



MINISTRY OF HEALTH  
SINGAPORE

SINGAPORE MYOCARDIAL INFARCTION REGISTRY REPORT NO. 3

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# **TRENDS IN ACUTE MYOCARDIAL INFARCTION IN SINGAPORE 2007 – 2013**



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IN SINGAPORE 2007 – 2013**

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# FOREWORD

Ischaemic heart disease, including acute myocardial infarction, is the second leading principal cause of death in Singapore. With ageing of our population, changes in lifestyle and growing prevalence of risk factors such as diabetes and obesity, the burden of heart disease and acute myocardial infarction will continue to be a major challenge to our nation for years ahead. In order to better understand and overcome this disease, the Singapore Myocardial Infarction Registry (SMIR) was first established in 1988.

The SMIR is unique, possibly the only nation-wide myocardial infarction registry in the world. The staff has worked hard to put together data on acute myocardial infarction (AMI), commonly known as heart attack, in Singapore using a comprehensive protocol that requires meticulous screening of cardiac enzymes, discharge coding and electrocardiograms by a dedicated team of nurses. This third report of SMIR is the collective effort of those who have collected and analysed the data as well as those who have written and commented on the report.

The data provided by the SMIR fulfils a critical function for our healthcare service planning, providing insight and understanding of the trends and pattern of AMI in Singapore. This publication will be invaluable for those involved in overcoming this disease, whether cardiologists, epidemiologists or health administrators, and will also serve as a useful reference for both physicians and public health professionals. I would like to express my gratitude to those who have worked on this report.

**Prof Koh Tian Hai**

Chairman

Singapore Myocardial Infarction Registry Advisory Committee

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## 1. GLOSSARY

<b>AMI</b>	Acute Myocardial Infarction
<b>ASR</b>	Age-standardised rate
<b>BMI</b>	Body Mass Index
<b>CCPS</b>	Central Claims Processing Systems
<b>CI</b>	Confidence interval
<b>CR</b>	Crude rate
<b>DOS</b>	Department of Statistics
<b>ECG</b>	Electrocardiogram
<b>EMR</b>	Electronic Medical Records
<b>GP</b>	General Practitioner
<b>HIDS</b>	Hospital In-patient Discharge Summary
<b>HSA</b>	Health Sciences Authority
<b>ICD</b>	International Classification of Diseases
<b>MHA</b>	Ministry of Home Affairs
<b>MI</b>	Myocardial Infarction
<b>MOH</b>	Ministry of Health
<b>MONICA</b>	Monitoring Trends and Determinants in Cardiovascular Disease, World Health Organization
<b>NDRS</b>	National Disease Registries System
<b>NRDO</b>	National Registry of Diseases Office
<b>NSTEMI</b>	Non-ST-Segment Elevation Myocardial Infarction
<b>SCDB</b>	Singapore Cardiac Databank
<b>SMIR</b>	Singapore Myocardial Infarction Registry
<b>STEMI</b>	ST-Segment Elevation Myocardial Infarction

## 2. INTRODUCTION

Cardiovascular diseases include coronary heart diseases (acute myocardial infarction or “heart attacks”), cerebrovascular diseases (stroke), hypertension (raised blood pressure) and heart failure. This disease group claimed 17.5 million lives in 2012 (31% of global deaths), making it the world’s largest cause of death. Of these deaths, about 7.4 million and 6.7 million were caused by coronary heart disease and stroke respectively<sup>1</sup>. In Singapore, ischaemic heart diseases were the third leading cause of death (15.5%) and third leading cause of hospitalisation (3.5%) in 2013<sup>2</sup>.

The Acute Myocardial Infarction (AMI) Registry was established by Ministry of Health (MOH) in 1988, transferred to the Singapore Cardiac Databank (SCDB) in 2002 and subsequently to the National Registry of Diseases Office (NRDO) in 2007. Data for AMI cases diagnosed prior to 2007 has been collected by SCDB. After the transfer to NRDO, it was re-named the Singapore Myocardial Infarction Registry (SMIR). SMIR continues to collect epidemiological data on AMI cases diagnosed in all the restructured hospitals<sup>3</sup> and a small number of AMI deaths that occur at home certified by medical practitioners in Singapore. AMI cases occurring in private hospitals<sup>4</sup> have also been included in the report since 2012.

As the number of patients with AMI increases over the years, it becomes increasingly imperative to have data comprising various aspects of the disease and maintaining this data in one central place in Singapore. Such an attempt to gather data at a national level is time consuming and the cooperation of various healthcare professionals involved in the management of AMI patients from all hospitals is crucial to the success of the Registry.

The availability of such national statistics on AMI will enable planning and projection for our future needs. Such data will be helpful for identification of useful trends to provide the basis for correct decision making. The emergence of early signs of unfavourable trends will forewarn decision makers and allow suitable preventive measures to be taken.

The data used in this monograph is from the period of 2007 to 2013 and finalised in the SMIR as of 12<sup>th</sup> January 2015. It is updated regularly and hence, there may be differences in the figures presented in this monograph when compared to previous reports. The results presented in this monograph are considered to be more reliable where differences exist.

All records in the SMIR undergo the processes of registration, verification, matching and classification before they are finalised.

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1 Fact Sheet 2013, World Health Organisation

2 Health Facts Singapore 2013, Ministry of Health

3 Includes the National Heart Centre (NHC), Singapore General Hospital (SGH), Changi General Hospital (CGH), Tan Tock Seng Hospital (TTSH), Alexandra Hospital (AH), National University Hospital (NUH), Kandang Kerbau Hospital (KKH) and Khoo Teck Puat Hospital (KTPH)

4 Includes Gleneagles Hospital, Mount Alvernia Hospital, Mount Elizabeth Hospital, Mount Elizabeth Novena Hospital, Parkway East Hospital and Raffles Hospital

## Legislation

In 2007, the National Registry of Diseases Act was enacted to provide legislative cover for the Registries at NRDO, including the SMIR. The Act allows compilation of information on the incidence of selected diseases for disease prevention and control. Legislation also mandated notification from private hospitals from September 2012 onwards.

## Sources of data

The sources of data included the cardiac biomarkers (Troponins T and I) listing generated by the laboratories and Hospital In-patient Discharge Summary (HIDS) from the hospitals, Mediclaims listing and Claims and Subvention listing from the MOH, death data generated by the Registry of Birth and Death from the Ministry of Home Affairs (MHA) and necropsy information from the Health Sciences Authority (HSA). Mediclaims, which was formally known as the Central Claims Processing Systems (CCPS), has consistently been the main source of case finding from 2007 to 2013. All cases with the mention of AMI in hospital discharge forms and Mediclaims, together with death information documented in case notes, are included in the data collection process. Death information is also verified with the Birth and Death Registry to attain up-to-date status of registered patients in SMIR.

In addition, letters are sent to medical practitioners to confirm AMI as the cause of death for the small number of cases that appears in the Birth and Death Registry before registering these cases (i.e. patients who died at home). These medical practitioners notify the registry in the form of hardcopy notification.

## Data collection and processing

### a) Identification Key

The primary identification key for our Singapore residents is the National Registration Identity Card (NRIC) number. For non-residents, their passport number or foreign identification number (FIN) are used. These are unique numbers assigned to avoid duplication of records in our database, especially when we update our data from multiple sources. A master patient list is created by merging data from all sources using the patient's primary identification key.

### b) Verification of information

For unmatched cases (single source from either the enzyme information or HIDS), SMIR Registry Coordinators confirm the diagnosis of AMI by viewing the patient's electronic medical records (EMR), before extracting relevant clinical information from case notes.

### c) Coding

The International Classification of Diseases 9th Revision (ICD-9) Clinical Modification code of 410 was used to identify AMI cases in the data sources from 2007 to 2011,

while ICD-10 Australian Modification codes I21 and I22 were used for AMI cases diagnosed in 2012 and 2013. The MONICA (Monitoring Trends and Determinants in Cardiovascular Disease, World Health Organization) criteria were used for defining episodes. Recurrence of AMI after 28 days of a recorded AMI episode was counted as another episode.

d) AMI definition

In computing the incidence of AMI, the population of AMI patients for a particular year was extracted based on the date that the AMI episode occurred. AMI episodes were broadly classified into STEMI, NSTEMI and others. From 2011 onwards, AMI episodes that were neither STEMI nor NSTEMI were further classified into five different types of MI (Myocardial Infarction) based on the clinical classification cited by the American College of Cardiology Foundation. In particular, Type 2 MI episodes were eventually analysed together with NSTEMI in this monograph as their definitions are similar. The analyses done for STEMI and NSTEMI episodes were more in-depth than episodes that were neither (termed as MI) as the number of cases for the latter was relatively smaller and the latter was a heterogeneous group.

The AMI episodes included in this monograph were:

1) Definitive AMI –

- Definite ECG, or
- Symptoms (typical or atypical), together with probable ECG and abnormal enzymes suggestive of myocardial necrosis, or
- Typical symptoms and abnormal enzymes with ischaemic or non-codable or unavailable ECG.

2) Clinical AMI –

- ECG changes suggestive of AMI, but not supported with raised cardiac enzymes or typical symptoms, or
- At least two of the following criteria: clinical history of prolonged chest pain more than 20 minutes; raised biochemical markers of myocardial necrosis; serial ECG tracings showing ST-T changes from baseline or Q waves duration or that are 0.03 seconds in two or more contiguous leads.

3) Death cases signed up by pathologists stating AMI as a cause of death with necropsy report reflecting pinpoint or total occlusion of the coronary arteries.

4) Death cases signed by pathologists or general practitioners (GP) as AMI but without necropsy done.

e) Follow-up

All records are updated with date and cause of death information received from MHA.

## **Data management**

Most of the data is managed via electronic platform. In 2004, the National Disease Registries System (NRDS) was developed to merge data from various sources, keep the data secure and generate reports. Electronic transmission of data has been established between hospitals and the SMIR to ensure safe transmission of data. The Registry Coordinators visit the medical records offices of the hospitals to extract detailed information from case notes and collect the additional information in their laptops. Information submitted by medical practitioners via hardcopy notifications are entered into the NRDS. The hardcopy forms are subsequently scanned and stored in an electronic repository.

## **Data request**

The data in the SMIR is a resource for epidemiological studies, public health research and policy making. Data request forms can be downloaded from NRDO's website. Upon approval, the information is usually released as aggregate data or key-coded records.

## **Analysis**

### Population estimates

The population estimates used to calculate incidence and mortality rates in this monograph were obtained from the Department of Statistics (DOS), which releases mid-year population estimates annually. Only Singapore citizens and permanent residents (i.e. Singapore residents) were included for analysis.

### Calculation of rates

Incidence rate is computed by taking the number of AMI episodes divided by the mid-year Singapore resident population. The count is based on the onset date of each AMI episode. Age standardisation is done using the direct method with the Segi World population as the standardisation weights.

Only deaths from AMI were considered for the computation of mortality and case-fatality in this monograph. Mortality rate was computed for AMI episodes, by taking the number of deaths due to AMI divided by the mid-year Singapore resident population. The count is based on the death date of each AMI episode. Age standardisation is done using the direct method with the Segi World population as the standardisation weights.

Case-fatality rate was computed for AMI episodes, which is the proportion of AMI events that are fatal within 30 days of onset, regardless if the death occurred within or outside the hospital. Age standardisation is done using the direct method and using the patients diagnosed with AMI in 2007 to 2013 as the standardisation weights.

## Exclusion criteria

In section 9, transfer patients, patients seen by the GP, patients brought in dead and patients with medication contraindications were excluded from the analysis of medications given at all time points. In addition, patients who died at the emergency medicine department or in hospital were excluded from the analysis of medications given upon hospital discharge.

In section 10, transfer patients, patients with AMI subtype that was neither STEMI nor NSTEMI, as well as patients who were admitted with complete heart failure, were excluded from the analysis of in-hospital complications and events.

This monograph can be downloaded at NRDO website: [www.nrdo.gov.sg](http://www.nrdo.gov.sg).

## 3. EXECUTIVE SUMMARY

The overall age-standardised incidence rate had increased from 208.9 per 100,000 population in 2007 to 221.2 per 100,000 population in 2013. However, the overall age-standardised mortality rate had decreased from 40.8 per 100,000 in 2007 to 26.0 per 100,000 in 2013. Similarly, the overall crude 30-day case-fatality rate had decreased from 16.1% in 2007 to 8.9% in 2013.

Although the age-standardised incidence and mortality rates were higher in males than females, the 30-day case-fatality rates for both genders did not differ significantly.

Age-standardised incidence and mortality rates of the Chinese were lower than those of the Malays and Indians. The Chinese however had higher 30-day case-fatality rates than the other two ethnic groups.

Age-standardised incidence and mortality rates were lower in ST-Segment Elevation Myocardial Infarction (STEMI) patients than non-ST-Segment Elevation Myocardial Infarction (NSTEMI) patients, although patients with STEMI had comparatively higher 30-day case-fatality rates.

Hypertension and hyperlipidaemia were the two most common risk factors among AMI patients. 76.1% of the patients had hypertension and 71.9% had hyperlipidaemia in 2013. There were higher proportions of females with hypertension compared to the males for each year from 2007 to 2013. For hyperlipidaemia, a higher proportion was also observed for the females from 2009 to 2013. While the Chinese had the highest proportion of hypertension, the Indians had the highest proportion of hyperlipidaemia among the three main ethnic groups. In general, hypertension and hyperlipidaemia were more commonly seen in NSTEMI patients compared to STEMI patients.



The top three symptoms reported by patients with AMI were chest pain, breathlessness and diaphoresis. In 2013, 56.5%, 54.7% and 29.6% of the patients experienced chest pain, breathlessness and diaphoresis respectively. There were more male than female patients who complained of chest pain and diaphoresis. The proportion of male patients who were breathless during the onset of AMI was close to their female counterparts. The Indians had the highest proportions of chest pain and diaphoresis, while the Malays had the highest proportion of breathlessness among the three main ethnic groups. Symptoms of chest pain and diaphoresis were more prevalent among STEMI patients, while breathlessness was more common among NSTEMI patients.

The proportions of patients given aspirin, beta blocker and/or other anti-platelet on arrival were above 95% in 2013. Similar trends were observed for medications given during hospitalisation and upon discharge.

Arrhythmic complications (56.6% in 2013) were found to be the most common complication, whereas left ventricular systolic dysfunction (40.9% in 2013) was the most common event that occurred when the patients were hospitalised. Generally, the proportion of AMI patients with complications and events during hospital stay had been decreasing over the years.

## 4. INCIDENCE OF AMI, 2007 – 2013

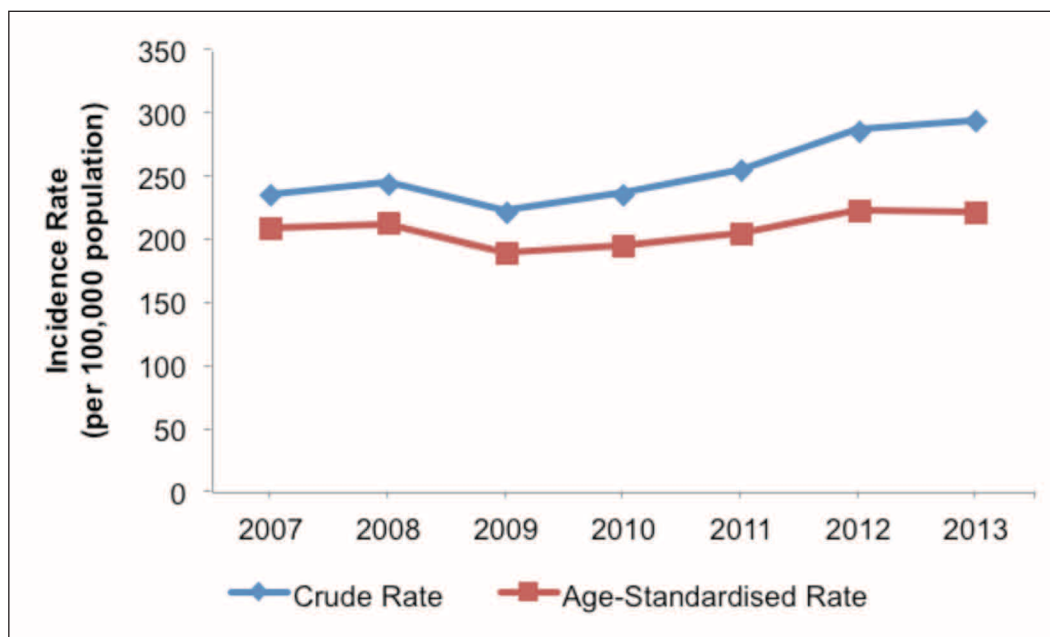
### 4.1 Incidence of AMI, Overall, 2007 – 2013

The average number of AMI episodes from 2007 to 2013 was 7,829 per year. The crude incidence rate increased significantly from 234.7 per 100,000 population in 2007 to 293.1 per 100,000 population in 2013. The age-standardised incidence rate ranged from 189.4 per 100,000 in 2009 to 223.1 per 100,000 population in 2012 during the 7-year period (Table 4.1.1).

**Table 4.1.1 Incidence of AMI Per 100,000 Population (95% CI)**

Year	2007	2008	2009	2010	2011	2012	2013
<b>No. of cases</b>	6817	7251	6796	7344	8013	9118	9463
<b>CR</b>	234.7 (229.2-240.3)	244.0 (238.4-249.7)	221.6 (216.4-226.9)	235.6 (230.2-241.0)	254.2 (248.6-259.8)	285.7 (279.8-291.6)	293.1 (287.1-299.0)
<b>ASR</b>	208.9 (203.9-214.0)	212.4 (207.4-217.3)	189.4 (184.9-194.0)	194.5 (190.0-199.1)	204.7 (200.1-209.2)	223.1 (218.5-227.8)	221.2 (216.7-225.7)

**Figure 4.1.1 Crude and Age-Standardised Incidence Rate of AMI Per 100,000 Population**



The number and incidence rate of AMI increased with age (Tables 4.1.2 and 4.1.3). The median age at AMI onset fluctuated between 68.3 to 69.2 years (Table 4.1.4).

**Table 4.1.2 Incidence of AMI by Age Group**

Age Group	2007	2008	2009	2010	2011	2012	2013
15-19	0	0	1	0	0	0	0
20-24	0	3	0	3	3	4	3
25-29	10	7	12	9	10	11	10
30-34	25	26	28	25	26	32	36
35-39	92	96	84	92	100	107	104
40-44	234	227	224	218	213	231	265
45-49	470	415	425	458	496	494	493
50-54	642	695	652	749	688	830	843
55-59	710	767	759	814	848	986	1004
60-64	646	786	785	814	1006	1147	1079
65-69	810	824	722	670	777	960	1048
70-74	857	878	828	906	986	1126	1113
75-79	894	946	907	920	1030	1086	1113
80-84	672	788	686	806	900	1015	1078
85+	755	793	683	860	930	1089	1274

**Table 4.1.3 Age-Specific Incidence Rate of AMI Per 100,000 Population**

Age Group	2007	2008	2009	2010	2011	2012	2013
15-19	0.0	0.0	0.4	0.0	0.0	0.0	0.0
20-24	0.0	1.3	0.0	1.2	1.2	1.5	1.1
25-29	3.9	2.7	4.4	3.3	3.8	4.3	3.9
30-34	8.5	9.0	9.4	8.4	8.7	10.8	12.1
35-39	30.5	31.2	26.5	28.8	31.6	34.1	34.0
40-44	72.9	71.5	71.6	70.4	69.4	74.8	84.8
45-49	149.0	130.5	131.8	141.5	153.1	153.9	155.9
50-54	230.0	240.3	219.2	247.1	223.3	267.4	269.4
55-59	321.4	334.4	316.3	327.3	325.5	362.8	357.3
60-64	476.8	513.1	462.6	424.2	483.4	536.2	485.6
65-69	711.8	715.9	621.3	602.0	691.3	744.8	718.3
70-74	1090.3	1080.0	947.4	978.4	986.0	1078.5	1054.0
75-79	1573.9	1606.1	1472.4	1413.2	1539.6	1606.5	1578.7
80-84	2126.6	2331.4	1844.1	2025.1	2132.7	2301.6	2333.3
85+	3044.4	2992.5	2465.7	2925.2	3000.0	3250.7	3548.7

**Table 4.1.4 Median and Mean Age in Years at Onset**

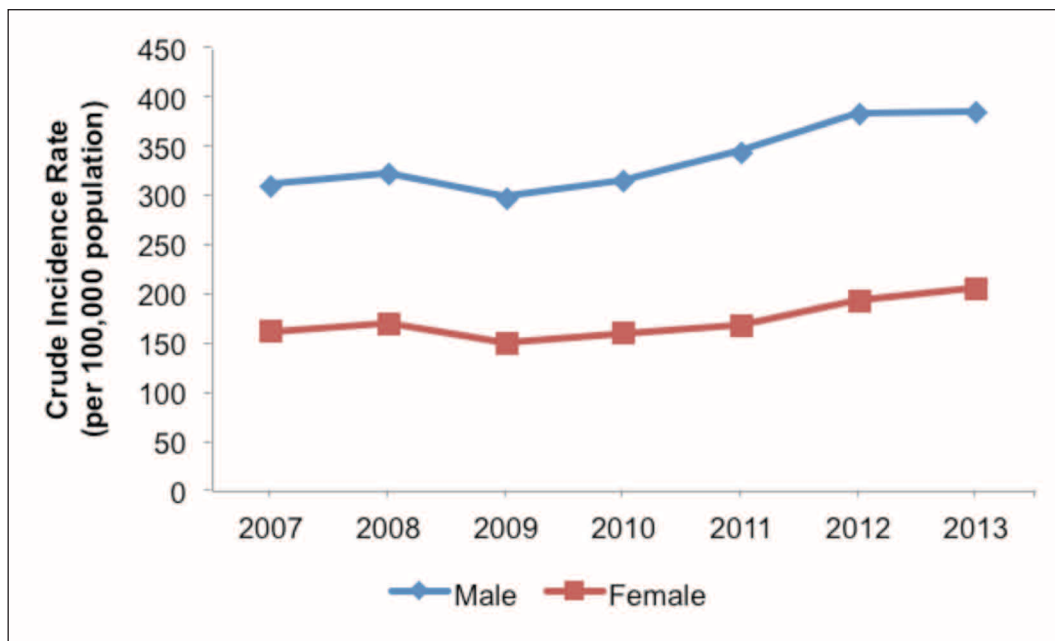
Year	2007	2008	2009	2010	2011	2012	2013
Median Age	68.5	68.8	68.3	68.9	69.1	68.5	69.2
Mean Age	67.6	67.9	67.4	67.9	68.3	68.4	68.8

#### 4.2 Incidence of AMI by Gender, 2007 – 2013

Approximately, there were twice as many men than women who suffered from AMI each year as observed in the incident cases (Table 4.2.1) and crude incidence rates (Table 4.2.2).

**Table 4.2.1 Incidence of AMI by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	4420	4686	4464	4798	5306	5972	6056
Female	2397	2565	2332	2546	2707	3146	3407
Ratio (M vs F)	1.8	1.8	1.9	1.9	2.0	1.9	1.8

**Figure 4.2.1 Crude Incidence Rate of AMI Per 100,000 Population by Gender****Table 4.2.2 Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Gender**

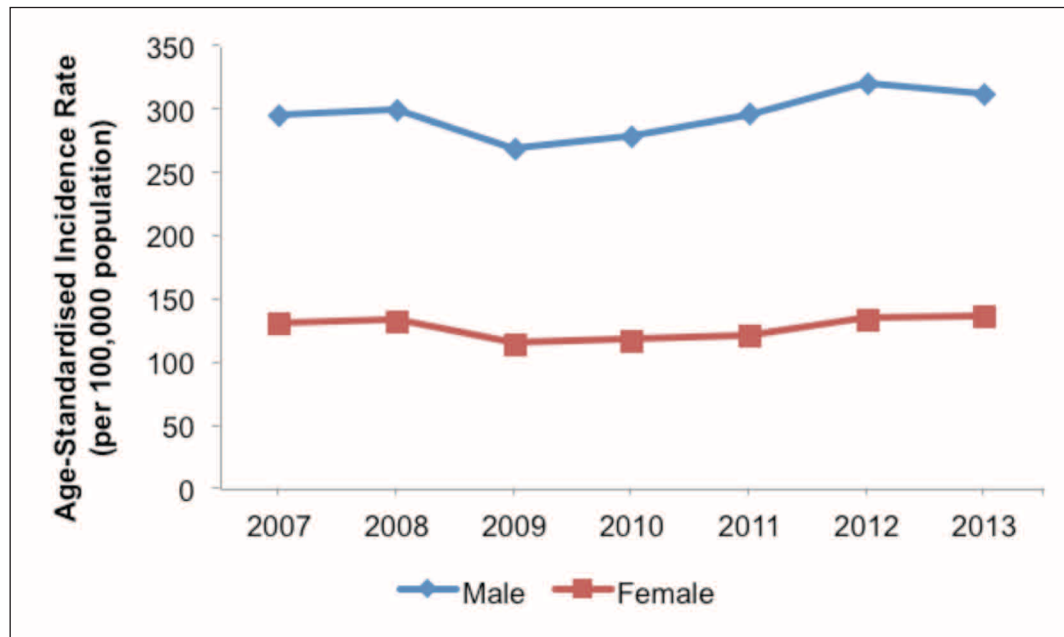
Gender	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	309.8 (300.7-318.9)	321.3 (312.1-330.5)	297.1 (288.4-305.8)	314.3 (305.4-323.2)	343.9 (334.7-353.2)	382.8 (373.1-392.5)	384.0 (374.3-393.7)
<b>Female</b>	162.3 (155.8-168.8)	169.6 (163.0-176.1)	149.2 (143.1-155.2)	160.1 (153.8-166.3)	168.2 (161.8-174.5)	192.9 (186.1-199.6)	206.2 (199.3-213.2)

The age-standardised incidence rate among the males was approximately doubled of the females (Table 4.2.3). This could be due to higher prevalence of smoker, diabetes mellitus, hypertension, hyperlipidaemia and obesity, among men in Singapore<sup>5</sup>. Being male also puts a person on higher risk of getting AMI<sup>6</sup>. The median age at AMI onset was older among the females than males (Table 4.2.4).

5 National Health Survey 2010, Ministry of Health

6 Cotran RS, Kumar V, Robbins SL (eds): Robbins Pathologic Basis of Disease. 5<sup>th</sup> ed. Philadelphia: WB Saunders, 1994

**Figure 4.2.2 Age-Standardised Incidence Rate of AMI Per 100,000 Population by Gender**



**Table 4.2.3 Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	295.5 (286.6-304.3)	299.6 (290.9-308.3)	268.8 (260.8-276.8)	278.3 (270.3-286.2)	295.9 (287.8-304.0)	320.6 (312.4-328.8)	312.4 (304.4-320.3)
<b>Female</b>	130.2 (124.8-135.5)	132.3 (127.1-137.6)	114.5 (109.7-119.3)	117.3 (112.5-122.0)	120.6 (115.9-125.4)	133.6 (128.8-138.4)	135.5 (130.8-140.2)

**Table 4.2.4 Median and Mean Age in Years at Onset by Gender**

Gender	Year	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	<b>Median Age</b>	64.4	64.1	62.6	63.2	63.9	64.3	64.4
	<b>Mean Age</b>	64.5	64.6	63.7	64.4	64.9	65.2	65.1
<b>Female</b>	<b>Median Age</b>	75.3	75.7	75.9	76.1	76.3	75.9	77.4
	<b>Mean Age</b>	73.5	74.1	74.4	74.4	74.9	74.4	75.4

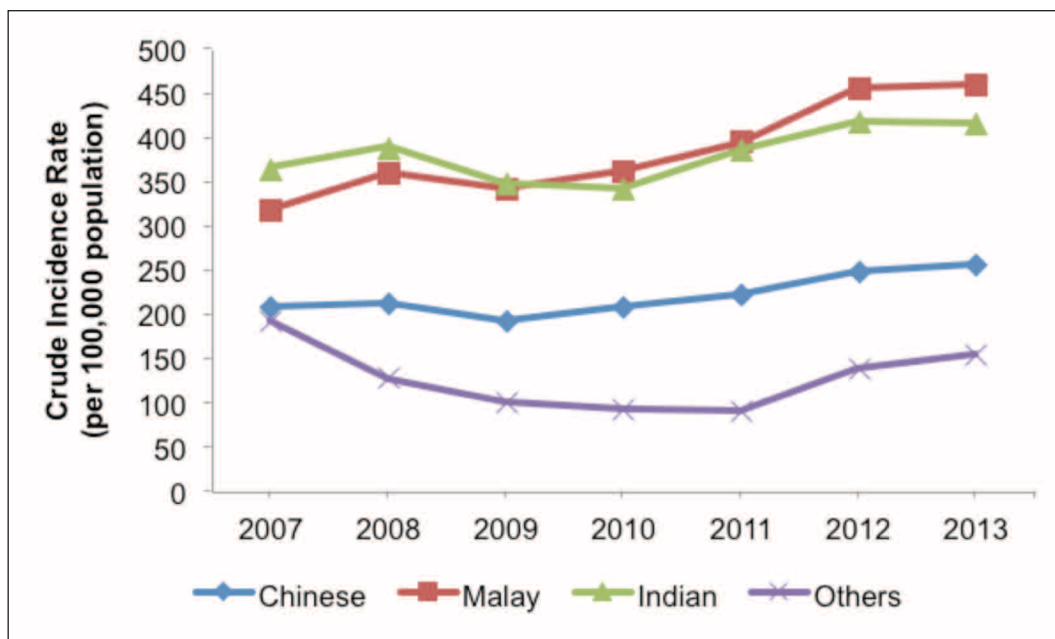
### 4.3 Incidence of AMI by Ethnic Group, 2007 – 2013

The Indians had the highest crude incidence from 2007 to 2009, but this was surpassed by the Malays from 2010 onwards (Table 4.3.2).

**Table 4.3.1 Incidence of AMI by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	4630	4824	4453	4906	5295	5979	6261
Malay	1172	1352	1317	1413	1568	1839	1879
Indian	880	975	933	934	1062	1163	1168
Others	135	100	93	91	88	137	155

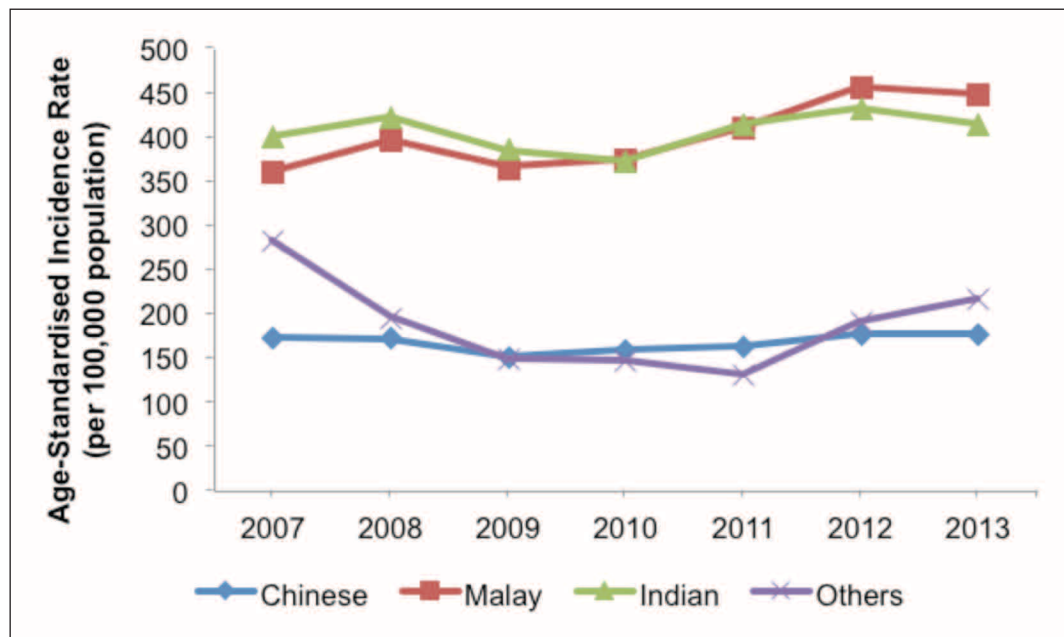
**Figure 4.3.1 Crude Incidence Rate of AMI Per 100,000 Population by Ethnic Group**



**Table 4.3.2 Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	208.1 (202.1-214.1)	212.8 (206.8-218.9)	191.8 (186.2-197.4)	208.3 (202.4-214.1)	222.3 (216.3-228.3)	248.0 (241.7-254.2)	256.7 (250.3-263.0)
<b>Malay</b>	318.5 (300.2-336.7)	359.6 (340.4-378.7)	342.9 (324.4-361.4)	361.1 (342.3-379.9)	394.9 (375.3-414.4)	456.3 (435.5-477.2)	459.6 (438.9-480.4)
<b>Indian</b>	364.2 (340.2-388.3)	388.6 (364.2-413.0)	348.0 (325.7-370.3)	342.0 (320.1-363.9)	385.1 (361.9-408.2)	417.0 (393.0-441.0)	415.4 (391.5-439.2)
<b>Others</b>	193.4 (160.8-226.0)	128.2 (103.1-153.3)	100.8 (80.3-121.2)	93.5 (74.3-112.7)	90.0 (71.2-108.8)	139.4 (116.0-162.7)	155.5 (131.0-179.9)

Similar to the crude incidence rate, the Indians had the highest age-standardised incidence rate from 2007 to 2009, but this was surpassed by the Malays from 2010 onwards (Table 4.3.3). There were higher prevalence of diabetes mellitus and low high-density lipoprotein levels among the Indians in Singapore. However, the Malays had higher prevalence of smoker, hypertension, high low-density lipoprotein levels and obesity<sup>7</sup>.

**Figure 4.3.2 Age-Standardised Incidence Rate of AMI Per 100,000 Population by Ethnic Group**

**Table 4.3.3 Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	172.6 (167.6-177.7)	171.9 (166.9-176.8)	151.5 (147.0-156.0)	158.2 (153.7-162.7)	163.4 (158.9-167.8)	176.9 (172.3-181.4)	176.2 (171.7-180.6)
<b>Malay</b>	359.0 (337.8-380.3)	396.3 (374.5-418.1)	364.8 (344.5-385.2)	373.6 (353.4-393.9)	410.5 (389.4-431.6)	455.4 (434.0-476.8)	446.8 (426.2-467.4)
<b>Indian</b>	399.8 (372.4-427.2)	422.3 (394.9-449.6)	385.4 (359.8-410.9)	371.7 (347.1-396.3)	414.0 (388.2-439.7)	432.3 (406.8-457.7)	414.4 (390.1-438.6)
<b>Others</b>	281.3 (231.2-331.3)	194.7 (154.4-234.9)	148.2 (115.5-180.9)	146.3 (113.8-178.8)	130.3 (100.7-159.9)	190.3 (156.3-224.3)	216.5 (180.3-252.7)

Within each gender, the crude and age-standardised incidence rate for the Chinese was the lowest among the three main ethnic groups (Tables 4.3.5A to 4.3.6B).

**Table 4.3.4 Incidence of AMI by Gender and Ethnic Group**

Gender	Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	<b>Chinese</b>	2925	3065	2871	3172	3429	3871	3914
	<b>Malay</b>	770	885	860	939	1041	1198	1214
	<b>Indian</b>	627	670	667	625	774	810	828
	<b>Others</b>	98	66	66	62	62	93	100
<b>Female</b>	<b>Chinese</b>	1705	1759	1582	1734	1866	2108	2347
	<b>Malay</b>	402	467	457	474	527	641	665
	<b>Indian</b>	253	305	266	309	288	353	340
	<b>Others</b>	37	34	27	29	26	44	55



**Table 4.3.5A Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Males**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	269.2 (259.5-279.0)	277.3 (267.5-287.1)	254.2 (244.9-263.5)	277.1 (267.4-286.7)	296.5 (286.6-306.4)	331.0 (320.6-341.4)	331.1 (320.7-341.5)
<b>Malay</b>	424.0 (394.1-454.0)	477.1 (445.7-508.5)	454.5 (424.2-484.9)	487.0 (455.9-518.2)	531.9 (499.6-564.3)	602.9 (568.8-637.1)	602.5 (568.6-636.4)
<b>Indian</b>	500.4 (461.2-539.6)	513.4 (474.5-552.3)	476.1 (440.0-512.2)	437.7 (403.4-472.0)	537.5 (499.6-575.4)	558.2 (519.8-596.7)	567.5 (528.9-606.2)
<b>Others</b>	293.4 (235.3-351.5)	177.4 (134.6-220.2)	150.7 (114.3-187.0)	134.2 (100.8-167.6)	133.3 (100.1-166.5)	198.3 (158.0-238.6)	210.1 (168.9-251.3)

**Table 4.3.5B Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Females**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	149.8 (142.7-156.9)	151.5 (144.4-158.6)	132.7 (126.2-139.3)	143.2 (136.5-150.0)	152.3 (145.4-159.2)	169.8 (162.5-177.0)	186.7 (179.1-194.2)
<b>Malay</b>	215.7 (194.6-236.7)	245.1 (222.9-267.4)	234.5 (213.0-256.0)	238.8 (217.3-260.3)	261.7 (239.3-284.0)	313.8 (289.5-338.0)	320.8 (296.4-345.2)
<b>Indian</b>	217.5 (190.7-244.3)	253.3 (224.9-281.8)	207.8 (182.8-232.8)	237.1 (210.7-263.6)	218.5 (193.3-243.7)	263.8 (236.3-291.3)	251.3 (224.6-278.0)
<b>Others</b>	101.6 (68.9-134.4)	83.3 (55.3-111.3)	55.7 (34.7-76.7)	56.8 (36.1-77.4)	50.7 (31.2-70.2)	85.6 (60.3-110.9)	105.6 (77.7-133.5)

**Table 4.3.6A Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Males**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	247.3 (238.3-256.4)	247.7 (238.8-256.6)	218.1 (210.0-226.2)	232.3 (224.1-240.4)	239.4 (231.3-247.5)	260.4 (252.2-268.7)	252.5 (244.6-260.5)
<b>Malay</b>	496.1 (459.7-532.5)	533.2 (496.8-569.5)	490.9 (456.9-525.0)	513.0 (478.7-547.3)	564.3 (528.6-600.0)	624.6 (588.2-661.0)	601.8 (567.0-636.5)
<b>Indian</b>	530.4 (486.8-573.9)	547.0 (503.5-590.5)	525.1 (483.1-567.1)	469.8 (431.2-508.4)	576.9 (534.3-619.5)	583.9 (542.1-625.7)	567.3 (527.4-607.3)
<b>Others</b>	394.2 (310.4-478.0)	271.1 (200.9-341.3)	209.9 (153.7-266.2)	188.5 (137.8-239.1)	168.7 (123.6-213.7)	231.6 (181.2-282.0)	265.5 (210.3-320.8)

**Table 4.3.6B Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Females**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	106.5 (101.2-111.7)	103.8 (98.8-108.9)	89.5 (84.9-94.1)	91.4 (86.9-95.9)	94.8 (90.3-99.3)	101.8 (97.3-106.3)	105.7 (101.2-110.1)
<b>Malay</b>	234.3 (210.7-257.9)	270.8 (245.6-295.9)	248.2 (224.7-271.7)	245.4 (222.5-268.3)	270.3 (246.2-294.3)	301.8 (277.8-325.9)	303.7 (280.1-327.2)
<b>Indian</b>	264.1 (230.5-297.8)	293.2 (259.6-326.8)	247.3 (216.9-277.8)	267.5 (237.1-298.0)	244.6 (215.6-273.7)	275.6 (246.2-304.9)	253.4 (226.0-280.7)
<b>Others</b>	165.8 (109.9-221.7)	123.2 (78.3-168.1)	79.4 (45.7-113.1)	95.7 (57.2-134.1)	92.3 (52.2-132.3)	137.7 (93.8-181.6)	157.6 (112.8-202.5)

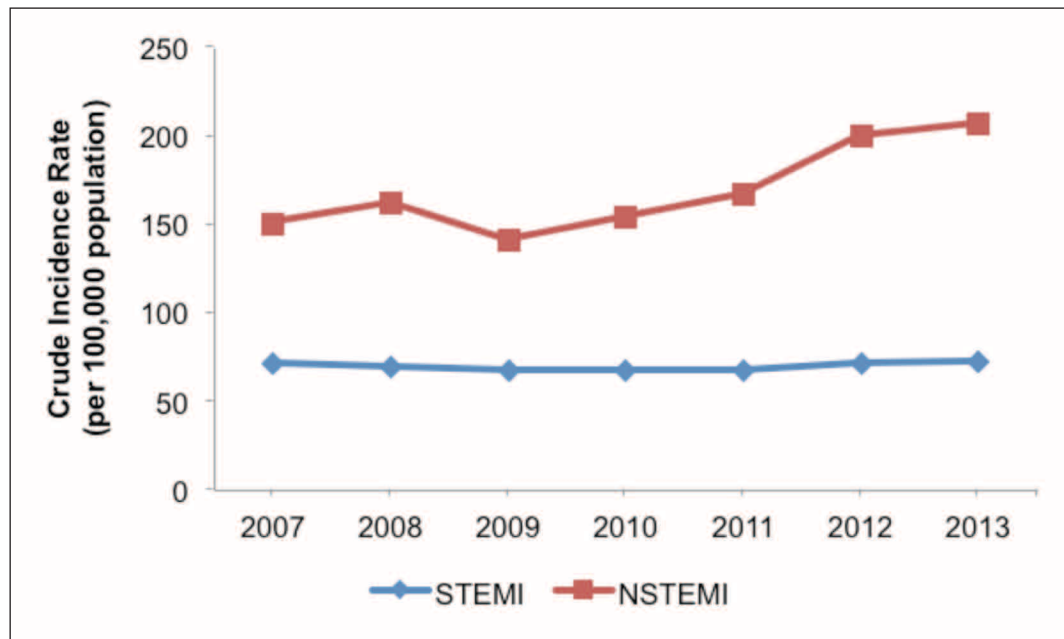
#### 4.4 Incidence of AMI by Subtype, 2007 – 2013

Over the years, the crude incidence rate of NSTEMI was higher and increased faster than that of STEMI since 2009 (Table 4.4.2).

**Table 4.4.1 Incidence of AMI by Subtype**

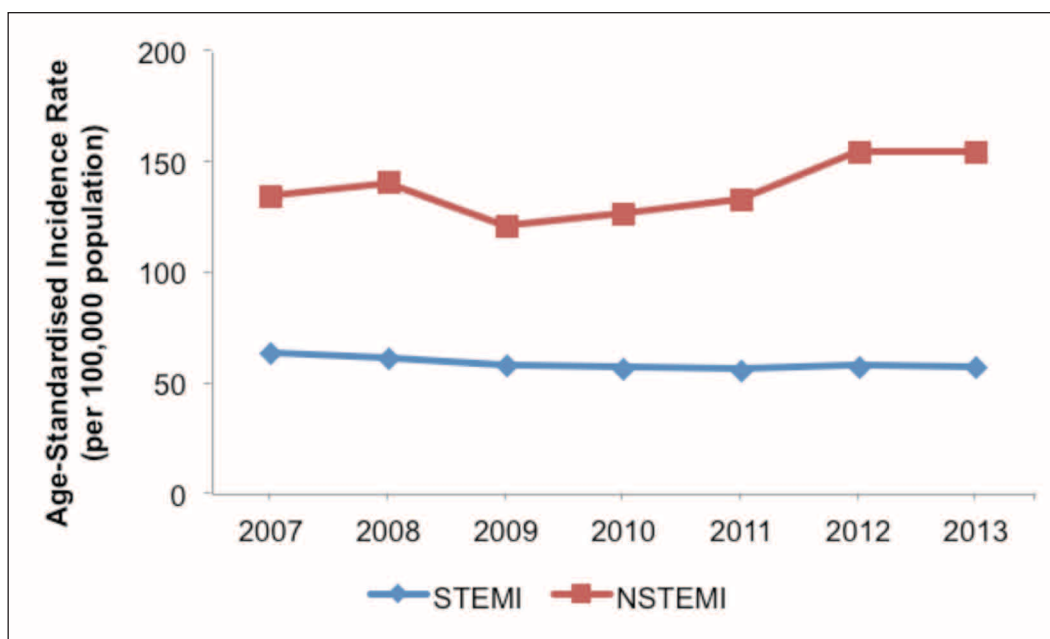
Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	2077	2068	2070	2099	2126	2274	2347
<b>NSTEMI</b>	4371	4801	4329	4798	5251	6375	6677
<b>MI<sup>8</sup></b>	369	382	397	447	636	469	439

<sup>8</sup> MI comprises of Type 1, 3, 4 and 5 MI, AMI with ST-elevation, AMI without ST-elevation and unknown cases

**Figure 4.4.1 Crude Incidence Rate of AMI Per 100,000 Population by Subtype****Table 4.4.2 Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	71.5 (68.4-74.6)	69.6 (66.6-72.6)	67.5 (64.6-70.4)	67.3 (64.5-70.2)	67.4 (64.6-70.3)	71.3 (68.3-74.2)	72.7 (69.7-75.6)
<b>NSTEMI</b>	150.5 (146.1-155.0)	161.6 (157.0-166.1)	141.2 (137.0-145.4)	153.9 (149.6-158.3)	166.6 (162.1-171.1)	199.7 (194.8-204.7)	206.8 (201.8-211.7)

The age-standardised incidence rate of STEMI decreased significantly from 63.1 per 100,000 population in 2007 to 56.9 per 100,000 population in 2013, while that of NSTEMI increased significantly from 134.5 per 100,000 in 2007 to 154.3 per 100,000 population in 2013 (Table 4.4.3). The use of sensitive cardiac biomarkers, such as Troponins T and I, to identify AMI cases, could have contributed to the higher NSTEMI numbers, compared to STEMI.

**Figure 4.4.2 Age-Standardised Incidence Rate of AMI Per 100,000 Population by Subtype****Table 4.4.3 Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	63.1 (60.4-65.9)	60.7 (58.0-63.4)	57.9 (55.4-60.5)	56.5 (54.0-59.0)	55.9 (53.4-58.3)	57.3 (54.9-59.7)	56.9 (54.5-59.2)
<b>NSTEMI</b>	134.5 (130.5-138.6)	140.5 (136.5-144.6)	120.6 (116.9-124.2)	126.4 (122.7-130.0)	132.7 (129.0-136.4)	154.5 (150.7-158.4)	154.3 (150.6-158.1)

Within each gender, STEMI patients had lower crude and age-standardised incidence rates than NSTEMI patients (Tables 4.4.5A to 4.4.6B).

**Table 4.4.4 Incidence of AMI by Gender and Subtype**

Gender	Subtype	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	<b>STEMI</b>	1572	1599	1605	1645	1716	1794	1844
	<b>NSTEMI</b>	2578	2839	2605	2878	3200	3897	3939
<b>Female</b>	<b>STEMI</b>	505	469	465	454	410	480	503
	<b>NSTEMI</b>	1793	1962	1724	1920	2051	2478	2738

**Table 4.4.5A Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype for Males**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	110.2 (104.7-115.6)	109.6 (104.3-115.0)	106.8 (101.6-112.0)	107.7 (102.5-113.0)	111.2 (106.0-116.5)	115.0 (109.7-120.3)	116.9 (111.6-122.3)
<b>NSTEMI</b>	180.7 (173.7-187.7)	194.7 (187.5-201.8)	173.4 (166.7-180.0)	188.5 (181.6-195.4)	207.4 (200.2-214.6)	249.8 (241.9-257.6)	249.8 (242.0-257.6)

**Table 4.4.5B Crude Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype for Females**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	34.2 (31.2-37.2)	31.0 (28.2-33.8)	29.7 (27.0-32.4)	28.5 (25.9-31.2)	25.5 (23.0-27.9)	29.4 (26.8-32.1)	30.4 (27.8-33.1)
<b>NSTEMI</b>	121.4 (115.8-127.0)	129.7 (124.0-135.4)	110.3 (105.1-115.5)	120.7 (115.3-126.1)	127.4 (121.9-132.9)	151.9 (145.9-157.9)	165.7 (159.5-171.9)

**Table 4.4.6A Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype for Males**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	99.7 (94.7-104.8)	98.0 (93.1-102.9)	93.3 (88.7-98.0)	92.6 (88.0-97.1)	94.0 (89.5-98.5)	94.8 (90.4-99.3)	94.2 (89.9-98.6)
<b>NSTEMI</b>	177.7 (170.7-184.7)	185.6 (178.7-192.5)	160.3 (154.1-166.6)	169.4 (163.1-175.7)	179.5 (173.2-185.9)	210.4 (203.7-217.0)	204.1 (197.6-210.5)

**Table 4.4.6B Age-Standardised Incidence Rate of AMI Per 100,000 Population (95% CI) by Subtype for Females**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	28.0 (25.5-30.5)	24.6 (22.3-26.9)	23.5 (21.3-25.7)	21.5 (19.4-23.5)	19.3 (17.3-21.2)	21.1 (19.2-23.1)	20.8 (18.9-22.6)
<b>NSTEMI</b>	97.0 (92.4-101.7)	101.0 (96.4-105.6)	84.0 (79.9-88.1)	88.2 (84.1-92.3)	90.7 (86.6-94.8)	104.8 (100.5-109.0)	108.5 (104.3-112.7)

## 5. MORTALITY OF AMI, 2007 – 2013

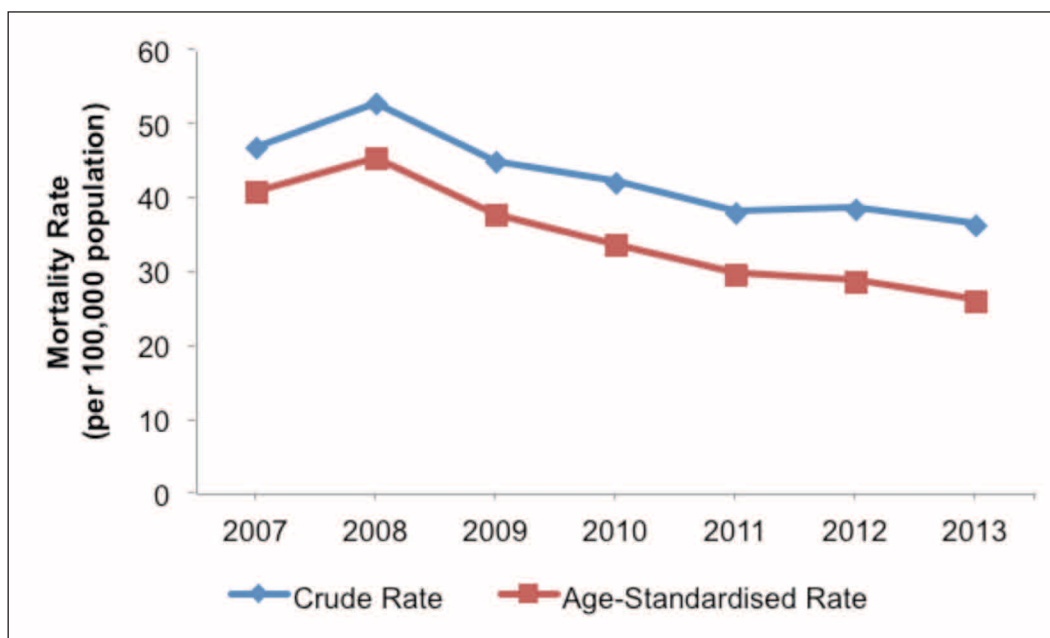
### 5.1 Mortality of AMI, Overall, 2007 – 2013

The number of deaths due to AMI decreased from 1,356 in 2007 to 1,172 in 2013. Correspondingly, the crude mortality rate decreased significantly from 46.7 per 100,000 population in 2007 to 36.3 per 100,000 population in 2013. The age-standardised mortality rates also decreased significantly from 40.8 per 100,000 population in 2007 to 26.0 per 100,000 in 2013 (Table 5.1.1).

**Table 5.1.1 Mortality of AMI Per 100,000 Population (95% CI)**

Year	2007	2008	2009	2010	2011	2012	2013
No. of deaths	1356	1565	1375	1311	1199	1228	1172
CR	46.7 (44.2-49.2)	52.7 (50.1-55.3)	44.8 (42.5-47.2)	42.1 (39.8-44.3)	38.0 (35.9-40.2)	38.5 (36.3-40.6)	36.3 (34.2-38.4)
ASR	40.8 (38.6-43.0)	45.2 (43.0-47.5)	37.7 (35.6-39.7)	33.6 (31.7-35.4)	29.7 (27.9-31.4)	28.7 (27.0-30.3)	26.0 (24.5-27.5)

**Figure 5.1.1 Crude and Age-Standardised Mortality Rate of AMI Per 100,000 Population**



The largest number of deaths occurred among patients aged 85 years and older (Table 5.1.2). These patients also had the highest age-specific mortality rate (Table 5.1.3). The median and mean age at death had risen over the years (Table 5.1.4).

**Table 5.1.2 Mortality of AMI by Age Group**

Age Group	2007	2008	2009	2010	2011	2012	2013
15-19	0	0	0	0	0	0	0
20-24	0	0	0	1	0	0	0
25-29	1	1	1	1	0	4	0
30-34	2	3	1	2	3	0	0
35-39	10	10	5	1	6	6	5
40-44	18	31	15	14	14	10	11
45-49	47	46	35	40	46	30	21
50-54	73	81	88	61	50	64	44
55-59	104	110	92	58	74	72	69
60-64	83	129	116	122	115	116	98
65-69	139	178	145	111	105	103	114
70-74	205	195	174	155	144	136	136
75-79	234	239	259	212	171	186	202
80-84	200	229	171	252	192	195	181
85+	240	313	273	281	279	306	291

**Table 5.1.3 Age-Specific Mortality Rate of AMI Per 100,000 Population**

Age Group	2007	2008	2009	2010	2011	2012	2013
15-19	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.0	0.4	0.0	0.0	0.0
25-29	0.4	0.4	0.4	0.4	0.0	1.6	0.0
30-34	0.7	1.0	0.3	0.7	1.0	0.0	0.0
35-39	3.3	3.3	1.6	0.3	1.9	1.9	1.6
40-44	5.6	9.8	4.8	4.5	4.6	3.2	3.5
45-49	14.9	14.5	10.9	12.4	14.2	9.3	6.6
50-54	26.2	28.0	29.6	20.1	16.2	20.6	14.1
55-59	47.1	48.0	38.3	23.3	28.4	26.5	24.6
60-64	61.3	84.2	68.4	63.6	55.3	54.2	44.1
65-69	122.1	154.6	124.8	99.7	93.4	79.9	78.1
70-74	260.8	239.9	199.1	167.4	144.0	130.3	128.8
75-79	412.0	405.8	420.5	325.7	255.6	275.1	286.5
80-84	632.9	677.5	459.7	633.2	455.0	442.2	391.8
85+	967.7	1181.1	985.6	955.8	900.0	913.4	810.6

**Table 5.1.4 Mean and Median Age in Years at Death**

Year	2007	2008	2009	2010	2011	2012	2013
Median Age	74.6	75.0	75.2	76.8	76.4	77.4	78.1
Mean Age	72.7	73.0	73.3	74.7	74.2	74.9	75.4

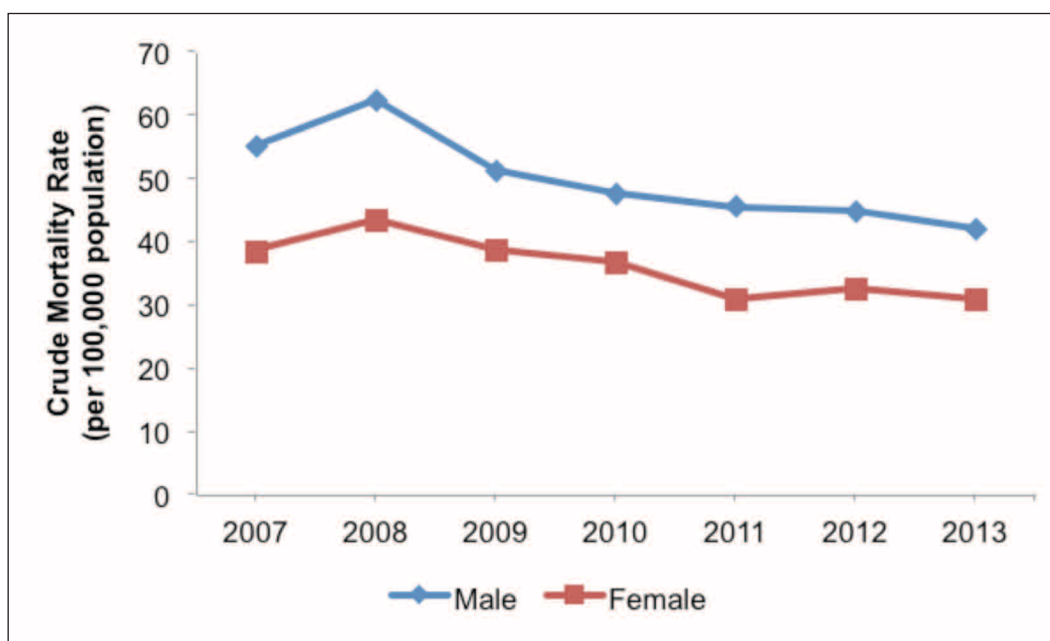
## 5.2 Mortality of AMI by Gender, 2007 – 2012

Although twice more men than women suffered from AMI each year, the number of men who died from AMI each year was less than twice the number of women who died from AMI in 2007 to 2013 (Table 5.2.1). The crude mortality rate of the males was also less than two times that of the females over the 7-year period (Table 5.2.2).

**Table 5.2.1 Mortality of AMI by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	788	910	771	728	702	699	662
Female	568	655	604	583	497	529	510
Ratio (M vs F)	1.4	1.4	1.3	1.2	1.4	1.3	1.3

**Figure 5.2.1 Crude Mortality Rate of AMI Per 100,000 Population by Gender**



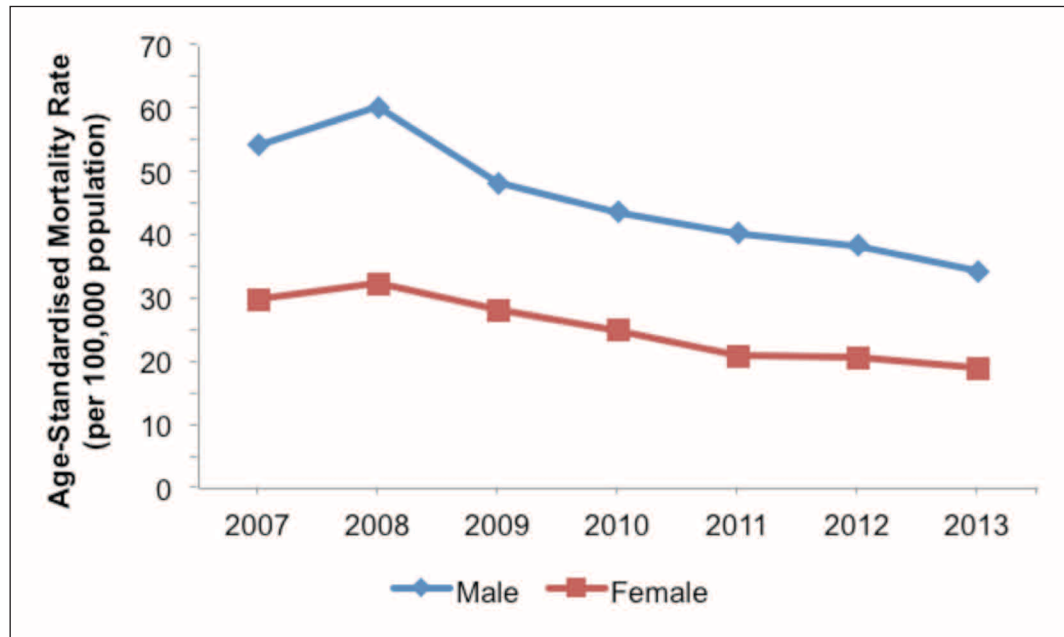
**Table 5.2.2 Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	55.2 (51.4-59.1)	62.4 (58.3-66.4)	51.3 (47.7-54.9)	47.7 (44.2-51.1)	45.5 (42.1-48.9)	44.8 (41.5-48.1)	42.0 (38.8-45.2)
Female	38.5 (35.3-41.6)	43.3 (40.0-46.6)	38.6 (35.6-41.7)	36.7 (33.7-39.6)	30.9 (28.2-33.6)	32.4 (29.7-35.2)	30.9 (28.2-33.6)



The age-standardised mortality rate for both genders declined at similar pace from 2009 onwards. Higher incidence, especially STEMI, among the males (Tables 4.2.1 and 4.4.4) potentially led to higher age-standardised mortality rate for the males than the females (Table 5.2.3). Women died of AMI at an older age than men (Table 5.2.4).

**Figure 5.2.2 Age-Standardised Mortality Rate of AMI Per 100,000 Population by Gender**



**Table 5.2.3 Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	54.2 (50.3-58.1)	60.3 (56.3-64.2)	48.2 (44.7-51.6)	43.6 (40.4-46.9)	40.3 (37.2-43.3)	38.3 (35.4-41.2)	34.3 (31.6-36.9)
<b>Female</b>	29.8 (27.2-32.3)	32.3 (29.8-34.9)	28.1 (25.7-30.4)	24.9 (22.8-27.0)	20.8 (18.9-22.8)	20.6 (18.8-22.4)	18.8 (17.1-20.4)

**Table 5.2.4 Median and Mean Age in Years at Death by Gender**

Gender	Year	2007	2008	2009	2010	2011	2012	2013
<b>Male</b>	<b>Median Age</b>	72.0	70.8	71.3	72.4	73.0	73.2	73.4
	<b>Mean Age</b>	69.9	69.6	69.7	71.3	71.4	71.9	71.9
<b>Female</b>	<b>Median Age</b>	78.1	79.2	78.9	80.7	80.1	80.3	81.6
	<b>Mean Age</b>	76.8	77.7	77.9	79.1	78.2	78.8	80.1

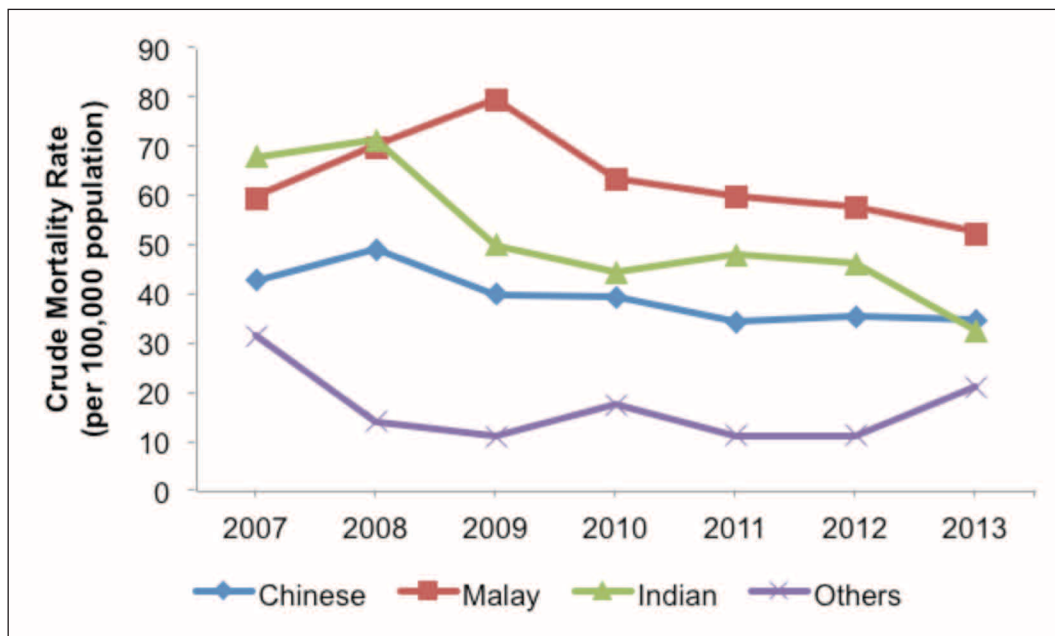
### 5.3 Mortality of AMI by Ethnic Group, 2007 – 2013

From 2009 onwards, the Malays had the highest crude mortality rate, followed by the Indians and Chinese (Table 5.3.2).

**Table 5.3.1 Mortality of AMI by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	951	1112	926	925	819	856	846
Malay	219	263	305	248	237	232	214
Indian	164	179	134	121	132	129	91
Others	22	11	10	17	11	11	21

**Figure 5.3.1 Crude Mortality Rate of AMI Per 100,000 Population by Ethnic Group**

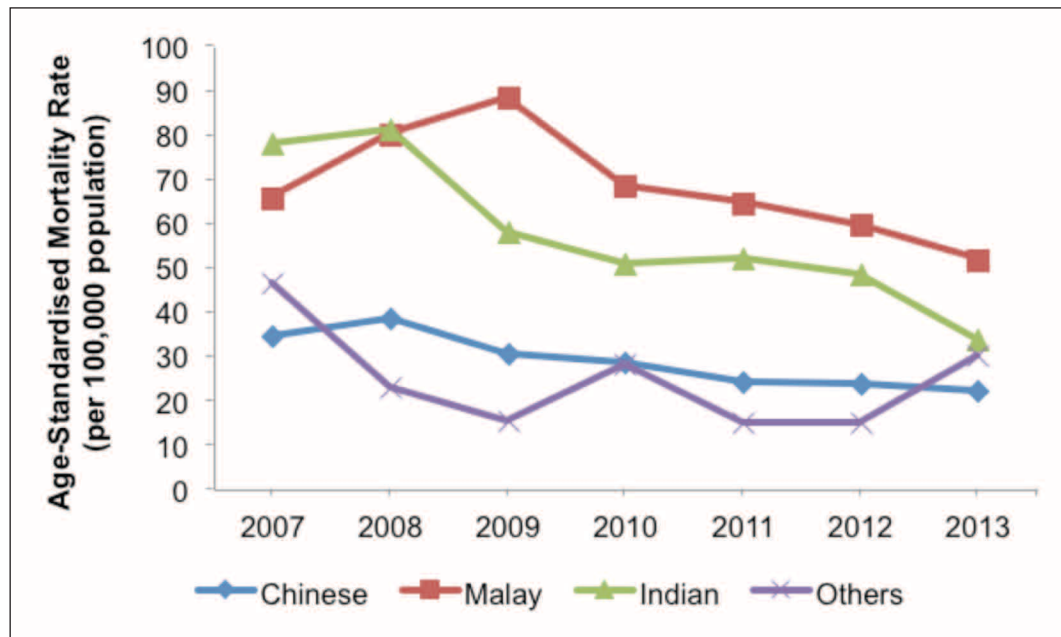


**Table 5.3.2 Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	42.7 (40.0-45.5)	49.1 (46.2-51.9)	39.9 (37.3-42.5)	39.3 (36.7-41.8)	34.4 (32.0-36.7)	35.5 (33.1-37.9)	34.7 (32.3-37.0)
Malay	59.5 (51.6-67.4)	69.9 (61.5-78.4)	79.4 (70.5-88.3)	63.4 (55.5-71.3)	59.7 (52.1-67.3)	57.6 (50.2-65.0)	52.3 (45.3-59.4)
Indian	67.9 (57.5-78.3)	71.3 (60.9-81.8)	50.0 (41.5-58.4)	44.3 (36.4-52.2)	47.9 (39.7-56.0)	46.3 (38.3-54.2)	32.4 (25.7-39.0)
Others	31.5 (18.3-44.7)	14.1 (5.8-22.4)	10.8 (4.1-17.5)	17.5 (9.2-25.8)	11.2 (4.6-17.9)	11.2 (4.6-17.8)	21.1 (12.1-30.1)

The Indians had the highest age-standardised mortality rate in 2007, but this was surpassed by the Malays from 2008 onwards (Table 5.3.3). Higher proportions of AMI patients with diabetes mellitus and hyperlipidaemia were observed among the Malays and Indians than the Chinese (Table 7.3.1). These probably explained the difference in age-standardised mortality rate between the ethnic groups.

**Figure 5.3.2 Age-Standardised Mortality Rate of AMI Per 100,000 Population by Ethnic Group**



**Table 5.3.3 Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
<b>Chinese</b>	34.4 (32.2-36.6)	38.4 (36.1-40.7)	30.4 (28.4-32.4)	28.4 (26.6-30.3)	24.2 (22.5-25.8)	23.6 (22.0-25.3)	22.1 (20.6-23.6)
<b>Malay</b>	65.6 (56.7-74.6)	80.1 (70.1-90.1)	88.1 (77.9-98.4)	68.4 (59.5-77.2)	64.6 (56.0-73.2)	59.5 (51.6-67.4)	51.7 (44.6-58.8)
<b>Indian</b>	78.1 (65.7-90.5)	81.2 (68.9-93.5)	58.1 (47.9-68.3)	51.0 (41.6-60.4)	52.1 (42.8-61.3)	48.7 (40.1-57.3)	33.6 (26.5-40.7)
<b>Others</b>	46.3 (26.2-66.4)	22.8 (8.9-36.7)	15.3 (5.7-24.9)	28.1 (13.9-42.3)	15.0 (5.7-24.3)	14.9 (5.9-23.9)	30.0 (16.5-43.6)

For both genders, the crude and age-standardised mortality rate among the Chinese was lower than the Malays and Indians (Tables 5.3.5A to 5.3.6B).

**Table 5.3.4 Mortality of AMI by Gender and Ethnic Group**

Gender	Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Male	Chinese	525	632	493	512	464	478	449
	Malay	133	162	182	140	141	134	136
	Indian	117	107	90	66	88	80	65
	Others	13	9	6	10	9	7	12
Female	Chinese	426	480	433	413	355	378	397
	Malay	86	101	123	108	96	98	78
	Indian	47	72	44	55	44	49	26
	Others	9	2	4	7	2	4	9

**Table 5.3.5A Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Males**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	48.3 (44.2-52.5)	57.2 (52.7-61.6)	43.6 (39.8-47.5)	44.7 (40.8-48.6)	40.1 (36.5-43.8)	40.9 (37.2-44.5)	38.0 (34.5-41.5)
Malay	73.2 (60.8-85.7)	87.3 (73.9-100.8)	96.2 (82.2-110.2)	72.6 (60.6-84.6)	72.0 (60.2-83.9)	67.4 (56.0-78.9)	67.5 (56.2-78.8)
Indian	93.4 (76.5-110.3)	82.0 (66.5-97.5)	64.2 (51.0-77.5)	46.2 (35.1-57.4)	61.1 (48.3-73.9)	55.1 (43.1-67.2)	44.6 (33.7-55.4)
Others	38.9 (17.8-60.1)	24.2 (8.4-40.0)	13.7 (2.7-24.7)	21.6 (8.2-35.1)	19.4 (6.7-32.0)	14.9 (3.9-26.0)	25.2 (10.9-39.5)

**Table 5.3.5B Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Females**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	37.4 (33.9-41.0)	41.3 (37.6-45.0)	36.3 (32.9-39.7)	34.1 (30.8-37.4)	29.0 (26.0-32.0)	30.4 (27.4-33.5)	31.6 (28.5-34.7)
Malay	46.1 (36.4-55.9)	53.0 (42.7-63.4)	63.1 (52.0-74.3)	54.4 (44.1-64.7)	47.7 (38.1-57.2)	48.0 (38.5-57.5)	37.6 (29.3-46.0)
Indian	40.4 (28.9-52.0)	59.8 (46.0-73.6)	34.4 (24.2-44.5)	42.2 (31.1-53.4)	33.4 (23.5-43.2)	36.6 (26.4-46.9)	19.2 (11.8-26.6)
Others	24.7 (8.6-40.9)	4.9 (0.0-11.7)	8.2 (0.2-16.3)	13.7 (3.6-23.8)	3.9 (0.0-9.3)	7.8 (0.2-15.4)	17.3 (6.0-28.6)

**Table 5.3.6A Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Males**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	45.9 (42.0-49.9)	53.2 (49.0-57.4)	38.7 (35.2-42.1)	38.0 (34.7-41.4)	33.3 (30.2-36.3)	32.6 (29.6-35.5)	28.8 (26.1-31.5)
Malay	84.5 (69.6-99.4)	100.4 (84.3-116.5)	109.7 (93.2-126.1)	84.7 (70.0-99.4)	78.5 (65.0-92.1)	75.5 (62.3-88.7)	71.0 (58.7-83.3)
Indian	103.2 (83.5-122.9)	88.6 (70.9-106.3)	74.5 (58.2-90.8)	53.1 (39.6-66.5)	67.8 (52.9-82.8)	60.5 (46.7-74.4)	48.4 (36.2-60.6)
Others	54.5 (23.1-85.9)	44.5 (14.3-74.7)	20.2 (1.9-38.4)	37.4 (13.1-61.6)	22.9 (7.5-38.4)	17.8 (4.4-31.1)	28.3 (11.5-45.1)

**Table 5.3.6B Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Ethnic Group for Females**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	25.5 (23.0-28.0)	26.4 (23.9-28.9)	22.4 (20.2-24.6)	20.5 (18.4-22.5)	16.6 (14.8-18.4)	16.3 (14.6-18.0)	16.6 (14.9-18.3)
Malay	48.5 (38.0-59.1)	61.9 (49.5-74.2)	69.5 (56.8-82.3)	53.3 (42.8-63.7)	51.8 (40.9-62.6)	45.5 (36.1-54.8)	35.4 (27.4-43.5)
Indian	50.3 (35.5-65.2)	73.2 (55.9-90.5)	40.3 (28.1-52.6)	50.9 (37.2-64.7)	38.6 (26.7-50.5)	36.7 (26.2-47.3)	19.8 (12.0-27.6)
Others	36.5 (11.5-61.4)	6.0 (0.0-14.6)	10.1 (0.2-20.1)	17.4 (4.5-30.3)	9.3 (0.0-22.2)	8.5 (0.1-16.8)	27.5 (8.6-46.4)

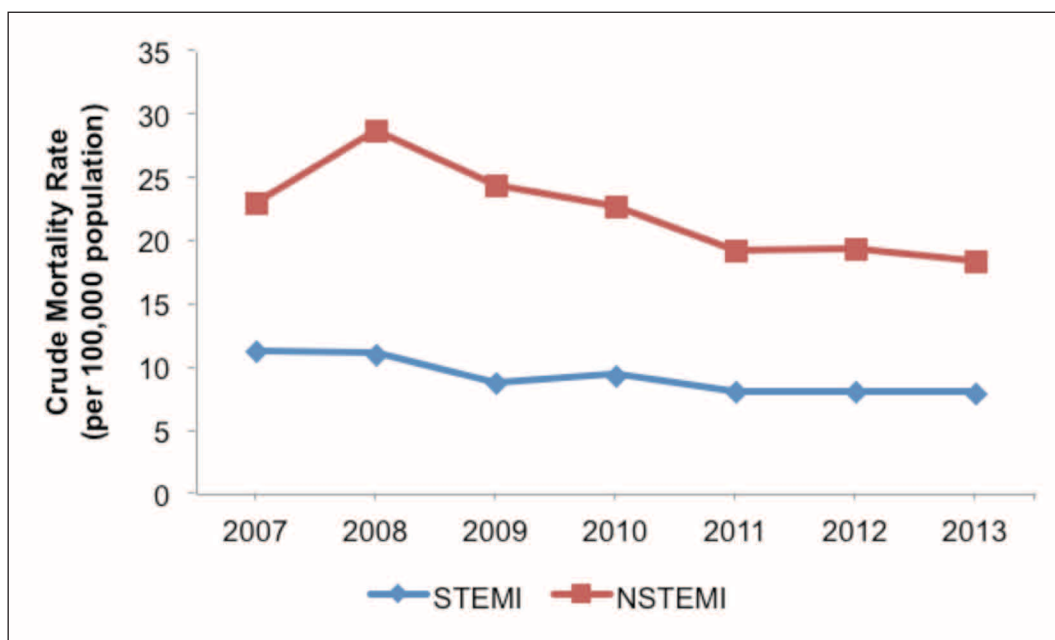
#### 5.4 Mortality of AMI by Subtype, 2007 – 2013

The crude mortality rate of NSTEMI was higher but decreased faster than that of STEMI over the years (Table 5.4.2).

**Table 5.4.1 Mortality of AMI by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	325	327	268	291	252	257	257
NSTEMI	665	851	745	708	603	618	593
MI <sup>9</sup>	366	387	362	312	344	353	322

**Figure 5.4.1 Crude Mortality Rate of AMI Per 100,000 Population by Subtype**



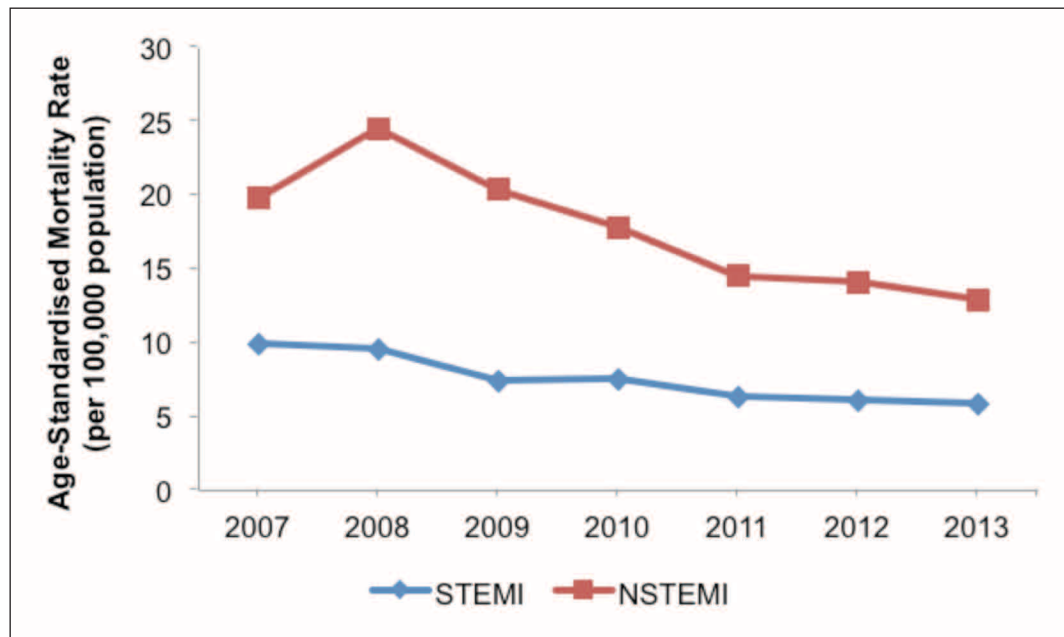
**Table 5.4.2 Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	11.2 (10.0-12.4)	11.0 (9.8-12.2)	8.7 (7.7-9.8)	9.3 (8.3-10.4)	8.0 (7.0-9.0)	8.1 (7.1-9.0)	8.0 (7.0-8.9)
NSTEMI	22.9 (21.2-24.6)	28.6 (26.7-30.6)	24.3 (22.6-26.0)	22.7 (21.0-24.4)	19.1 (17.6-20.7)	19.4 (17.8-20.9)	18.4 (16.9-19.8)

<sup>9</sup> MI comprises of Type 1, 3, 4 and 5 MI, AMI with ST-elevation, AMI without ST-elevation and unknown cases

The age-standardised mortality rate for both STEMI and NSTEMI followed the trends of the crude mortality rate (Table 5.4.3). NSTEMI patients being older with co-morbidities, had higher age-standardised mortality rate than STEMI patients. But the availability and improvement in treatment probably led to the decline in age-standardised mortality rates for both STEMI and NSTEMI patients.

**Figure 5.4.2 Age-Standardised Mortality Rate of AMI Per 100,000 Population by Subtype**



**Table 5.4.3 Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	9.9 (8.8-11.0)	9.5 (8.4-10.5)	7.3 (6.5-8.2)	7.5 (6.6-8.4)	6.3 (5.5-7.1)	6.0 (5.3-6.8)	5.8 (5.1-6.5)
<b>NSTEMI</b>	19.8 (18.2-21.3)	24.5 (22.8-26.2)	20.4 (18.9-21.8)	17.8 (16.5-19.1)	14.5 (13.3-15.7)	14.1 (13.0-15.3)	12.9 (11.8-13.9)

For both genders, STEMI patients had lower crude and age-standardised mortality rate than NSTEMI patients (Tables 5.4.5A to 5.4.6B).

**Table 5.4.4 Mortality of AMI by Gender and Subtype**

Gender	Subtype	2007	2008	2009	2010	2011	2012	2013
Male	STEMI	186	203	169	185	162	145	154
	NSTEMI	334	454	369	344	304	343	300
Female	STEMI	139	124	99	106	90	112	103
	NSTEMI	331	397	376	364	299	275	293

**Table 5.4.5A Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype for Males**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	13.0 (11.2-14.9)	13.9 (12.0-15.8)	11.2 (9.6-12.9)	12.1 (10.4-13.9)	10.5 (8.9-12.1)	9.3 (7.8-10.8)	9.8 (8.2-11.3)
NSTEMI	23.4 (20.9-25.9)	31.1 (28.3-34.0)	24.6 (22.1-27.1)	22.5 (20.2-24.9)	19.7 (17.5-21.9)	22.0 (19.7-24.3)	19.0 (16.9-21.2)

**Table 5.4.5B Crude Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype for Females**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	9.4 (7.8-11.0)	8.2 (6.8-9.6)	6.3 (5.1-7.6)	6.7 (5.4-7.9)	5.6 (4.4-6.7)	6.9 (5.6-8.1)	6.2 (5.0-7.4)
NSTEMI	22.4 (20.0-24.8)	26.2 (23.7-28.8)	24.1 (21.6-26.5)	22.9 (20.5-25.2)	18.6 (16.5-20.7)	16.9 (14.9-18.9)	17.7 (15.7-19.8)

**Table 5.4.6A Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype for Males**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	12.7 (10.9-14.6)	13.2 (11.4-15.1)	10.3 (8.7-11.9)	10.9 (9.3-12.5)	9.3 (7.8-10.8)	7.8 (6.5-9.1)	8.0 (6.7-9.3)
NSTEMI	23.5 (21.0-26.1)	30.7 (27.8-33.6)	24.0 (21.5-26.5)	20.9 (18.7-23.2)	17.5 (15.5-19.5)	19.0 (17.0-21.1)	15.5 (13.7-17.3)

**Table 5.4.6B Age-Standardised Mortality Rate of AMI Per 100,000 Population (95% CI) by Subtype for Females**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	7.3 (6.0-8.5)	6.1 (5.0-7.2)	4.5 (3.6-5.4)	4.4 (3.5-5.3)	3.7 (2.9-4.5)	4.4 (3.5-5.2)	3.7 (3.0-4.4)
NSTEMI	17.4 (15.4-19.3)	19.6 (17.6-21.6)	17.3 (15.5-19.1)	15.4 (13.8-17.1)	12.4 (10.9-13.9)	10.4 (9.1-11.6)	10.8 (9.5-12.1)



## 6. 30-DAY CASE-FATALITY OF AMI, 2007 – 2013

### 6.1 30-Day Case-Fatality of AMI, Overall, 2007 – 2013

The number of AMI patients who died within 30 days from the onset of AMI showed a decreasing trend with time. The crude case fatality rate dropped significantly from 16.1% in 2007 to 8.9% in 2013. The age-standardised case fatality rate also fell significantly during the same period (Table 6.1.1).

**Table 6.1.1 30-Day Case-Fatality of AMI (%)**

Year	2007	2008	2009	2010	2011	2012	2013
<b>No. of cases</b>	1095	1205	1042	976	869	909	841
<b>CR</b>	16.1 (15.1-17.0)	16.6 (15.7-17.6)	15.3 (14.4-16.3)	13.3 (12.5-14.1)	10.8 (10.1-11.6)	10.0 (9.3-10.6)	8.9 (8.3-9.5)
<b>ASR</b>	16.2 (15.3-17.1)	16.7 (15.8-17.5)	15.6 (14.8-16.5)	13.3 (12.6-14.1)	10.8 (10.1-11.5)	9.9 (9.3-10.5)	8.7 (8.1-9.3)

The number of AMI deaths within 30 days from an AMI onset was consistently highest among patients from the oldest age group during the 7-year period (Table 6.1.2).

**Table 6.1.2 30-Day Case-Fatality of AMI by Age Group**

Age Group	2007	2008	2009	2010	2011	2012	2013
15-19	0	0	0	0	0	0	0
20-24	0	0	0	1	0	0	0
25-29	1	1	1	1	0	1	0
30-34	2	3	1	2	3	0	0
35-39	10	10	5	1	6	5	5
40-44	16	28	14	14	8	9	10
45-49	41	37	32	34	39	25	17
50-54	65	68	74	53	42	47	40
55-59	85	89	80	47	61	58	51
60-64	75	105	90	94	85	89	76
65-69	112	133	102	79	80	80	79
70-74	164	149	126	111	104	94	96
75-79	179	181	194	156	118	137	133
80-84	153	174	132	171	132	143	131
85+	192	227	191	212	191	221	203

## 6.2 30-Day Case-Fatality of AMI by Gender, 2007 – 2013

The crude and age-standardised case-fatality rates were not significantly different between the two genders (Tables 6.2.2 and 6.2.3).

**Table 6.2.1 30-Day Case-Fatality of AMI by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	655	717	610	560	523	516	503
Female	440	488	432	416	346	393	338
Ratio (M vs F)	1.5	1.5	1.4	1.3	1.5	1.3	1.5

**Table 6.2.2 30-Day Crude Case-Fatality Rate of AMI (%) by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	14.8 (13.7-16.0)	15.3 (14.2-16.4)	13.7 (12.6-14.7)	11.7 (10.7-12.6)	9.9 (9.0-10.7)	8.6 (7.9-9.4)	8.3 (7.6-9.0)
Female	18.4 (16.6-20.1)	19.0 (17.3-20.7)	18.5 (16.8-20.3)	16.3 (14.8-17.9)	12.8 (11.4-14.1)	12.5 (11.3-13.7)	9.9 (8.9-11.0)

**Table 6.2.3 30-Day Age-Standardised Case-Fatality Rate of AMI (%) by Gender**

Gender	2007	2008	2009	2010	2011	2012	2013
Male	16.3 (15.2-17.5)	16.8 (15.7-18.0)	15.6 (14.4-16.8)	13.2 (12.2-14.3)	11.0 (10.1-11.9)	9.7 (8.9-10.5)	9.3 (8.5-10.0)
Female	16.3 (14.8-17.8)	16.8 (15.3-18.4)	16.3 (14.7-17.9)	13.6 (12.2-14.9)	11.5 (10.1-12.9)	10.9 (9.7-12.0)	8.0 (7.1-8.9)

### 6.3 30-Day Case-Fatality of AMI by Ethnic Group, 2007 – 2013

Contrary to the incidence and mortality rates, the Chinese patients being older with co-morbidities, had the highest crude case-fatality rate, followed by the Malays, then the Indians from 2007 to 2013 (Table 6.3.2).

**Table 6.3.1 30-Day Case-Fatality of AMI by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	774	867	713	693	597	656	621
Malay	169	205	217	187	176	154	144
Indian	133	129	103	84	89	87	60
Others	19	4	9	12	7	12	16

**Table 6.3.2 30-Day Crude Case-Fatality Rate of AMI (%) by Ethnic Group**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	16.7 (15.5-17.9)	18.0 (16.8-19.2)	16.0 (14.8-17.2)	14.1 (13.1-15.2)	11.3 (10.4-12.2)	11.0 (10.1-11.8)	9.9 (9.1-10.7)
Malay	14.4 (12.0-16.6)	15.2 (13.0-17.2)	16.5 (14.0-18.7)	13.2 (11.0-15.1)	11.2 (10.0-12.9)	8.4 (7.0-9.7)	7.7 (6.0-8.9)
Indian	15.1 (13.0-17.7)	13.2 (11.0-15.5)	11.0 (9.0-13.2)	9.0 (7.0-10.9)	8.4 (7.0-10.1)	7.5 (6.0-9.1)	5.1 (4.0-6.4)
Others	14.1 (7.7-20.4)	4.0 (0.1-7.9)	9.7 (3.4-16.0)	13.2 (5.7-20.6)	8.0 (2.1-13.8)	8.8 (3.8-13.7)	10.3 (5.3-15.4)

For both male and female patients, the crude case-fatality rate was the highest among the Chinese compared to the other ethnic groups (Tables 6.3.4A and 6.3.4B).

**Table 6.3.3 30-Day Case-Fatality of AMI by Gender and Ethnic Group**

Gender	Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Male	Chinese	441	505	400	394	349	370	358
	Malay	108	125	134	105	108	88	96
	Indian	96	85	70	54	60	50	41
	Others	10	2	6	7	6	8	8
Female	Chinese	333	362	313	299	248	286	263
	Malay	61	80	83	82	68	66	48
	Indian	37	44	33	30	29	37	19
	Others	9	2	3	5	1	4	8

**Table 6.3.4A 30-Day Crude Case-Fatality Rate of AMI (%) by Ethnic Group for Males**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	15.1 (13.7-16.5)	16.5 (15.0-17.9)	13.9 (12.6-15.3)	12.4 (11.2-13.6)	10.2 (9.1-11.2)	9.6 (8.6-10.5)	9.1 (8.2-10.1)
Malay	14.0 (11.4-16.7)	14.1 (11.6-16.6)	15.6 (12.9-18.2)	11.2 (9.0-13.3)	10.4 (8.4-12.3)	7.3 (5.8-8.9)	7.9 (6.3-9.5)
Indian	15.3 (12.0-18.4)	12.7 (10.0-15.4)	10.5 (8.0-13.0)	8.6 (6.0-10.9)	7.8 (6.0-9.7)	6.2 (4.0-7.9)	5.0 (3.0-6.5)
Others	10.2 (3.9-16.5)	3.0 (0.0-7.2)	9.1 (1.8-16.4)	11.3 (2.9-19.7)	9.7 (1.9-17.4)	8.6 (2.6-14.6)	8.0 (2.5-13.5)

**Table 6.3.4B 30-Day Crude Case-Fatality Rate of AMI (%) by Ethnic Group for Females**

Ethnic Group	2007	2008	2009	2010	2011	2012	2013
Chinese	19.5 (17.4-21.6)	20.6 (18.5-22.7)	19.8 (17.6-22.0)	17.2 (15.3-19.2)	13.3 (11.6-14.9)	13.6 (12.0-15.1)	11.2 (9.9-12.6)
Malay	15.2 (11.0-19.0)	17.1 (13.0-20.9)	18.2 (14.0-22.1)	17.3 (14.0-21.0)	12.9 (10.0-16.0)	10.3 (8.0-12.8)	7.2 (5.0-9.3)
Indian	14.6 (10.0-19.3)	14.4 (10.0-18.7)	12.4 (8.0-16.6)	9.7 (6.0-13.2)	10.1 (6.0-13.7)	10.5 (7.0-13.9)	5.6 (3.0-8.1)
Others	24.3 (8.0-40.2)	5.9 (0.0-14.0)	11.1 (0.0-23.7)	17.2 (2.0-32.4)	3.8 (0.0-11.4)	9.1 (0.0-18.0)	14.5 (4.0-24.6)

#### 6.4 30-Day Case-Fatality of AMI by Subtype, 2007 – 2013

As STEMI is more severe than NSTEMI, the crude case-fatality rate was higher among patients suffering from STEMI compared to NSTEMI across the years (Table 6.4.2).

**Table 6.4.1 30-Day Case-Fatality of AMI by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	285	282	229	249	208	213	221
<b>NSTEMI</b>	463	556	452	416	330	352	303
<b>MI<sup>10</sup></b>	347	367	361	311	331	344	317

**Table 6.4.2 30-Day Crude Case-Fatality Rate of AMI (%) by Subtype**

Subtype	2007	2008	2009	2010	2011	2012	2013
<b>STEMI</b>	13.7 (12.1-15.3)	13.6 (12.0-15.2)	11.1 (9.6-12.5)	11.9 (10.4-13.3)	9.8 (8.5-11.1)	9.4 (8.1-10.6)	9.4 (8.2-10.7)
<b>NSTEMI</b>	10.6 (9.6-11.6)	11.6 (10.6-12.5)	10.4 (9.5-11.4)	8.7 (7.8-9.5)	6.3 (5.6-7.0)	5.5 (4.9-6.1)	4.5 (4.0-5.0)

<sup>10</sup> MI comprises of Type 1, 3, 4 and 5 MI, AMI with ST-elevation, AMI without ST-elevation and unknown cases

For both male and female patients, STEMI patients had higher crude case-fatality rate than NSTEMI patients (Tables 6.4.4A and 6.4.4B).

**Table 6.4.3 30-Day Case-Fatality of AMI by Gender and Subtype**

Gender	Subtype	2007	2008	2009	2010	2011	2012	2013
Male	STEMI	160	176	142	162	136	116	136
	NSTEMI	239	302	236	199	162	194	162
Female	STEMI	125	106	87	87	72	97	85
	NSTEMI	224	254	216	217	168	158	141

**Table 6.4.4A 30-Day Crude Case-Fatality Rate of AMI (%) by Subtype for Males**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	10.2 (8.6-11.8)	11.0 (9.4-12.6)	8.8 (7.4-10.3)	9.8 (8.3-11.4)	7.9 (6.6-9.3)	6.5 (5.3-7.6)	7.4 (6.1-8.6)
NSTEMI	9.3 (8.1-10.4)	10.6 (9.4-11.8)	9.1 (7.9-10.2)	6.9 (6.0-7.9)	5.1 (4.3-5.8)	5.0 (4.3-5.7)	4.1 (3.5-4.7)

**Table 6.4.4B 30-Day Crude Case-Fatality Rate of AMI (%) by Subtype for Females**

Subtype	2007	2008	2009	2010	2011	2012	2013
STEMI	24.8 (20.4-29.1)	22.6 (18.3-26.9)	18.7 (14.8-22.6)	19.2 (15.1-23.2)	17.6 (13.5-21.6)	20.2 (16.2-24.2)	16.9 (13.3-20.5)
NSTEMI	12.5 (10.9-14.1)	12.9 (11.4-14.5)	12.5 (10.9-14.2)	11.3 (9.8-12.8)	8.2 (7.0-9.4)	6.4 (5.4-7.4)	5.1 (4.3-6.0)

## 7. RISK FACTOR PROFILE OF AMI, 2007 – 2013

### 7.1 Risk Factor Profile of AMI, Overall, 2007 – 2013

A person is considered to be a smoker if he/she was a former or current smoker at the point of admission. Hypertension, diabetes mellitus and hyperlipidaemia are defined as positive if there was a past history of the disease or if it was diagnosed at admission. There was a limitation in the reporting of hyperlipidaemia, namely, in 2007, newly diagnosed hyperlipidaemia was based on doctor's diagnosis. But from 2008 onwards, hyperlipidaemia diagnosed at admission was based on lab values and this refers to patients with total cholesterol more than 6.2 mmol/L or low density lipoprotein more than 4.1 mmol/L. Hence, the hyperlipidaemia figures in 2007 were not comparable to those in the other years.

Hypertension and hyperlipidaemia were the two most common risk factors among AMI patients, with 76.1% having hypertension and 71.9% having hyperlipidaemia in 2013. The proportions of AMI patients with hypertension and hyperlipidaemia had increased slightly since 2009. 27.4% of the AMI episodes in 2013 had previous history of AMI and the proportion of these recurrent AMI episodes had risen slightly over the years (Table 7.1.1).

**Table 7.1.1 Risk Factor Profile of AMI (%)**

Risk Factor	2007	2008	2009	2010	2011	2012	2013
<b>BMI <math>\geq</math> 23 kg/m<sup>2</sup></b>	56.8	56.4	57.5	57.2	57.0	57.9	57.1
<b>Diabetes Mellitus</b>	50.4	51.2	50.3	48.6	50.4	50.8	50.0
<b>Hyperlipidaemia</b>	84.3	68.4	67.1	67.6	69.1	70.1	71.9
<b>Hypertension</b>	72.8	72.5	71.5	71.9	74.4	75.2	76.1
<b>Past AMI Event</b>	23.2	26.0	26.7	26.7	27.3	27.8	27.4
<b>Smoker</b>	45.5	46.1	46.1	46.2	46.4	45.8	45.8

## 7.2 Risk Factor Profile of AMI by Gender, 2007 – 2013

There were consistently higher proportions of females with hypertension compared to the males for every year during the 7-year period. For hyperlipidaemia, a higher proportion was observed in the females than the males from 2009 to 2013 (Table 7.2.1)

**Table 7.2.1 Risk Factor Profile of AMI (%) by Gender**

Gender	Risk Factor	2007	2008	2009	2010	2011	2012	2013
Male	BMI $\geq$ 23 kg/m <sup>2</sup>	61.3	60.2	61.5	61.2	60.3	61.9	61.4
	Diabetes Mellitus	45.8	46.3	45.5	43.9	45.8	47.2	45.9
	Hyperlipidaemia	86.1	69.2	66.6	66.3	67.9	69.0	70.8
	Hypertension	67.2	66.9	65.6	66.6	68.6	70.5	71.0
	Past AMI Event	22.6	24.8	25.4	25.2	26.5	27.7	26.7
	Smoker	63.5	65.1	64.2	64.6	64.8	64.1	65.4
Female	BMI $\geq$ 23 kg/m <sup>2</sup>	46.7	47.9	48.6	48.9	49.9	49.8	48.9
	Diabetes Mellitus	58.7	60.0	59.3	57.5	59.4	57.8	57.2
	Hyperlipidaemia	81.0	67.1	68.3	70.1	71.4	72.2	73.9
	Hypertension	82.8	82.7	82.5	81.8	85.6	84.0	85.2
	Past AMI Event	24.2	28.2	29.3	29.4	28.8	28.0	28.5
	Smoker	13.2	11.7	11.9	11.8	10.7	11.0	11.2



### 7.3 Risk Factor Profile of AMI by Ethnic Group, 2007 – 2013

The Chinese had the highest proportion of hypertension among the ethnic groups, while the Indians had the highest proportion of hyperlipidaemia (Table 7.3.1).

**Table 7.3.1 Risk Factor Profile of AMI (%) by Ethnic Group**

Ethnic Group	Risk Factor	2007	2008	2009	2010	2011	2012	2013
Chinese	BMI $\geq$ 23 kg/m <sup>2</sup>	52.7	51.8	52.3	52.8	51.7	52.6	51.6
	Diabetes Mellitus	46.6	46.6	46.4	44.2	46.0	45.5	45.2
	Hyperlipidaemia	82.5	65.1	65.0	65.2	66.5	68.1	70.2
	Hypertension	74.2	73.4	72.5	72.9	75.4	75.6	77.1
	Past AMI Event	21.7	24.1	25.2	24.6	25.1	25.7	25.3
	Smoker	44.5	44.6	44.2	44.2	44.0	43.9	43.8
Malay	BMI $\geq$ 23 kg/m <sup>2</sup>	65.3	64.8	67.2	65.3	67.0	67.9	67.1
	Diabetes Mellitus	57.0	59.0	54.1	54.0	56.4	59.4	57.8
	Hyperlipidaemia	87.7	75.1	69.6	71.8	73.1	73.5	75.6
	Hypertension	71.5	70.0	70.1	69.9	72.9	74.8	74.3
	Past AMI Event	24.2	28.8	28.4	29.5	30.1	31.2	30.7
	Smoker	48.8	50.8	49.4	53.0	52.6	50.9	50.9
Indian	BMI $\geq$ 23 kg/m <sup>2</sup>	65.7	64.8	65.9	66.3	67.7	66.7	67.9
	Diabetes Mellitus	63.0	63.3	64.2	64.4	64.1	64.1	63.6
	Hyperlipidaemia	89.2	76.0	73.3	74.0	76.0	75.4	76.1
	Hypertension	68.6	72.0	68.6	70.9	72.0	74.3	74.2
	Past AMI Event	29.9	31.3	31.0	33.4	34.8	34.3	33.4
	Smoker	45.5	46.7	49.1	45.8	48.8	47.8	47.9
Others	BMI $\geq$ 23 kg/m <sup>2</sup>	58.5	59.3	74.2	60.6	58.1	65.0	66.9
	Diabetes Mellitus	41.4	45.5	42.2	40.2	46.5	51.5	47.7
	Hyperlipidaemia	83.6	67.7	73.3	63.2	74.4	64.4	64.9
	Hypertension	64.1	68.7	68.9	62.1	68.6	67.4	70.9
	Past AMI Event	23.4	28.3	33.3	25.3	19.8	20.5	25.2
	Smoker	52.3	48.5	57.8	51.7	52.3	45.5	48.3

Among male AMI patients, hypertension was more common for the Chinese, whereas hyperlipidaemia was more common for the Indians than the other ethnic groups (Table 7.3.2A). Among female AMI patients, hypertension was more common for the Malays, while hyperlipidaemia was more common for the Indians than the other ethnic groups (Table 7.3.2B).

**Table 7.3.2A Risk Factor Profile of AMI (%) by Ethnic Group for Males**

Ethnic Group	Risk Factor	2007	2008	2009	2010	2011	2012	2013
Chinese	BMI $\geq$ 23 kg/m <sup>2</sup>	57.9	56.7	57.2	58.2	55.7	57.9	56.7
	Diabetes Mellitus	42.0	42.1	42.2	39.8	41.5	42.8	41.7
	Hyperlipidaemia	84.9	65.9	64.6	64.2	65.2	67.6	69.2
	Hypertension	68.9	67.8	67.2	68.0	69.9	71.6	72.5
	Past AMI Event	20.4	22.5	23.6	23.0	24.0	25.3	24.5
	Smoker	61.6	62.3	61.2	61.2	61.9	60.8	62.2
Malay	BMI $\geq$ 23 kg/m <sup>2</sup>	68.5	67.4	70.5	67.9	68.3	70.3	70.7
	Diabetes Mellitus	51.6	51.5	46.8	48.5	50.2	53.6	51.3
	Hyperlipidaemia	88.3	75.8	68.2	69.9	72.2	69.7	73.6
	Hypertension	65.2	62.9	62.6	63.2	65.7	67.1	67.1
	Past AMI Event	24.9	29.4	27.3	29.0	29.3	30.8	29.4
	Smoker	70.6	73.5	71.5	74.9	74.0	74.0	75.3
Indian	BMI $\geq$ 23 kg/m <sup>2</sup>	68.8	65.2	65.9	65.6	69.6	67.0	68.8
	Diabetes Mellitus	57.4	58.5	58.2	58.0	59.5	58.1	58.8
	Hyperlipidaemia	89.4	75.7	72.4	71.3	73.9	75.1	74.8
	Hypertension	63.0	68.1	62.6	66.0	66.8	71.0	70.3
	Past AMI Event	30.5	28.6	30.4	30.9	34.9	35.2	33.5
	Smoker	62.8	66.8	67.2	66.1	65.8	66.0	65.9
Others	BMI $\geq$ 23 kg/m <sup>2</sup>	57.9	61.2	75.9	58.8	60.4	70.1	64.4
	Diabetes Mellitus	39.1	48.5	42.2	36.7	40.0	46.7	38.5
	Hyperlipidaemia	85.9	66.7	71.9	63.3	71.7	62.2	67.7
	Hypertension	59.8	66.7	67.2	55.0	66.7	62.2	64.6
	Past AMI Event	23.9	27.3	26.6	23.3	18.3	23.3	24.0
	Smoker	71.7	65.2	70.3	65.0	65.0	61.1	67.7

**Table 7.3.2B Risk Factor Profile of AMI (%) by Ethnic Group for Females**

<b>Ethnic Group</b>	<b>Risk Factor</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
<b>Chinese</b>	<b>BMI <math>\geq</math> 23 kg/m<sup>2</sup></b>	41.4	41.3	42.0	41.8	43.5	42.3	42.2
	<b>Diabetes Mellitus</b>	54.4	54.5	53.9	52.1	54.2	50.5	51.0
	<b>Hyperlipidaemia</b>	78.6	63.6	65.7	67.1	68.7	69.1	72.0
	<b>Hypertension</b>	83.0	83.1	82.0	81.6	85.4	82.9	84.9
	<b>Past AMI Event</b>	23.9	26.7	28.0	27.5	27.1	26.4	26.6
	<b>Smoker</b>	15.8	14.0	14.0	13.6	11.6	12.9	13.4
<b>Malay</b>	<b>BMI <math>\geq</math> 23 kg/m<sup>2</sup></b>	58.8	58.8	59.9	59.4	64.0	63.3	60.2
	<b>Diabetes Mellitus</b>	66.8	73.2	67.7	64.9	68.6	70.2	69.6
	<b>Hyperlipidaemia</b>	86.7	73.7	72.2	75.6	74.8	80.6	79.1
	<b>Hypertension</b>	82.9	83.5	84.1	83.2	86.9	89.2	87.3
	<b>Past AMI Event</b>	23.1	27.7	30.5	30.5	31.8	31.9	33.0
	<b>Smoker</b>	9.0	8.0	8.2	9.4	10.9	7.9	6.9
<b>Indian</b>	<b>BMI <math>\geq</math> 23 kg/m<sup>2</sup></b>	57.1	63.8	65.9	67.9	62.7	65.8	65.6
	<b>Diabetes Mellitus</b>	76.5	73.5	79.0	77.4	76.4	78.0	75.3
	<b>Hyperlipidaemia</b>	88.9	76.5	75.6	79.3	81.8	76.0	79.2
	<b>Hypertension</b>	82.3	80.5	83.6	81.0	85.7	82.1	83.6
	<b>Past AMI Event</b>	28.4	36.9	32.4	38.4	34.6	32.4	33.3
	<b>Smoker</b>	3.3	3.7	4.2	4.9	3.2	5.8	4.2
<b>Others</b>	<b>BMI <math>\geq</math> 23 kg/m<sup>2</sup></b>	60.0	50.0	62.5	65.0	52.4	55.0	71.7
	<b>Diabetes Mellitus</b>	47.2	39.4	42.3	48.1	61.5	61.9	63.6
	<b>Hyperlipidaemia</b>	77.8	69.7	76.9	63.0	80.8	69.0	60.0
	<b>Hypertension</b>	75.0	72.7	73.1	77.8	73.1	78.6	81.8
	<b>Past AMI Event</b>	22.2	30.3	50.0	29.6	23.1	14.3	27.3
	<b>Smoker</b>	2.8	15.2	26.9	22.2	23.1	11.9	14.5

#### 7.4 Risk Factor Profile of AMI by Subtype, 2007 – 2013

There were higher proportions of patients with hypertension (from 2007 to 2013) and hyperlipidaemia (from 2009 to 2013) among the patients diagnosed with NSTEMI compared to those with STEMI (Table 7.4.1).

**Table 7.4.1 Risk Factor Profile of AMI (%) by Subtype**

Subtype	Risk Factor	2007	2008	2009	2010	2011	2012	2013
STEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	63.7	62.9	64.2	63.9	63.2	65.7	64.8
	Diabetes Mellitus	41.6	42.5	40.6	39.7	39.3	38.6	38.7
	Hyperlipidaemia	87.8	69.1	60.7	60.1	60.6	61.8	64.0
	Hypertension	59.8	60.1	56.6	56.9	58.4	59.6	61.3
	Past AMI Event	10.5	14.5	12.1	14.5	12.6	14.2	12.3
	Smoker	54.1	57.1	56.7	56.6	58.3	55.7	57.6
NSTEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	53.4	53.2	54.3	54.7	55.5	55.1	54.5
	Diabetes Mellitus	54.6	54.9	54.6	52.5	54.4	55.3	54.0
	Hyperlipidaemia	83.5	68.6	70.7	71.2	72.5	73.4	75.0
	Hypertension	78.7	77.9	78.1	78.3	80.1	80.5	81.2
	Past AMI Event	29.1	30.9	33.8	32.0	32.9	32.7	32.4
	Smoker	42.2	41.7	41.8	42.3	42.6	43.0	42.2

For both men and women, hypertension and hyperlipidaemia were more prevalent among NSTEMI than STEMI patients for most the years (Tables 7.4.2A and 7.4.2B).

**Table 7.4.2A Risk Factor Profile of AMI (%) by Subtype for Males**

Subtype	Risk Factor	2007	2008	2009	2010	2011	2012	2013
STEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	66.6	65.8	67.0	66.7	66.1	69.4	68.9
	Diabetes Mellitus	38.2	39.0	37.0	36.5	36.3	35.6	35.7
	Hyperlipidaemia	89.7	69.9	60.0	60.0	60.6	60.8	62.3
	Hypertension	55.2	54.1	51.4	52.3	54.2	56.0	56.4
	Past AMI Event	11.0	14.7	11.5	14.4	12.6	14.1	12.2
	Smoker	67.4	69.3	69.2	68.7	69.4	67.5	70.4
NSTEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	58.1	56.7	58.2	58.4	58.2	58.4	58.1
	Diabetes Mellitus	50.3	50.3	50.5	48.0	50.5	52.4	50.5
	Hyperlipidaemia	84.9	69.2	71.1	70.3	71.8	72.9	75.0
	Hypertension	74.3	73.9	74.0	74.7	75.4	77.0	77.7
	Past AMI Event	29.7	30.3	33.7	31.2	33.3	33.7	33.1
	Smoker	62.3	62.9	61.7	62.7	63.4	63.3	63.5

**Table 7.4.2B Risk Factor Profile of AMI (%) by Subtype for Females**

Subtype	Risk Factor	2007	2008	2009	2010	2011	2012	2013
STEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	52.6	50.7	53.3	52.7	50.0	50.1	49.1
	Diabetes Mellitus	52.1	54.5	53.3	51.3	51.9	49.8	49.4
	Hyperlipidaemia	81.9	66.2	63.2	60.3	60.5	65.4	70.2
	Hypertension	74.2	80.5	74.9	73.9	76.0	73.2	79.2
	Past AMI Event	9.3	14.1	14.3	14.7	12.6	14.6	12.6
	Smoker	12.5	15.4	13.0	12.5	11.6	11.4	10.8
NSTEMI	BMI $\geq$ 23 kg/m <sup>2</sup>	45.1	47.3	47.4	48.7	50.6	49.7	48.8
	Diabetes Mellitus	60.8	61.6	60.6	59.1	60.4	59.9	59.1
	Hyperlipidaemia	81.6	67.8	70.1	72.6	73.4	74.2	75.0
	Hypertension	85.1	83.7	84.3	83.5	87.4	86.1	86.2
	Past AMI Event	28.3	31.6	34.0	33.1	32.2	31.1	31.3
	Smoker	13.2	11.0	11.7	11.6	10.3	11.2	11.5

## 8. SYMPTOMS OF AMI, 2007 – 2013

### 8.1 Symptoms of AMI, Overall, 2007 – 2013

The top three symptoms reported by AMI patients were chest pain, breathlessness and diaphoresis. Among patients with onset of AMI in 2013, 56.5%, 54.7% and 29.6% of them experienced chest pain, breathlessness and diaphoresis respectively. The proportions of AMI patients who presented other symptoms (shown in Table 8.1.1) had remained relatively stable over the years from 2007 to 2013.

**Table 8.1.1 Symptoms of AMI (%)**

Symptom	2007	2008	2009	2010	2011	2012	2013
Back Pain	4.1	4.8	5.2	5.0	5.7	5.2	5.3
Breathlessness	53.8	51.7	52.0	54.9	55.1	55.7	54.7
Chest Pain	59.4	57.7	59.7	59.9	58.0	58.3	56.5
Diaphoresis	31.5	30.5	32.6	33.5	31.6	31.3	29.6
Epigastric Pain	6.5	5.5	5.4	5.7	5.8	4.8	5.0
Jaw Pain	2.1	2.6	2.9	3.0	2.7	3.0	2.7
Shoulder Pain	3.5	3.9	4.3	4.0	4.0	4.7	3.9
Syncope	1.6	2.9	1.7	1.9	1.4	1.9	1.8

## 8.2 Symptoms of AMI by Gender, 2007 – 2013

The proportions of males who complained of chest pain and diaphoresis were higher than females. The proportion of males who were breathless during the onset of AMI was close to that of the females (Table 8.2.1).

**Table 8.2.1 Symptoms of AMI (%) by Gender**

Gender	Subtype	2007	2008	2009	2010	2011	2012	2013
Male	Back Pain	3.8	4.9	5.5	4.8	6.2	5.2	5.3
	Breathlessness	52.6	52.2	52.6	54.8	55.3	56.5	55.7
	Chest Pain	64.4	63.9	65.9	65.7	63.9	63.9	63.4
	Diaphoresis	35.9	36.2	37.9	39.4	37.5	36.5	35.4
	Epigastric Pain	6.0	5.2	4.8	4.9	5.3	4.3	4.3
	Jaw Pain	2.5	3.1	3.4	3.2	3.3	3.4	3.3
	Shoulder Pain	3.8	4.4	4.8	4.5	4.4	4.6	4.2
	Syncope	1.8	3.0	1.7	2.3	1.7	2.0	1.9
Female	Back Pain	4.6	4.6	4.6	5.4	4.9	5.1	5.2
	Breathlessness	56.1	50.8	50.9	55.1	54.6	54.1	52.8
	Chest Pain	50.1	46.3	47.9	49.0	46.5	47.5	44.3
	Diaphoresis	23.4	20.0	22.6	22.5	20.1	21.6	19.3
	Epigastric Pain	7.3	6.1	6.4	7.2	6.8	5.8	6.2
	Jaw Pain	1.5	1.6	2.1	2.5	1.4	2.1	1.5
	Shoulder Pain	3.1	3.1	3.3	3.1	3.0	4.8	3.4
	Syncope	1.3	2.6	1.6	1.1	0.9	1.6	1.5

### 8.3 Symptoms of AMI by Ethnic Group, 2007 – 2013

The Indians had the highest proportions of chest pain and diaphoresis, while the Malays had the highest proportion of breathlessness among the three main ethnic groups (Table 8.3.1).

**Table 8.3.1 Symptoms of AMI (%) by Ethnic Group**

Ethnic Group	Symptom	2007	2008	2009	2010	2011	2012	2013
Chinese	Back Pain	3.2	3.9	3.9	3.5	4.4	4.2	4.0
	Breathlessness	53.4	50.0	51.3	54.1	53.8	55.0	53.6
	Chest Pain	56.8	54.4	56.8	56.2	55.6	55.0	53.0
	Diaphoresis	30.2	29.7	31.1	31.6	30.6	30.2	27.9
	Epigastric Pain	6.0	5.2	4.7	5.5	6.0	4.3	4.9
	Jaw Pain	1.7	2.1	2.7	2.8	2.4	2.8	2.3
	Shoulder Pain	2.7	3.1	3.7	3.2	2.9	3.7	3.1
	Syncope	1.8	2.9	1.7	2.0	1.5	2.2	1.9
Malay	Back Pain	5.2	4.9	6.9	7.1	7.0	5.9	7.1
	Breathlessness	56.7	56.3	53.7	57.7	58.4	59.0	58.4
	Chest Pain	61.7	61.8	61.4	63.8	58.0	61.7	61.8
	Diaphoresis	34.1	31.3	32.0	35.9	31.9	31.7	32.0
	Epigastric Pain	8.7	6.2	7.3	6.7	6.2	5.9	5.6
	Jaw Pain	2.1	2.3	2.3	1.6	2.2	2.6	2.7
	Shoulder Pain	3.5	3.6	5.1	3.8	4.1	5.1	4.3
	Syncope	1.3	2.9	1.4	1.8	1.5	1.6	1.6
Indian	Back Pain	6.7	8.9	8.8	9.7	10.3	8.9	9.2
	Breathlessness	53.4	52.8	52.5	54.8	56.4	55.5	54.3
	Chest Pain	69.0	68.2	70.1	72.5	69.8	68.0	65.9
	Diaphoresis	35.0	33.2	39.7	39.8	36.3	37.1	34.4
	Epigastric Pain	5.6	6.1	5.1	5.2	4.7	5.7	4.4
	Jaw Pain	4.2	4.8	4.9	5.5	4.5	4.4	4.1
	Shoulder Pain	7.6	8.4	6.4	8.6	8.6	9.2	7.2
	Syncope	1.1	2.3	1.8	1.6	1.0	0.9	1.5
Others	Back Pain	5.9	8.0	8.6	4.4	9.1	5.8	5.2
	Breathlessness	43.7	62.0	58.1	50.5	55.7	44.5	54.2
	Chest Pain	65.9	59.0	68.8	65.9	61.4	70.8	64.5
	Diaphoresis	31.1	32.0	40.9	34.1	34.1	29.2	36.8
	Epigastric Pain	7.4	6.0	10.8	5.5	4.5	4.4	7.1
	Jaw Pain	3.7	4.0	5.4	5.5	1.1	3.6	7.1
	Shoulder Pain	5.9	5.0	3.2	7.7	9.1	4.4	8.4
	Syncope	3.7	5.0	2.2	1.1	2.3	1.5	2.6

Among male AMI patients, breathlessness was more common for the Malays, while chest pain was more common for the Indians than the other ethnic groups (Table 8.3.2A). Among female AMI patients, the Indians had higher proportion of chest pain, breathlessness and diaphoresis than the other ethnic groups (Table 8.3.2B).

**Table 8.3.2A Symptoms of AMI (%) by Ethnic Group for Males**

Ethnic Group	Symptom	2007	2008	2009	2010	2011	2012	2013
Chinese	Back Pain	3.2	4.5	4.3	3.9	5.1	4.4	4.1
	Breathlessness	52.6	50.9	52.9	54.4	53.7	56.1	55.2
	Chest Pain	62.6	61.1	62.9	62.7	61.8	60.5	60.0
	Diaphoresis	34.8	35.9	36.4	37.9	36.3	35.1	33.6
	Epigastric Pain	5.6	4.8	4.5	4.8	5.5	3.9	4.3
	Jaw Pain	2.0	2.6	3.1	3.2	3.0	3.1	2.6
	Shoulder Pain	3.1	3.6	3.9	3.8	3.4	3.5	3.2
	Syncope	2.0	3.2	1.8	2.5	1.8	2.3	2.0
Malay	Back Pain	4.4	4.2	7.1	6.6	7.1	5.8	7.3
	Breathlessness	55.3	57.2	52.3	57.7	59.9	60.9	59.6
	Chest Pain	65.1	67.8	69.5	68.9	63.4	68.5	69.0
	Diaphoresis	38.2	37.6	38.3	41.2	38.7	38.2	39.0
	Epigastric Pain	8.3	6.3	6.2	5.4	6.2	5.3	4.5
	Jaw Pain	2.9	3.2	2.9	1.3	2.4	3.3	3.6
	Shoulder Pain	3.9	4.0	6.4	3.5	4.4	5.3	4.8
	Syncope	1.4	3.3	1.2	2.1	1.8	1.9	1.7
Indian	Back Pain	5.4	7.2	8.4	6.9	9.7	8.3	8.3
	Breathlessness	50.4	51.2	50.8	52.5	56.6	54.3	52.7
	Chest Pain	71.3	71.0	73.2	75.8	73.6	71.9	69.6
	Diaphoresis	38.0	36.0	42.6	44.3	41.3	40.5	37.9
	Epigastric Pain	5.1	5.4	4.4	4.6	3.6	4.6	3.6
	Jaw Pain	4.5	4.8	4.8	5.8	5.8	4.8	5.2
	Shoulder Pain	6.9	8.7	7.1	9.4	8.8	9.3	7.5
	Syncope	1.3	2.2	1.8	1.9	1.0	0.9	1.7
Others	Back Pain	4.1	9.1	9.1	3.2	9.7	4.3	4.0
	Breathlessness	42.9	57.6	59.1	50.0	51.6	38.7	54.0
	Chest Pain	68.4	69.7	72.7	66.1	62.9	78.5	75.0
	Diaphoresis	35.7	36.4	48.5	38.7	35.5	37.6	45.0
	Epigastric Pain	8.2	9.1	6.1	4.8	4.8	2.2	10.0
	Jaw Pain	3.1	6.1	7.6	6.5	1.6	4.3	10.0
	Shoulder Pain	4.1	4.6	4.6	6.5	8.1	4.3	8.0
	Syncope	4.1	1.5	3.0	1.6	1.6	2.2	3.0



Table 8.3.2B Symptoms of AMI (%) by Ethnic Group for Females

Ethnic Group	Symptom	2007	2008	2009	2010	2011	2012	2013
Chinese	Back Pain	3.2	2.7	3.1	2.8	3.3	3.8	3.9
	Breathlessness	54.8	48.5	48.4	53.6	54.1	53.0	51.1
	Chest Pain	46.8	42.6	45.8	44.5	44.1	45.0	41.2
	Diaphoresis	22.2	18.9	21.6	20.2	20.0	21.1	18.3
	Epigastric Pain	6.9	6.0	5.1	6.8	6.9	5.0	6.0
	Jaw Pain	1.3	1.3	1.9	2.1	1.4	2.2	1.7
	Shoulder Pain	2.1	2.3	3.4	2.0	2.0	4.1	2.8
	Syncope	1.5	2.6	1.5	1.1	0.9	1.9	1.6
Malay	Back Pain	6.7	6.2	6.6	8.2	6.6	6.1	6.6
	Breathlessness	59.2	54.6	56.2	57.8	55.2	55.4	56.1
	Chest Pain	55.2	50.5	46.0	53.6	47.4	49.0	48.6
	Diaphoresis	26.4	19.3	20.4	25.3	18.4	19.7	19.4
	Epigastric Pain	9.5	6.0	9.4	9.3	6.1	6.9	7.5
	Jaw Pain	0.8	0.6	1.1	2.3	1.9	1.1	0.9
	Shoulder Pain	2.7	2.8	2.6	4.4	3.4	4.7	3.5
	Syncope	1.0	2.1	1.8	1.1	0.8	1.1	1.4
Indian	Back Pain	9.9	12.8	9.8	15.5	11.8	10.2	11.2
	Breathlessness	60.9	56.4	56.8	59.6	55.9	58.1	58.2
	Chest Pain	63.2	62.0	62.4	65.7	59.4	59.2	57.1
	Diaphoresis	27.7	27.2	32.3	30.7	22.6	29.2	25.9
	Epigastric Pain	6.7	7.5	7.1	6.5	7.6	8.2	6.2
	Jaw Pain	3.6	4.9	5.3	4.9	1.0	3.4	1.5
	Shoulder Pain	9.5	7.9	4.9	6.8	8.0	9.1	6.5
	Syncope	0.8	2.3	1.9	1.0	1.0	0.9	0.9
Others	Back Pain	10.8	5.9	7.4	6.9	7.7	9.1	7.3
	Breathlessness	46.0	70.6	55.6	51.7	65.4	56.8	54.6
	Chest Pain	59.5	38.2	59.3	65.5	57.7	54.6	45.5
	Diaphoresis	18.9	23.5	22.2	24.1	30.8	11.4	21.8
	Epigastric Pain	5.4	0.0	22.2	6.9	3.9	9.1	1.8
	Jaw Pain	5.4	0.0	0.0	3.5	0.0	2.3	1.8
	Shoulder Pain	10.8	5.9	0.0	10.3	11.5	4.6	9.1
	Syncope	2.7	11.8	0.0	0.0	3.9	0.0	1.8

#### 8.4 Symptoms of AMI by Subtype, 2007 – 2013

Symptoms of chest pain and diaphoresis were more prevalent among patients diagnosed with STEMI, while breathlessness was more prevalent among patients diagnosed with NSTEMI (Table 8.4.1).

**Table 8.4.1 Symptoms of AMI (%) by Subtype**

Subtype	Symptom	2007	2008	2009	2010	2011	2012	2013
STEMI	Back Pain	5.2	7.1	6.8	6.6	7.9	7.7	6.9
	Breathlessness	53.1	51.4	53.3	53.4	54.5	56.2	55.6
	Chest Pain	78.4	80.1	81.7	80.7	80.2	80.7	80.1
	Diaphoresis	52.8	53.5	56.8	56.7	56.5	55.5	55.8
	Epigastric Pain	7.3	6.6	5.9	5.6	6.4	5.1	6.2
	Jaw Pain	2.9	3.8	4.2	4.8	4.0	3.9	4.4
	Shoulder Pain	4.4	5.5	5.4	5.7	4.4	5.4	5.6
	Syncope	2.5	4.0	2.4	3.0	1.8	2.5	2.8
NSTEMI	Back Pain	3.8	4.1	4.8	4.7	5.3	4.5	5.0
	Breathlessness	56.8	53.9	54.3	57.3	57.7	57.3	55.8
	Chest Pain	53.3	50.8	53.2	54.0	53.5	52.7	49.9
	Diaphoresis	23.5	22.3	23.5	25.4	23.9	24.1	21.5
	Epigastric Pain	6.5	5.4	5.5	6.0	5.9	4.9	4.7
	Jaw Pain	2.0	2.2	2.6	2.4	2.4	2.8	2.2
	Shoulder Pain	3.4	3.6	4.2	3.6	4.1	4.7	3.5
	Syncope	1.2	2.4	1.4	1.4	1.3	1.6	1.4

For both genders, chest pain and diaphoresis were more commonly observed among STEMI patients, while breathlessness was more commonly seen in NSTEMI patients (Tables 8.4.2A and 8.4.2B).

**Table 8.4.2A Symptoms of AMI (%) by Subtype for Males**

Subtype	Symptom	2007	2008	2009	2010	2011	2012	2013
STEMI	Back Pain	4.9	7.1	7.0	6.6	8.2	7.5	6.8
	Breathlessness	51.3	52.5	53.8	53.6	54.5	57.0	56.2
	Chest Pain	84.6	85.2	86.3	84.9	84.3	85.2	84.4
	Diaphoresis	57.8	58.3	60.8	61.9	60.7	60.1	60.8
	Epigastric Pain	7.2	6.3	5.4	4.4	6.3	4.6	5.2
	Jaw Pain	3.2	4.4	5.0	4.9	4.4	4.3	5.0
	Shoulder Pain	4.5	5.8	5.5	6.1	4.9	5.4	5.7
	Syncope	2.4	4.4	2.4	3.5	2.1	2.6	2.8
NSTEMI	Back Pain	3.3	4.1	5.0	4.2	5.6	4.5	4.9
	Breathlessness	56.9	54.5	55.1	57.6	58.6	58.0	57.3
	Chest Pain	56.5	55.3	58.0	58.4	58.2	56.8	55.7
	Diaphoresis	25.6	26.2	26.8	29.0	28.1	27.3	25.1
	Epigastric Pain	5.7	5.0	4.8	5.5	5.1	4.2	4.1
	Jaw Pain	2.3	2.6	2.7	2.5	3.1	3.2	2.7
	Shoulder Pain	3.7	4.0	4.9	3.9	4.6	4.6	3.7
	Syncope	1.4	2.4	1.4	1.7	1.6	1.7	1.5

**Table 8.4.2B Symptoms of AMI (%) by Subtype for Females**

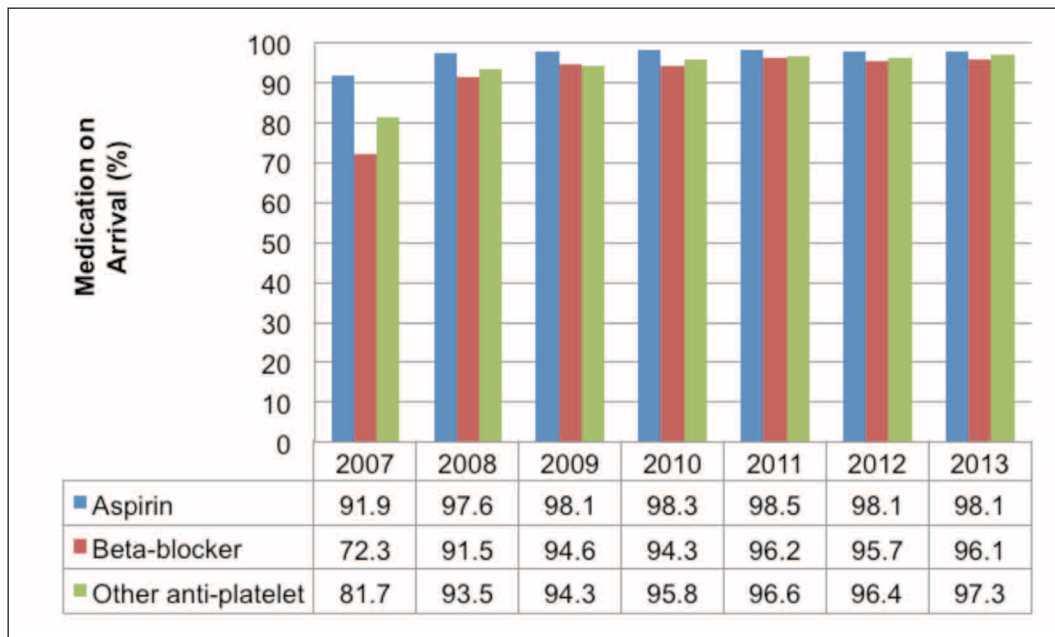
Subtype	Symptom	2007	2008	2009	2010	2011	2012	2013
STEMI	Back Pain	5.9	7.0	6.2	6.4	6.6	8.8	7.2
	Breathlessness	58.4	47.6	51.6	52.6	54.6	53.1	53.7
	Chest Pain	59.2	62.5	65.8	65.4	63.4	64.0	64.0
	Diaphoresis	37.4	37.3	43.2	37.9	38.8	38.3	37.4
	Epigastric Pain	7.7	7.5	7.5	9.7	6.8	6.9	9.9
	Jaw Pain	1.8	1.9	1.5	4.6	2.7	2.5	2.2
	Shoulder Pain	4.2	4.3	5.0	4.2	2.4	5.4	5.4
	Syncope	3.0	2.8	2.4	1.5	0.7	2.1	2.6
NSTEMI	Back Pain	4.5	4.1	4.5	5.5	4.9	4.7	5.1
	Breathlessness	56.8	53.2	53.3	57.0	56.4	56.2	53.8
	Chest Pain	48.7	44.2	45.8	47.3	46.1	46.3	41.6
	Diaphoresis	20.4	16.8	18.5	20.1	17.5	19.2	16.4
	Epigastric Pain	7.5	5.9	6.6	6.8	7.2	5.9	5.6
	Jaw Pain	1.5	1.6	2.4	2.2	1.3	2.2	1.5
	Shoulder Pain	3.0	3.0	3.2	3.2	3.5	5.0	3.2
	Syncope	0.9	2.5	1.5	0.9	0.9	1.3	1.2

## 9. MEDICATIONS, 2007 – 2013

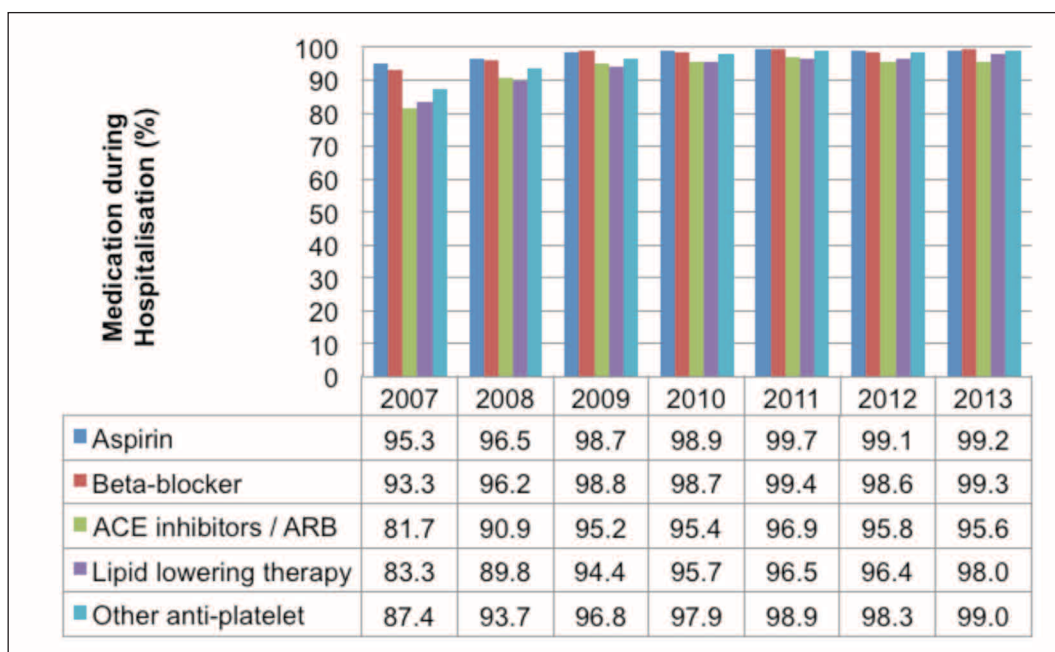
### 9.1 Medications, 2007 – 2013

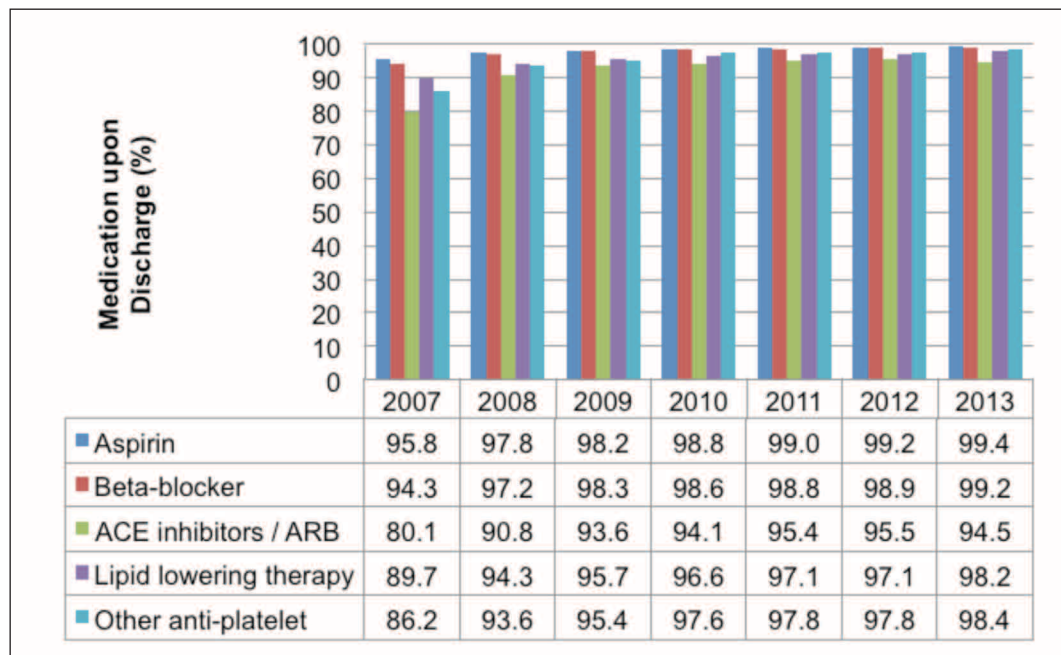
Over the 7-year period, the proportions of patients given medications such as aspirin, beta blockers, lipid lowering therapy and other anti-platelet agents have plateaued over the years and exceeded 95% in 2013 (Figures 9.1.1 to 9.1.3).

**Figure 9.1.1 Medications on Arrival (%)**



**Figure 9.1.2 Medications during Hospitalisation (%)**



**Figure 9.1.3 Medications upon Discharge (%)**

## 10. IN-PATIENT COMPLICATIONS AND EVENTS, 2007 – 2013

### 10.1 In-Patient Complications and Events, 2007 – 2013

Generally, the proportions of AMI patients with various complications and events during hospital stay had been decreasing over the years. Arrhythmic complications were found to be the most common complication after the onset of AMI (Table 10.1.1).

**Table 10.1.1 All In-Patient Complications (%)**

Complication	2007	2008	2009	2010	2011	2012	2013
Arrhythmic complications	42.5	46.3	61.4	62.8	62.9	61.6	56.6
Cardiogenic shock	3.7	3.7	4.2	3.9	3.5	3.0	2.4
Complete heart block	1.4	1.3	1.8	1.3	0.9	1.0	1.0
Heart failure	17.8	15.4	15.3	14.5	13.9	13.6	11.3
Reinfarction	3.1	2.5	2.2	1.8	1.7	1.2	1.1

Left ventricular systolic dysfunction (ejection fraction <50%) was the most common event that occurred when the patients were hospitalised (Table 10.1.2).

**Table 10.1.2 All In-Patient Events (%)**

Complication	2007	2008	2009	2010	2011	2012	2013
Acute renal failure	9.3	12.7	11.7	10.0	9.4	8.5	7.8
Cerebrovascular accident	2.1	2.2	1.7	1.4	1.6	1.8	1.8
Left ventricular systolic disorder	40.4	40.8	44.6	41.4	42.1	40.9	40.9

**Figure 10.1.1 Top 5 In-Patient Complications and Events (%)**

