARS Plus Reports from 2010 to 2012 were included in this study. These reports were obtained from the OpCen of the HEMS.

The HEARS Plus Reports were reviewed in 3 phases. An initial review of the HEARS Plus Reports was done to determine the extent of documentation of fires. A second review was done to identify fires in individual reports and to compose a master list of all fire events. Fire events were listed chronologically and assigned a unique event identification code. The final review was done before data encoding.

A data extraction tool was developed as a questionnaire using EpiInfo 2000 for the purposes of extracting the relevant information from the HEARS Plus Reports. The questionnaire was developed using legal values to minimize errors in data encoding. Only one database was built using the data extraction tool. Format, completeness, and inconsistency checks were done prior to data analysis.

The following were extracted from the HEARS Plus Reports:

- 1. Year of event
- 2. Month of event
- 3. Time of day of event
- 4. Duration of event (in minutes)
- 5. Identified cause of event
- 6. Region where event occurred
- 7. Province where event occurred
- 8. City or municipality where event occurred
- 9. Number of casualties – Number of individuals who were victimized by an event, either physically and/or psychologically, and includes both dead and injured individuals
- 10. Number of individuals and families affected – Estimated number of individuals and families that have been affected by an event

8. Data Management

All electronic files were in the possession of the main researcher for the duration of the research project. Back-up files were stored in an external USB drive. The final electronic database was turned over to HEMS for final storage and use.

No confidentiality issues were identified for this study as no personal identifying information was available in the HEARS Plus Reports. However, events were still given unique identifying codes for the purposes of data analysis.

9. Data Analysis

Fires and fire-related casualties were expressed as frequencies and proportions. Other variables were presented as frequencies and proportions or as medians. Epi Info 2000 was used to produce these descriptive statistics.

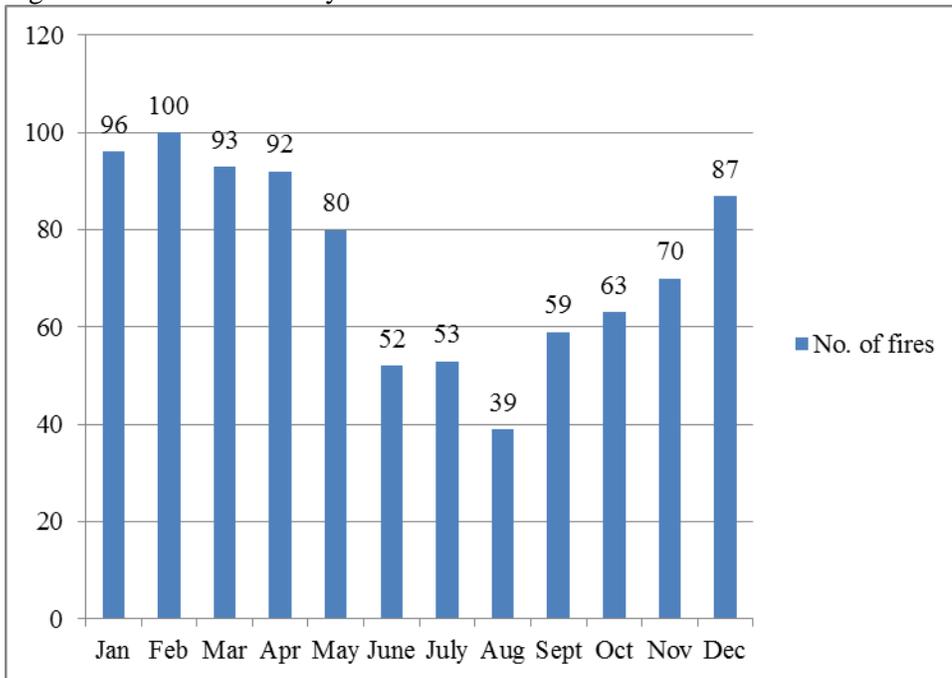
10. Results

Fires

From 2010 to 2012, a total of 883 fires were reported in the HEARS Plus Reports of the HEMS: 275 in 2010, 269 in 2011, and 339 in 2012.

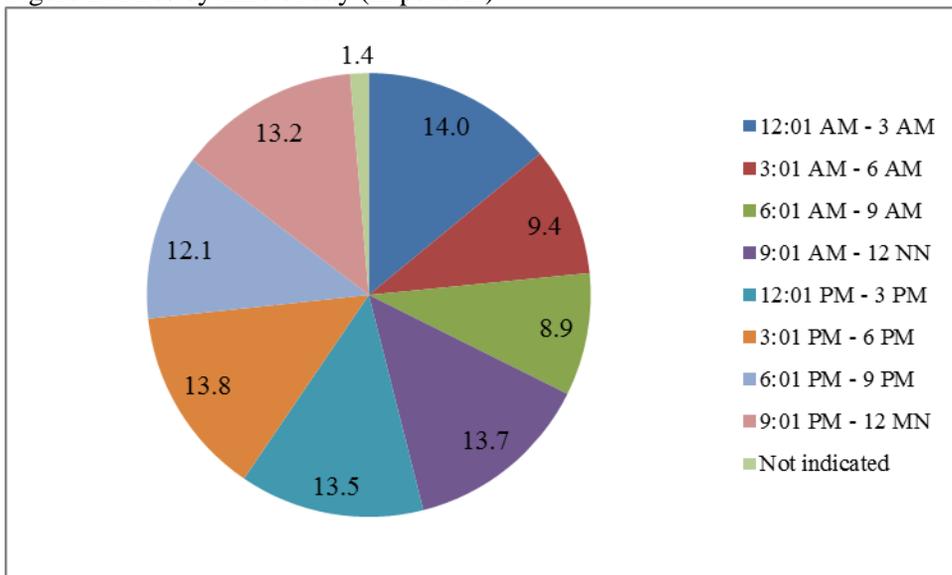
Forty-three percent (43%) of fires from 2010 to 2012 occurred in the first four months of the year. February had the highest number of fires, while August had the lowest number. Figure 1 shows the number of fires reported by month. In general, the months of December to April correspond to the dry season in the Philippines. A trough in fire incidence from June to October was also noted from 2010 to 2012, which corresponds roughly to the wet season in the country.

Figure 1. Number of fires by month



Fires occurred most often between 12:01 AM to 3 AM, while they occurred least often between 3:01 AM and 9 AM. Otherwise, fires were generally well-distributed throughout the day. Figure 2 shows fire events by time of day. In addition, the median length of time of a fire was 1 hour and 5 minutes. The median length of time of fires was highest from midnight to 3 AM and lowest from 9 AM to 3 PM.

Figure 2. Fires by time of day (in percent)



The cause of majority of fires was undetermined at the time that they were included in the HEARS Plus Report (87.7%). Faulty electrical wiring and neglected open flames were the most common causes of fires reported at 2.9% and 2.4%, respectively. Figure 3 shows fire events by cause. Majority of

fires involved residential areas at 70.2%, followed by commercial areas at 16.9%. Figure 4 shows fire events by the area affected.

Figure 3. Fires by cause (in percent)

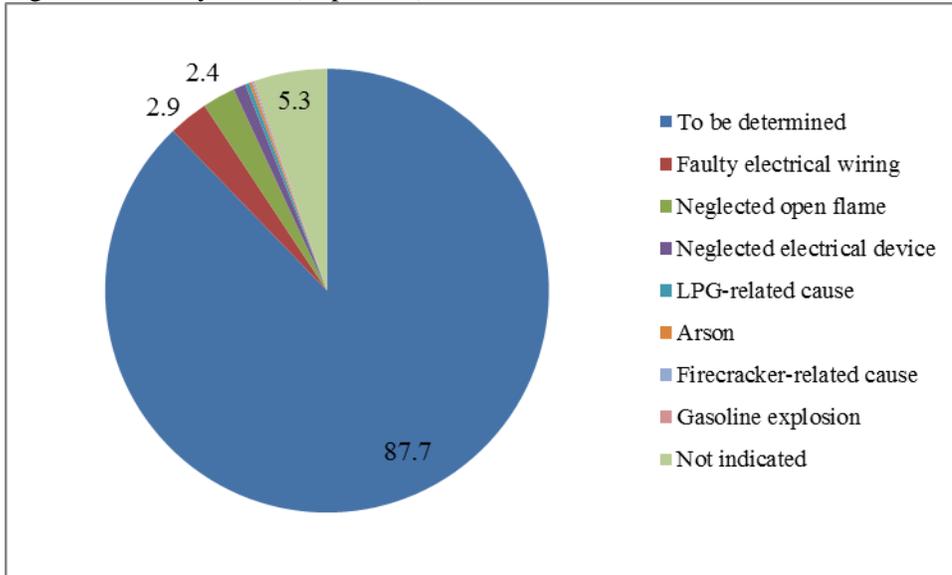
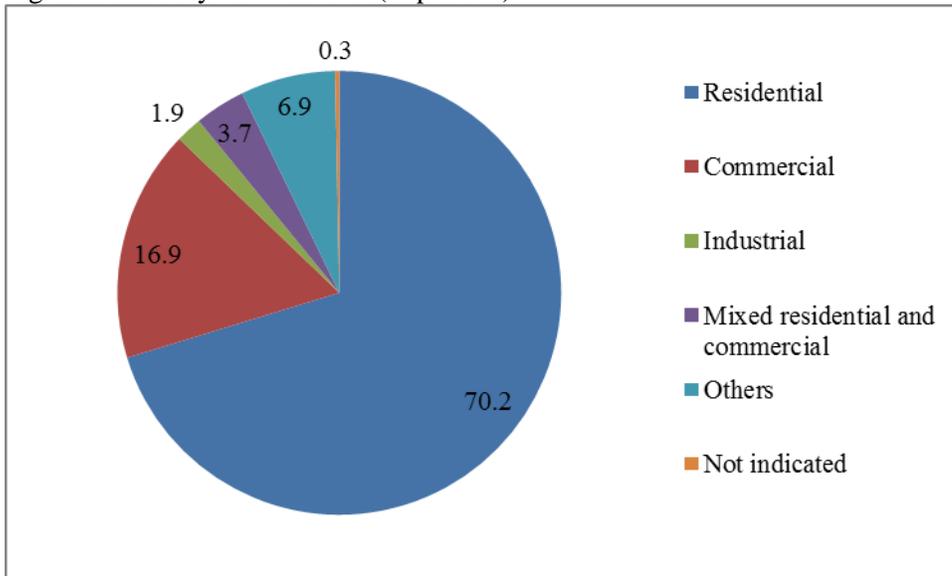


Figure 4. Fires by area affected (in percent)



The National Capital Region (NCR) had the greatest proportion of fires for the entire period at 77.0%. This was followed by regions 4A, 7, and 10 (at 4.6%, 3.6%, and 3.5%, respectively). Table 1 details fires and fire-related casualties by region.

Table 1. Fires and Fire-Related Casualties by Region

Region	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
NCR	680	77.0	506	61.4	142	51.4	359	66.1
CAR	8	0.9	47	5.7	9	3.3	38	7.0
1	7	0.8	8	1.0	6	2.2	2	0.4
2	4	0.5	41	5.0	21	7.6	20	3.7
3	12	1.4	4	0.5	3	1.1	1	0.2
4A	41	4.6	31	3.8	14	5.1	17	3.1
4B	3	0.3	0	0.0	0	0.0	0	0.0
5	4	0.5	6	0.7	5	1.8	1	0.2
6	14	1.6	12	1.5	7	2.5	5	0.9
7	32	3.6	27	3.3	9	3.3	18	3.3
8	4	0.5	17	2.1	0	0.0	17	3.1
9	7	0.8	9	1.1	3	1.1	6	1.1
10	31	3.5	52	6.3	14	5.1	38	7.0
11	10	1.1	3	0.4	2	0.7	1	0.2
12	11	1.2	29	3.5	14	5.1	15	2.8
13	9	1.0	27	3.3	24	8.7	3	0.6
ARMM	6	0.7	5	0.6	3	1.1	2	0.4
TOTAL	883	100.0	824	100.0	276	100.0	543	100.0

After Metro Manila, the province of Rizal had the next highest proportion of fires for the period (at 2.0% of all incidents reported by provinces). Table 2 details fires and fire-related casualties by province.

Table 2. Fires and Fire-Related Casualties by Province

Province	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
<i>Metro Manila</i>	680	77.0	506	61.4	142	51.4	359	66.1
<i>CAR</i>								
Benguet	1	0.1	31	3.8	0	0.0	31	5.7
Ifugao	1	0.1	7	0.8	3	1.1	4	0.7
<i>Region 1</i>								
Ilocos Sur	1	0.1	0	0.0	0	0.0	0	0.0
La Union	3	0.3	8	1.0	6	2.2	2	0.4
Pangasinan	1	0.1	0	0.0	0	0.0	0	0.0
<i>Region 2</i>								
Cagayan	2	0.2	31	3.8	16	5.8	15	2.8
Isabela	2	0.2	10	1.2	5	1.8	5	0.9
<i>Region 3</i>								
Bulacan	6	0.7	0	0.0	0	0.0	0	0.0
Nueva Ecija	2	0.2	4	0.5	3	1.1	1	0.2
Pampanga	1	0.1	0	0.0	0	0.0	0	0.0
Tarlac	1	0.1	0	0.0	0	0.0	0	0.0
Zambales	2	0.2	0	0.0	0	0.0	0	0.0
<i>Region 4A</i>								
Batangas	1	0.1	0	0.0	0	0.0	0	0.0
Cavite	14	1.6	11	1.3	1	0.4	10	1.8
Laguna	5	0.6	2	0.2	2	0.7	0	0.0
Quezon	2	0.2	1	0.1	1	0.4	0	0.0
Rizal	18	2.0	17	2.1	10	3.6	7	1.3
<i>Region 4B</i>								
Occidental Mindoro	1	0.1	0	0.0	0	0.0	0	0.0
Palawan	2	0.2	0	0.0	0	0.0	0	0.0
Romblon	1	0.1	0	0.0	0	0.0	0	0.0
<i>Region 5</i>								
Albay	1	0.1	0	0.0	0	0.0	0	0.0
Camarines Sur	3	0.3	6	0.7	5	1.8	1	0.2
<i>Region 6</i>								
Iloilo	5	0.6	1	0.1	1	0.4	0	0.0
Negros Occidental	1	0.1	3	0.4	3	1.1	0	0.0
<i>Region 7</i>								
Cebu	6	0.7	4	0.5	2	0.7	2	0.4
<i>Region 8</i>								
Leyte	5	0.6	17	2.1	0	0.0	17	3.1
<i>Region 9</i>								
Zamboanga del Norte	1	0.1	3	0.4	0	0.0	3	0.6
Zamboanga del Sur	1	0.1	0	0.0	0	0.0	0	0.0
Zamboanga Sibugay	1	0.1	0	0.0	0	0.0	0	0.0
<i>Region 10</i>								
Bukidnon	1	0.1	8	1.0	5	1.8	3	0.6
Lanao del Norte	2	0.2	15	1.8	0	0.0	15	2.8
Misamis Oriental	3	0.3	12	1.5	3	1.1	9	1.7
<i>Region 11</i>								
Davao Oriental	1	0.1	0	0.0	0	0.0	0	0.0
<i>Region 12</i>								
Cotabato	2	0.2	0	0.0	0	0.0	0	0.0
Saranggani	1	0.1	0	0.0	0	0.0	0	0.0
South Cotabato	1	0.1	0	0.0	0	0.0	0	0.0
<i>Region 13</i>								
Surigao del Norte	2	0.2	1	0.1	1	0.4	0	0.0
<i>ARMM</i>								
Basilan	1	0.1	1	0.1	0	0.0	1	0.2
Maguindanao	5	0.6	4	0.5	3	1.1	1	0.2
Not applicable	93	10.5	121	14.7	64	23.2	57	10.5
TOTAL	883	100.0	824	100.0	276	100.0	543	100.0

Note: Not applicable - independent component cities

Within Metro Manila, the cities of Quezon City and Manila had the greatest proportion of fires, at 20.6% and 19.1%, respectively, of all events in the Philippines. Table 3 details fire and fire-related casualties by city.

Table 3. Fires and Fire-Related Casualties by City

City	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
<i>Metro Manila</i>								
Caloocan	46	5.2	38	4.6	16	5.8	22	4.1
Las Piñas	13	1.5	16	1.9	5	1.8	8	1.5
Makati	41	4.6	38	4.6	13	4.7	25	4.6
Malabon	14	1.6	15	1.8	4	1.4	11	2.0
Mandaluyong	26	2.9	17	2.1	6	2.2	11	2.0
Manila	169	19.1	108	13.1	9	3.3	99	18.2
Marikina	20	2.3	2	0.2	1	0.4	1	0.2
Muntinlupa	8	0.9	2	0.2	2	0.7	0	0.0
Navotas	9	1.0	68	8.3	16	5.8	52	9.6
Parañaque	34	3.9	20	2.4	10	3.6	8	1.5
Pasay	37	4.2	20	2.4	6	2.2	14	2.6
Pasig	33	3.7	14	1.7	11	4.0	3	0.6
Pateros	4	0.5	3	0.4	0	0.0	3	0.6
Quezon City	182	20.6	124	15.0	36	13.0	88	16.2
San Juan	8	0.9	8	1.0	2	0.7	6	1.1
Taguig	15	1.7	4	0.5	4	1.4	0	0.0
Valenzuela	21	2.4	9	1.1	1	0.4	8	1.5
<i>Independent Cities</i>								
Butuan	5	0.6	24	2.9	21	7.6	3	0.6
Cagayan de Oro	25	2.8	23	2.8	9	3.3	14	2.6
Cebu City	25	2.8	23	2.8	7	2.5	16	2.9
Cotabato City	4	0.5	13	1.6	4	1.4	9	1.7
Dagupan	2	0.2	0	0.0	0	0.0	0	0.0
Davao City	9	1.0	3	0.4	2	0.7	1	0.2
General Santos	3	0.3	16	1.9	10	3.6	6	1.1
Iloilo City	8	0.9	8	1.0	3	1.1	5	0.9
Zamboanga City	4	0.5	6	0.7	3	1.1	3	0.6
<i>Others</i>	118	13.4	202	24.5	75	27.2	127	23.4
TOTAL	883	100.0	824	100.0	276	100.0	543	100.0

Fire-Related Casualties

Only 26.7% of all fires had reported casualties, for a total of 824 casualties from 2010 to 2012. Of these casualties, 33.5% were deaths and 65.9% were injuries (5 casualties were unclassified). Among events with reported casualties, deaths, or injuries, the median number of casualties, deaths, or injuries reported was 2. Likewise, the most frequently reported number of casualties, deaths, or injuries was 1. Thirty-nine (39) casualties (i.e., the greatest number of casualties from 2010 to 2012) were reported from a fire that occurred in a commercial building in Manila on September 7, 2012.

There were more casualties in February, March, and September (15.8%, 14.7%, and 11.5%, respectively). Deaths occurred more frequently in March and May (each at 12.0%), while injuries occurred more frequently in February, March, and September (19.5%, 16.2%, and 14.9%, respectively). June had the lowest proportion of casualties at 1.8%. Table 4 details fires and fire-related casualties by month.

Table 4. Fires and Fire-Related Casualties by Month

Month	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
January	96	10.9	66	8.0	32	11.6	34	6.3
February	100	11.3	130	15.8	24	8.7	106	19.5
March	93	10.5	121	14.7	33	12.0	88	16.2
April	92	10.4	78	9.5	26	9.4	50	9.2
May	80	9.1	70	8.5	33	12.0	37	6.8
June	51	5.8	15	1.8	9	3.3	6	1.1
July	53	6.0	21	2.5	7	2.5	14	2.6
August	39	4.4	36	4.4	17	6.2	19	3.5
September	59	6.7	95	11.5	14	5.1	81	14.9
October	63	7.1	35	4.2	11	4.0	21	3.9
November	70	7.9	76	9.2	20	7.2	56	10.3
December	87	9.9	81	9.8	50	18.1	31	5.7
TOTAL	883	100.0	824	100.0	276	100.0	543	100.0

More than half of all casualties were incurred between 9 PM and 6 AM (55.4%). Deaths followed the same pattern. Injuries were well-distributed throughout the day, though they occurred most frequently between 9PM and midnight (18.8%). The lowest proportion of casualties was from 12 noon to 3 PM.

Table 5. Fires and Fire-Related Casualties by Time of Day

Time of day	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
12:01 AM - 3 AM	124	14.2	163	19.9	88	32.1	72	13.3
3:01 AM - 6 AM	83	9.5	146	17.8	85	31.0	61	11.3
6:01 AM - 9 AM	79	9.1	68	8.3	8	2.9	60	11.1
9:01 AM - 12 NN	121	13.9	92	11.2	14	5.1	78	14.4
12:01 PM - 3 PM	119	13.6	39	4.8	5	1.8	34	6.3
3:01 PM - 6 PM	122	14.0	90	11.0	21	7.7	67	12.4
6:01 PM - 9 PM	107	12.3	78	9.5	10	3.6	68	12.5
9:01 PM - 12 MN	117	13.4	145	17.7	43	15.7	102	18.8
TOTAL	872	100.0	821	100.0	274	100.0	542	100.0

Casualties were most commonly due to a neglected or unattended open flame (3.3 to 3.7%). No casualties were due to fire-cracker related fires.

Table 6. Fires and Fire-Related Casualties by Cause

Cause	Fires		Casualties		Deaths		Injuries	
	No.	%	No.	%	No.	%	No.	%
To be determined	774	87.7	720	87.4	236	85.5	479	88.2
Faulty electrical wiring	26	2.9	13	1.6	8	2.9	5	0.9
Neglected open flame	21	2.4	29	3.5	9	3.3	20	3.7
Neglected electrical device	8	0.9	12	1.5	0	0.0	12	2.2
LPG-related cause	3	0.3	2	0.2	0	0.0	2	0.4
Arson	2	0.2	7	0.8	3	1.1	4	0.7
Firecracker-related cause	1	0.1	0	0.0	0	0.0	0	0.0
Gasoline explosion	1	0.1	5	0.6	5	1.8	0	0.0
Not indicated	47	5.3	36	4.4	15	5.4	21	3.9
TOTAL	883	100.0	824	100.0	276	100.0	543	100.0

NCR had the highest proportion of fire-related casualties at 61.4%, followed by Region 10 and the Cordillera Autonomous Region (6.3% and 5.7%, respectively). Region 4B had no reported casualties from 2010 to 2012. Please refer to Table 1.

After Metro Manila, the provinces of Benguet and Cagayan had the highest proportion of casualties (at 3.8% each). Cagayan had the next highest proportion of fire-related deaths after NCR (5.8%), while Benguet had the next highest proportion of fire-related injuries after NCR (5.7%). Please refer to Table 2.

Within Metro Manila, Quezon City and Manila had the highest proportion of fire-related casualties and injuries (28.1% and 34.4%, respectively). After Quezon City, Navotas and Caloocan had the next highest proportion of fire-related deaths at 5.8% each. Please refer to Table 3.

Other effects of fires

The number of individuals affected by fires was only reported in 29 HEARS Plus Reports. The total number of individuals affected was 34,159. The number of families affected by fires was more frequently reported than individuals (at 149 reports). The total number of families affected was 40,306.

The costs of damages due to fires were only reported in 7 HEARS Plus Reports. The total cost was Php 100.75 million.

11. Discussion

There were notable differences in the epidemiology of fires and fire-related casualties between the periods 2005 to 2009 and 2010 to 2012. The average number of fires reported per year from 2010 to 2012 was greater than that from 2005 to 2009 (294 vs. 178) (HEMS, 2012). Similarly, the average number of fire-related casualties per year was greater from 2010 to 2012 (275 vs. 206) (HEMS, 2012).

From 2005 to 2009, fires peaked distinctly in March and December, whereas fires peaked in February but were frequent all throughout December to April from 2010 to 2012 (HEMS, 2012).

Certain aspects of fire epidemiology did not change since 2009 however. The most common causes of fires were still faulty electrical wiring and neglected open flames (HEMS, 2012). Furthermore, fires still most frequently occurred in NCR and least in Regions 2, 8, and ARMM. Metro Manila still had the most number of fires, and Quezon City and Manila remained the cities with the most number of reported fires in the country.

Disaster risk reduction includes disaster management, disaster mitigation, and disaster preparedness (The United Nations Office for Disaster Risk Reduction, 2012). Though no recent fires in the Philippines have been classified as disasters, fires continue to have a significantly negative impact on the country. And unlike natural hazards, structural fires are preventable through risk reduction. There are many factors that can contribute to the occurrence and proliferation of fires, such as weather/ climate, fuels, ignition agents and human factors (Achard, Eva, Mollicone, & Beuchle, 2008). Socioeconomic factors however are the best known predictors of fire rates (United States Fire Administration, 1997).

Through Presidential Proclamation No. 115-A of 1996, March was designated as Fire Prevention Month, which coincided with what was traditionally thought as the peak month of fires in the Philippines. However, fires in 2010 to 2012 peaked throughout the dry season in the country, which is from December to May (Philippine Atmospheric, Geophysical and Astronomical Services Administration, n.d.). This was also notably longer than the peak months of March and December from 2005 to 2009. This changing monthly occurrence and duration is significant and thus warrants a re-examination of the Fire Prevention Month observance in March.

Fires were most frequent and were longer in duration from midnight to 3 AM, but they still occurred throughout the day. In general, half of all fires from 2010 to 2012 occurred during the day. Physical structures with fire hazards are at real risk for fires, especially during periods when occupants may be asleep or physically absent from the structures. Such hazards in the Philippines include the use of open flames such as candles and lamps during the evenings. The longer duration of fires from midnight to 3 AM may be the result of the lack of awareness of an on-going fire by sleeping individuals and slowed emergency response by firefighters. Whatever the underlying cause may be, the end result of a slow response to fires is a longer fire duration, which is more likely to result in significant damage to structures and deaths or injuries. The well-distributed occurrence of fires throughout the day implies that fire hazards are continually present throughout the day as well.

Majority of fires involved residential areas from 2010 to 2012. This represents a significant risk for families, most especially for those who live in slums or squatter areas. The Fire Code of the Philippines, or Presidential Decree No. 1185, was enacted in 1977 and covered all types of structures (including residential structures). Enforcement of the Code (which is now Republic Act 9514, or the Revised Fire Code of the Philippines of 2008) in informal settlement areas, such as slums or squatter areas, is a challenge. In addition, the extent to which the Code is enforced in formal residential areas is unknown. It is likely however that fire prevention measures and systems are more aggressively carried out in commercial areas than in residential areas. There is a need to improve upon reducing the risk for fires in residential areas as fires more commonly affect these areas.

Metro Manila was still the most affected by fires in the Philippines, and Quezon City and Manila were still the cities with the most number of fires. Disaster risk reduction in these areas is concentrated on naturally occurring hazards such as typhoons and flooding rather than on fires. Public information campaigns on fire prevention are the BFP's main initiative to promote risk reduction. However, since the

epidemiology of fires and fire-related casualties has not changed in Metro Manila in spite of these public information campaigns, other risk reduction initiatives may have to be employed to effect any improvement.

The apparent increased reporting of fires and fire-related casualties from 2010 to 2012 may be due to an increase in the acceptability and adherence of reporting agencies to the HEARS, though this requires validation with the BFP. Nevertheless, reporting of fires is limited to those that are identified by HEMS through media sources. This selective reporting is subject to bias, since only news-worthy fires are reported in the media, and fires are more likely to be underreported through this process. Furthermore, the number of affected individuals and families and the costs of damage due to fires were also frequently underreported in the HEARS Plus Reports. Other determinants of fires, such as socio-economic factors, were also not reported. Improved reporting of other determinants and effects of fires would allow for a more accurate and in-depth assessment of fires in the Philippines.

12. Conclusions and Recommendations

Fires were a greater problem from 2010 to 2012 in terms of incurred casualties. However, there is a need to validate whether the increases in the number of fire incidents and fire-related casualties were actual increases and not due to an increase in reporting to HEARS. The BFP's more comprehensive database should be analysed to validate this apparent increase in fire-related casualties.

Fires continue to be a problem in the same geographic locations in the Philippines, specifically for Metro Manila. This requires a closer examination by the BFP and local government units. There is a need to review present efforts at fire prevention and control in light of the continued problem of fires in Metro Manila.

Reporting of fires and fire-related casualties has increased in the HEARS, although the extent of reporting has been limited in scope. The information available from the present reporting system does not allow for a more in-depth investigation of the effects and determinants of fires. Reporting of the effects of fires and the factors that could affect their occurrence should be improved.

Finally, more research should be done on determinants of fires (e.g., weather/ climate factors, structural factors, and socioeconomic and behavioural factors) to identify specific points for interventions that can be carried out by families, local governments, DOH, BFP, and/or other relevant organizations. This can, more importantly, be used to guide future policy and planning for fire risk reduction.

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