Singapore Myocardial Infarction Registry

National Registry of Diseases Office
(NRDO)
Acknowledgement

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1. GLOSSARY

AMI       Acute Myocardial Infarction
ASIR      Age-Standardised Incidence Rate
ASMR      Age-Standardised Mortality Rate
CCPS      Central Claims Processing Systems
C&S       Casemix and Subvention
DOS       Department of Statistics
ECG       Electrocardiogram
EMR       Electronic Medical Records
GP        General Practitioner
HIDS      Hospital In-patient Discharge Summary
HSA       Health Sciences Authority
MHA       Ministry of Home Affairs
MOH       Ministry of Health
MONICA    Monitoring Trends and Determinants in Cardiovascular Disease, World Health Organization
NRDO      National Registry of Diseases Office
SCDB      Singapore Cardiac Databank
SMIR      Singapore Myocardial Infarction Registry
2. HIGHLIGHTS OF THE REPORT

Period:

An analysis of the SMIR data for the period 2007 to 2013 was conducted.

Findings:

**AMI Incidence & Rates**

- The number of AMI episodes had increased from 6,817 episodes in 2007 to 9,338 episodes in 2013. Similarly, the crude incidence rate had increased from 234.7 per 100,000 population in 2007 to 289.2 per 100,000 population in 2013. (Figure 5.1.1)

- The overall AMI age-standardised incidence rate (ASIR) generally showed an increasing trend over the years, with a notable peak in 2012. (Table 5.1.1)

- The overall median incident age of AMI onset was around 68 to 69 years old. Men suffer from AMI at a younger age as compared to women in 2007 to 2013. (Table 5.1.2)

- The age-specific incidence rate increased with increasing age. (Figure 5.1.2)

- The ASIR for males were 2.2 to 2.4 times of that for females during the observed period. The ASIR for both genders had generally risen over the years. (Table 5.1.3)

- Compared to Chinese, Malays and Indians had higher ASIR throughout the 7-year period. The three main ethnic groups generally showed an upward trend in ASIR over the years. (Table 5.1.4)

**AMI Mortality & Rates**

- The number of AMI deaths had decreased from 1,356 in 2007 to 1,161 in 2013. Similarly, the crude AMI mortality rate had decreased from 46.7 per 100,000 population in 2007 to 36.0 per 100,000 population in 2013. (Figure 5.2.1)

- The overall age-standardised mortality rate (ASMR) had decreased every year since 2008. (Table 5.2.1)

- Age-specific mortality rate increased with increasing age. (Figure 5.2.2)

- The ASMR for males were 1.7 to 1.9 times of that for females during the observed period. The ASMR had declined in both genders from 2008 to 2013. (Table 5.2.2)
• Indians had the highest ASMR in 2007 and 2008, but this was surpassed by the Malays from 2009 onwards. The ASMR for Chinese, Malays and Indians showed a downward trend from 2008, 2009 and 2011 onwards respectively. (Table 5.2.3)

AMI Case Fatality & Rates

• The number of AMI deaths within 30 days from onset had decreased from 1,095 in 2007 to 831 in 2013. Similarly, the crude AMI case fatality rate had decreased from 16.1% in 2007 to 8.9% in 2013. (Figure 5.3.1)

• The 30-day case fatality rate for females was higher than that for males throughout the seven years. The case fatality rates for both genders decreased yearly since 2008. (Table 5.3.1)

• Chinese had the highest 30-day case fatality rate for most of the years, except for 2009, where Malays had the highest rate. The case fatality rates for all ethnic groups had been decreasing over the years. (Table 5.3.2)
3. INTRODUCTION

The National Registry of Diseases Office (NRDO) collects and analyses epidemiological data to support the national disease management plans, policy formulation and programme planning.

The Acute Myocardial Infarction Registry was established and managed by Ministry of Health (MOH) from 1988. It was subsequently transferred to Singapore Cardiac Databank (SCDB) in 2002. In April 2007, NRDO took over the management of the registry which was re-named to the Singapore Myocardial Infarction Registry (SMIR). SMIR collects epidemiological data on acute myocardial infarction (AMI) cases diagnosed in all the public sector hospitals\(^1\) and a small number of AMI deaths that occur at home which have been certified by medical practitioners in Singapore. Legislation mandated notification from private hospitals from September 2012 onwards.

\(^1\) Include the National Heart Centre(NHC), Singapore General Hospital (SGH), Changi General Hospital (CGH), Tan Tock Seng Hospital (TTSH), Alexandra Hospital (AH), Khoo Teck Puat (KTPH) and National University Hospital (NUH).
4. METHODOLOGY

Data source for case finding
The sources of data included the cardiac biomarkers (Troponin T and Troponin I) listing generated by the laboratories in the restructured hospitals, Mediclaims listing, Hospital In-patient Discharge Summary (HIDS), Casemix and Subvention (C&S) listing and death data from the Ministry of Home Affairs (MHA) and the Health Science Authority (HSA).

Mediclaims, formally the Central Claims Processing Systems (CCPS), is the main source of case finding from 2008 to 2013. In addition, the use of more sensitive enzyme listing has increasingly become an important source of case finding. The use of more sensitive enzyme assays i.e. Troponin T and Troponin I in the diagnosis of AMI patients from 2007 onwards. Data collection from HSA on necropsies conducted on AMI patients began in 2007.

International Classification of Diseases 9th Revision (ICD-9 Clinical Modification) code of 410 was used to identify AMI cases in the data sources from 2008 – 2011, while ICD-10 codes I21 and I22 were used for AMI cases diagnosed in 2012 – 2013. A master patient list was created by merging data from these sources using the patient NRIC numbers as identifiers.

The SMIR coordinators extract detailed information from the case-notes at the medical record offices of the hospitals. For unmatched cases (mainly from the enzyme and HIDS listings), the coordinators would confirm the diagnosis of AMI by viewing the electronic medical records (EMR) of patients, before extracting relevant clinical information from the case-notes. NRDO also sent letters to the medical practitioners to confirm AMI as the cause of death for the small number of cases that appeared in the Death Registry before registering these cases.

The MONICA criteria were used for defining episodes. Recurrence of AMI after 28 days of a recorded AMI episode was counted as another episode.

Incidence
For the computation of new cases of AMI, the population of AMI patients for a particular year was extracted based on the date that the AMI episode occurred. AMI episodes included in this report were diagnosed as:

(a) Definitive AMI –
- Definite ECG changes, or
- Symptoms (typical or atypical), together with probable ECG changes and raised cardiac enzyme levels suggestive of myocardial necrosis, or
- Typical symptoms and abnormal enzymes with ischaemic changes/ non-codable/ unavailable ECG.
(b) 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 >20mins
  - Raised biochemical markers of myocardial necrosis
  - Serial ECG tracings showing ST-T changes from baseline or Q waves duration that are 0.03 seconds in two or more contiguous leads

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

(d) Death cases signed by pathologists or GPs as AMI, but without necropsy done.

Mortality rate
Deaths were reported and updated till 30 September 2014 for all patients registered in the SMIR within the period of analysis by matching the patients’ NRIC with death information imported from the Death Registry, Ministry of Home Affairs. Patients with AMI as primary cause of death were analysed.

Case fatality rate
Case fatalities were calculated for AMI episodes, which died of AMI within 30 days after presentation with AMI.

Population estimates
In this report, mid-year population estimates from the Department of Statistics (DOS) was used to generate age-specific incidence and mortality rates. All age-standardised rates given in this report, were derived by the direct method, where population denominators used in the calculation of age-standardised incidence and mortality rates were derived using the Segi World Population as population denominators.

Note that the statistics presented in this report refer to only Singapore citizens and permanent residents diagnosed with AMI episodes from 2007 to 2013 (inclusive) as they stood on 25th November 2014. Hence, the figures are preliminary and will be updated accordingly when more recent data have been captured by the Registry.
5. TABLES AND FIGURES

5.1 New cases of AMI, 2007 – 2013

The number of AMI episodes had increased from 6,817 episodes in 2007 to 9,338 episodes in 2013. Similarly, the crude incidence rate had increased from 234.7 per 100,000 population in 2007 to 289.2 per 100,000 population in 2013 (Figure 5.1.1).

Figure 5.1.1: Incidence and Crude Incidence Rate (per 100,000 population), 2007 – 2013

The overall AMI age-standardised incidence rate (ASIR) had increased from 189.4 per 100,000 population in 2009 to 218.3 per 100,000 population in 2013, with a notable peak of 223.1 per 100,000 population in 2012 (Table 5.1.1).

Table 5.1.1: Age-standardised Incidence Rate (per 100,000 population), 2007 – 2013

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>208.9</td>
<td>212.4</td>
<td>189.4</td>
<td>194.5</td>
<td>204.6</td>
<td>223.1</td>
<td>218.3</td>
</tr>
<tr>
<td>95% CI</td>
<td>(203.9-214.0)</td>
<td>(207.4-217.3)</td>
<td>(184.9-194.0)</td>
<td>(190.0-199.0)</td>
<td>(200.1-209.2)</td>
<td>(218.4-227.7)</td>
<td>(213.8-222.8)</td>
</tr>
</tbody>
</table>
The overall median incident age of AMI onset was around 68 to 69 years old. Men suffer from AMI at a younger age as compared to women in 2007 to 2013. The median age of AMI onset was 64 for males and 77 for females in 2013 (Table 5.1.2).

Table 5.1.2: Mean and Median Age at onset, 2007 – 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Median Age</td>
<td>68.5</td>
<td>68.8</td>
<td>68.3</td>
<td>68.9</td>
<td>69.1</td>
<td>68.5</td>
<td>69.2</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>67.6</td>
<td>67.9</td>
<td>67.4</td>
<td>67.9</td>
<td>68.3</td>
<td>68.4</td>
<td>68.8</td>
</tr>
<tr>
<td>Gender</td>
<td>Year</td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Male</td>
<td>Median Age</td>
<td>64.4</td>
<td>64.1</td>
<td>62.6</td>
<td>63.2</td>
<td>63.9</td>
<td>64.3</td>
<td>64.4</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>64.5</td>
<td>64.6</td>
<td>63.7</td>
<td>64.4</td>
<td>64.9</td>
<td>65.2</td>
<td>65.1</td>
</tr>
<tr>
<td>Female</td>
<td>Median Age</td>
<td>75.3</td>
<td>75.7</td>
<td>75.9</td>
<td>76.1</td>
<td>76.3</td>
<td>75.9</td>
<td>77.4</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>73.5</td>
<td>74.1</td>
<td>74.4</td>
<td>74.4</td>
<td>74.9</td>
<td>74.4</td>
<td>75.4</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Year</td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Chinese</td>
<td>Median Age</td>
<td>70.9</td>
<td>70.6</td>
<td>70.0</td>
<td>71.1</td>
<td>71.5</td>
<td>71.7</td>
<td>72.6</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>69.5</td>
<td>69.9</td>
<td>69.2</td>
<td>69.9</td>
<td>70.3</td>
<td>70.5</td>
<td>71.1</td>
</tr>
<tr>
<td>Malay</td>
<td>Median Age</td>
<td>65.7</td>
<td>65.0</td>
<td>64.8</td>
<td>63.3</td>
<td>64.3</td>
<td>63.6</td>
<td>63.9</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>64.7</td>
<td>64.5</td>
<td>64.7</td>
<td>64.1</td>
<td>64.8</td>
<td>64.4</td>
<td>64.5</td>
</tr>
<tr>
<td>Indian</td>
<td>Median Age</td>
<td>60.4</td>
<td>61.6</td>
<td>61.1</td>
<td>61.8</td>
<td>62.2</td>
<td>62.4</td>
<td>62.0</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>62.0</td>
<td>63.2</td>
<td>62.8</td>
<td>63.6</td>
<td>63.3</td>
<td>63.7</td>
<td>63.7</td>
</tr>
<tr>
<td>Others</td>
<td>Median Age</td>
<td>67.7</td>
<td>70.8</td>
<td>64.0</td>
<td>67.3</td>
<td>65.8</td>
<td>64.5</td>
<td>66.4</td>
</tr>
<tr>
<td></td>
<td>Mean Age</td>
<td>65.5</td>
<td>69.0</td>
<td>64.7</td>
<td>66.8</td>
<td>65.8</td>
<td>66.1</td>
<td>67.4</td>
</tr>
</tbody>
</table>

The age-specific incidence rate increased with increasing age (Figure 5.1.2).

Figure 5.1.2: Age-specific Incidence Rate (per 100,000 population), 2013
There were more men who suffered from AMI than women throughout the observed period. The number of AMI episodes increased every year for both genders from 2009 onwards (Figure 5.1.3).

**Figure 5.1.3: Incidence by Gender, 2007 – 2013**

![Incidence by Gender, 2007 – 2013](image)

The ASIR for males were 2.2 to 2.4 times of that for females. The ASIR for both genders had generally risen over the years (Table 5.1.3).

**Table 5.1.3: Age-standardised Incidence Rate (per 100,000 population) by Gender, 2007 – 2013**

<table>
<thead>
<tr>
<th>Gender</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>295.5</td>
<td>299.6</td>
<td>268.8</td>
<td>278.2</td>
<td>295.8</td>
<td>320.5</td>
<td>308.3</td>
</tr>
<tr>
<td>95% CI</td>
<td>(286.6-304.3)</td>
<td>(290.9-308.3)</td>
<td>(260.8-276.8)</td>
<td>(270.2-286.2)</td>
<td>(287.8-303.9)</td>
<td>(312.3-328.7)</td>
<td>(300.4-316.1)</td>
</tr>
<tr>
<td>Female</td>
<td>130.2</td>
<td>132.3</td>
<td>114.5</td>
<td>117.3</td>
<td>120.6</td>
<td>133.6</td>
<td>133.7</td>
</tr>
<tr>
<td>95% CI</td>
<td>(124.8-135.5)</td>
<td>(127.1-137.6)</td>
<td>(109.7-119.3)</td>
<td>(112.5-122.0)</td>
<td>(115.9-125.4)</td>
<td>(128.8-138.4)</td>
<td>(129.0-138.3)</td>
</tr>
</tbody>
</table>
Most of the AMI episodes were Chinese, followed by Malays, then Indians for the entire observed period. The number of AMI episodes for the three main ethnic groups had increased gradually over the years (Figure 5.1.4).

**Figure 5.1.4: Incidence by Ethnic Group, 2007 – 2013**

Compared to Chinese, Malays and Indians had higher ASIR throughout the 7-year period. The three main ethnic groups generally showed an upward trend in ASIR over the years (Table 5.1.4).

**Table 5.1.4: Age-standardised Incidence Rate (per 100,000 population) by Ethnic Group, 2007 – 2013**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>172.6</td>
<td>171.9</td>
<td>151.5</td>
<td>158.2</td>
<td>163.4</td>
<td>176.8</td>
<td>174.0</td>
</tr>
<tr>
<td>95% CI</td>
<td>(167.6-177.7)</td>
<td>(166.9-176.8)</td>
<td>(147.0-156.0)</td>
<td>(153.7-162.7)</td>
<td>(158.9-167.8)</td>
<td>(172.2-181.4)</td>
<td>(169.6-178.5)</td>
</tr>
<tr>
<td>Malay</td>
<td>359.0</td>
<td>396.3</td>
<td>364.8</td>
<td>373.6</td>
<td>410.3</td>
<td>455.4</td>
<td>440.4</td>
</tr>
<tr>
<td>95% CI</td>
<td>(337.8-380.3)</td>
<td>(374.5-418.1)</td>
<td>(344.5-385.2)</td>
<td>(353.4-393.9)</td>
<td>(389.2-431.4)</td>
<td>(434.0-476.8)</td>
<td>(419.9-460.9)</td>
</tr>
<tr>
<td>Indian</td>
<td>399.8</td>
<td>422.3</td>
<td>385.4</td>
<td>371.7</td>
<td>414.0</td>
<td>432.3</td>
<td>408.2</td>
</tr>
<tr>
<td>95% CI</td>
<td>(372.4-427.2)</td>
<td>(394.9-449.6)</td>
<td>(359.8-410.9)</td>
<td>(347.1-396.3)</td>
<td>(388.2-439.7)</td>
<td>(406.8-457.7)</td>
<td>(384.1-432.3)</td>
</tr>
<tr>
<td>Others</td>
<td>281.3</td>
<td>194.7</td>
<td>148.2</td>
<td>146.3</td>
<td>130.3</td>
<td>190.3</td>
<td>207.9</td>
</tr>
<tr>
<td>95% CI</td>
<td>(231.2-331.3)</td>
<td>(154.4-234.9)</td>
<td>(115.5-180.9)</td>
<td>(113.8-178.8)</td>
<td>(100.7-159.9)</td>
<td>(156.3-224.3)</td>
<td>(172.6-243.2)</td>
</tr>
</tbody>
</table>
5.2 Deaths from AMI, 2007 – 2013

The number of AMI deaths had decreased from 1,356 in 2007 to 1,161 in 2013. Similarly, the crude AMI mortality rate had decreased from 46.7 per 100,000 population in 2007 to 36.0 per 100,000 population in 2013 (Figure 5.2.1).

Figure 5.2.1: Incidence and Crude Mortality Rate (per 100,000 population), 2007 – 2013

The overall age-standardised mortality rate (ASMR) had decreased every year from 45.2 per 100,000 population in 2008 to 25.8 per 100,000 population in 2013 (Table 5.2.1).

Table 5.2.1: Age-standardised Mortality Rate (per 100,000 population), 2007 – 2013

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>40.8</td>
<td>45.2</td>
<td>37.7</td>
<td>33.6</td>
<td>29.6</td>
<td>28.7</td>
<td>25.8</td>
</tr>
<tr>
<td>95% CI</td>
<td>(38.6-43.0)</td>
<td>(43.0-47.5)</td>
<td>(35.6-39.7)</td>
<td>(31.7-35.4)</td>
<td>(27.9-31.4)</td>
<td>(27.0-30.3)</td>
<td>(24.3-27.3)</td>
</tr>
</tbody>
</table>
Age-specific mortality rate increased with increasing age (Figure 5.2.2).

**Figure 5.2.2: Age-specific Mortality Rate (per 100,000 population), 2013**

There were more men who died from AMI than women over the 7-year period. The numbers of men and women dying from AMI had fallen over the years (Figure 5.2.3).

**Figure 5.2.3: Mortality by Gender, 2007 – 2013**
Although men were about twice as likely as women to suffer from AMI each year (Table 5.1.3), men were less than 2 times as likely as women to die from AMI each year (Table 5.2.2). The ASMR had declined in both genders from 2008 to 2013.

Table 5.2.2: Age-standardised Mortality Rate (per 100,000 population) by Gender, 2007 – 2013

<table>
<thead>
<tr>
<th>Gender</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>54.2</td>
<td>60.3</td>
<td>48.2</td>
<td>43.6</td>
<td>40.2</td>
<td>38.3</td>
<td>33.9</td>
</tr>
<tr>
<td>Female</td>
<td>29.8</td>
<td>32.3</td>
<td>28.1</td>
<td>24.9</td>
<td>20.8</td>
<td>20.6</td>
<td>18.7</td>
</tr>
<tr>
<td>95% CI</td>
<td>(50.3-58.1)</td>
<td>(56.3-64.2)</td>
<td>(44.7-51.6)</td>
<td>(40.4-46.9)</td>
<td>(37.2-43.3)</td>
<td>(35.4-41.2)</td>
<td>(31.2-36.5)</td>
</tr>
<tr>
<td>95% CI</td>
<td>(27.2-32.3)</td>
<td>(29.8-34.9)</td>
<td>(25.7-30.4)</td>
<td>(22.8-27.0)</td>
<td>(18.9-22.8)</td>
<td>(18.8-22.4)</td>
<td>(17.0-20.3)</td>
</tr>
</tbody>
</table>

The number of AMI deaths was highest among Chinese, followed by Malays, then Indians for all seven years. The numbers had generally fallen across the various ethnic groups during the observed period (Figure 5.2.4).

Figure 5.2.4: Mortality by Ethnic Group, 2007 – 2013

0 200 400 600 800 1000 1200
AMI death

2007 2008 2009 2010 2011 2012 2013
Chinese 951 1112 926 925 819 856 838
Malay 219 263 305 248 236 232 212
Indian 164 179 134 121 132 129 90
Others 22 11 10 17 11 11 21
Indians had the highest ASMR in 2007 and 2008, but this was surpassed by the Malays from 2009 onwards. The ASMR for Chinese, Malays and Indians showed a downward trend from 2008, 2009 and 2011 onwards respectively (Table 5.2.3).

**Table 5.2.3: Age-standardised Mortality Rate (per 100,000 population) by Ethnic Group, 2007 – 2013**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>34.4</td>
<td>38.4</td>
<td>30.4</td>
<td>28.4</td>
<td>24.2</td>
<td>23.6</td>
<td>21.9</td>
</tr>
<tr>
<td>95% CI</td>
<td>(32.2-36.6)</td>
<td>(36.1-40.7)</td>
<td>(28.4-32.4)</td>
<td>(26.6-30.3)</td>
<td>(22.5-25.8)</td>
<td>(22.0-25.3)</td>
<td>(20.4-23.4)</td>
</tr>
<tr>
<td>Malay</td>
<td>65.6</td>
<td>80.1</td>
<td>88.1</td>
<td>68.4</td>
<td>64.4</td>
<td>59.5</td>
<td>51.3</td>
</tr>
<tr>
<td>95% CI</td>
<td>(56.7-74.6)</td>
<td>(70.1-90.1)</td>
<td>(77.9-98.4)</td>
<td>(59.5-77.2)</td>
<td>(55.8-73.0)</td>
<td>(51.6-67.4)</td>
<td>(44.2-58.4)</td>
</tr>
<tr>
<td>Indian</td>
<td>78.1</td>
<td>81.2</td>
<td>58.1</td>
<td>51.0</td>
<td>52.1</td>
<td>48.7</td>
<td>33.2</td>
</tr>
<tr>
<td>95% CI</td>
<td>(65.7-90.5)</td>
<td>(68.9-93.5)</td>
<td>(47.9-68.3)</td>
<td>(41.6-60.4)</td>
<td>(42.8-61.3)</td>
<td>(40.1-57.3)</td>
<td>(26.2-40.3)</td>
</tr>
<tr>
<td>Others</td>
<td>46.3</td>
<td>22.8</td>
<td>15.3</td>
<td>28.1</td>
<td>15.0</td>
<td>14.9</td>
<td>30.0</td>
</tr>
<tr>
<td>95% CI</td>
<td>(26.2-66.4)</td>
<td>(8.9-36.7)</td>
<td>(5.7-24.9)</td>
<td>(13.9-42.3)</td>
<td>(5.7-24.3)</td>
<td>(5.9-23.9)</td>
<td>(16.5-43.6)</td>
</tr>
</tbody>
</table>
5.3 30-Day Case Fatality of AMI, 2007 – 2013

The number of AMI deaths within 30 days from onset had decreased from 1,095 in 2007 to 831 in 2013. Similarly, the crude AMI case fatality rate had decreased from 16.1% in 2007 to 8.9% in 2013, likely due to an improvement in the management of patients diagnosed with AMI (Figure 5.3.1).

Figure 5.3.1: Case Fatality and Overall Case Fatality Rate (%), 2007 – 2013

Although more men than women died from AMI within 30 days from onset, there was a larger decline in the number of AMI deaths within 30 days among men as compared to women over the 7-year period (Figure 5.3.2).

Figure 5.3.2: Case Fatality by Gender, 2007 – 2013
Although men were more likely to die from AMI each year as compared to women (Table 5.2.2), the 30-day case fatality rate for females was higher than that for males throughout the seven years. This is likely due to women having an older median age at onset (more than 10 years older) than males (Table 5.3.1).

**Table 5.3.1: Case-Fatality Rate (%) by Gender, 2007 – 2013**

<table>
<thead>
<tr>
<th>Gender</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>14.8</td>
<td>15.3</td>
<td>13.7</td>
<td>11.7</td>
<td>9.8</td>
<td>8.6</td>
<td>8.3</td>
</tr>
<tr>
<td>Female</td>
<td>18.4</td>
<td>19.0</td>
<td>18.5</td>
<td>16.3</td>
<td>12.8</td>
<td>12.5</td>
<td>10.0</td>
</tr>
</tbody>
</table>

The highest number of AMI deaths came from Chinese, followed by Malays, then Indians consistently across the years. The number of AMI deaths within 30 days from onset had generally fallen across the various ethnic groups during the observed period (Figure 5.3.3).

**Figure 5.3.3: Case Fatality by Ethnic Group, 2007 – 2013**

![AMI death within 30 days](chart.png)

- Chinese: 774, 867, 713, 693, 597, 656, 613
- Malay: 169, 205, 217, 187, 175, 154, 142
- Indian: 133, 129, 103, 84, 89, 87, 60
- Others: 19, 4, 9, 12, 7, 12, 16
Although Chinese were less likely to get AMI (Table 5.1.4) and die from AMI each year (Table 5.2.3) as compared to Malays and Indians, Chinese had the highest 30-day case fatality rate for most of the years, except for 2009, where Malays had the highest rate. This is likely due to Chinese having an older median age at onset than Malays and Indians (Table 5.3.1). The case fatality rates for all ethnicity groups had been decreasing over the years (Table 5.3.2).

Table 5.3.2: Case-Fatality Rate (%) by Ethnic Group, 2007 – 2013

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>16.7</td>
<td>18.0</td>
<td>16.0</td>
<td>14.1</td>
<td>11.3</td>
<td>11.0</td>
<td>9.9</td>
</tr>
<tr>
<td>Malay</td>
<td>14.4</td>
<td>15.2</td>
<td>16.5</td>
<td>13.2</td>
<td>11.2</td>
<td>8.4</td>
<td>7.7</td>
</tr>
<tr>
<td>Indian</td>
<td>15.1</td>
<td>13.2</td>
<td>11.0</td>
<td>9.0</td>
<td>8.4</td>
<td>7.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Others</td>
<td>14.1</td>
<td>4.0</td>
<td>9.7</td>
<td>13.2</td>
<td>8.0</td>
<td>8.8</td>
<td>10.7</td>
</tr>
</tbody>
</table>