Chronic Disease Burden in China

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Ten Leading Causes of Death 1900 and 1990, USA

- Pneumonia & Influenza
- Tuberculosis
- Gastroenteritis
- Heart Disease
- Stroke
- Nephritis
- Cancer
- Accidents
- Diphtheria
- Chronic Lung Disease
- Suicide
- Chronic Liver Disease
- Diabetes Mellitus
- Other

Percent of Total Mortality

AHA, 2005
Death Rates for Major CVD in the US from 1900 to 1997

Projected Global Distribution of All Deaths (58 million) by Major Cause, 2005

- Cardiovascular diseases: 30%
- Diabetes mellitus: 2%
- Cancer: 13%
- Communicable, maternal, and perinatal conditions, and nutritional deficiencies: 30%
- Chronic respiratory diseases: 7%
- Other chronic diseases: 9%
- Injuries: 9%

Epidemiological Transition

- Epidemiological transition refers to the shift in the pattern of disease in a population away from infectious and deficiency diseases to chronic noncommunicable diseases.
- There are several factors involved in the epidemiological transition.
  - Demographic changes
  - Changes in risk factors, including biological factors (microorganisms), environmental factors, social, cultural and behavioral factors and clinical medicine.
- Demographic transition
- Nutrition transition
- Economic development
- Industrialization and urbanization

- Decline in infant mortality and mortality from infectious diseases
- Increase in life expectancy
• Unhealthy diet
  – high calorie
  – high fat
  – high salt
• Physical inactivity
• Cigarette smoking
• Stress
Proportionate Mortality for the Ten Leading Causes of Death in China, 1957

- Respiratory diseases: 36.4%
- Acute infectious disease: 7.9%
- Tuberculosis: 7.5%
- Digestive diseases: 7.3%
- Heart diseases: 6.6%
- Stroke: 5.5%
- Cancer: 5.2%
- Neuropsychiatric Disorders: 4.1%
- Other: 2.7%

Age-standardized Mortality for the Five Leading Causes of Death in Men

Age-standardized Mortality for the Five Leading Causes of Death in Women

- Heart disease: 268.5
- Stroke: 242.3
- Cancer: 214.1
- Pneumonia & influenza: 45.9
- Infectious disease: 35.3

Age-standardized Mortality for the Five Leading Causes of Vascular Death

CPHD-chronic pulmonary heart disease; CHD-coronary heart disease; HF-heart failure; RHD-rheumatic heart disease
Age-standardized Mortality for the Five Leading Causes of Cancer Death

Age-specific Mortality for the Five Leading Causes of Death by Age Groups, China

Age-standardized Mortality for the Five Leading Causes of Death by Urbanization

- Cancer (Urban: 279.5, Rural: 330.7)
- Heart diseases (Urban: 271.0, Rural: 311.1)
- Stroke (Urban: 256.1, Rural: 304.1)
- Pneumonia & influenza (Urban: 42.4, Rural:)
- Diabetes mellitus (Urban: 25.6, Rural: )
- Heart diseases (Urban: 311.1, Rural: 304.1)
- Cancer (Urban: 330.7, Rural: )
- Stroke (Urban: 304.1, Rural: )
- Infectious diseases (Urban: 73.3, Rural: )
- Accidents (Urban: 65.7, Rural: )

Prevalence of hypertension among Chinese Men, ages 35 to 74 years, in the 1991 Chinese National Hypertension Survey and 2000–2001 InterASIA

Prevalence of hypertension among Chinese Women, ages 35 to 74 years, in the 1991 Chinese National Hypertension Survey and 2000–2001 InterASIA

Percentage of Persons with Hypertension Who Were Aware, Treated, and Controlled in China, 2000-2001

- **Aware**: Men: 39.5%, Women: 50.8%
- **Treated**: Men: 23.5%, Women: 33.8%
- **Controlled**: Men: 6.1%, Women: 10.5%
- **Treated & Controlled†**: Men: 26.1%, Women: 31.0%

†Among treated hypertensives
Multivariate-adjusted RRs of CVD according to deciles of SBP and DBP among 169,871 Chinese adults

Multivariate-adjusted RRs of CHD according to deciles of SBP and DBP among 169,871 Chinese adults

Multivariately adjusted RRs of stroke according to deciles of SBP and DBP among 169,871 Chinese adults

Multivariate-adjusted RRs of CVD according to combination of SBP and DBP levels among 169,871 Chinese adults
Multivariate-adjusted RRs of CHD according to combination of SBP and DBP levels among 169,871 Chinese adults
Multivariate-adjusted RRs of stroke according to combination of SBP and DBP levels among 169,871 Chinese adults.
Multivariate-adjusted RRs (95% CI) of CVD, CHD, and stroke according to BPs by age, BMI, and cigarette smoking among 169 871 Chinese adults

## RRs and PAR of CVD Deaths Attributable to BP in China, 2005

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Pre-Hypertension</th>
<th>Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.40 (1.25–1.56)</td>
<td>4.41 (3.98–4.88)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>13.2 (11.0–15.4)</td>
<td>52.2 (50.1–54.3)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.37 (1.21–1.56)</td>
<td>4.29 (3.82–4.82)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>11.3 (9.1–13.5)</td>
<td>50.4 (48.0–52.7)</td>
</tr>
</tbody>
</table>

### RRs and PAR of Stroke Deaths Attributable to BP in China, 2005

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Pre-Hypertension</th>
<th>Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.45 (1.25–1.67)</td>
<td>5.68 (4.99–6.47)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>14.6 (11.9–17.2)</td>
<td>60.0 (57.4–62.6)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.53 (1.28–1.82)</td>
<td>5.73 (4.90–6.72)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>15.3 (12.6–18.0)</td>
<td>59.4 (56.4–62.3)</td>
</tr>
</tbody>
</table>

### RRs and PAR of Premature CVD Deaths Attributable to BP in China, 2005

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Pre-Hypertension</th>
<th>Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.50 (1.29–1.74)</td>
<td>4.91 (4.28–5.65)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>16.0 (13.0–19.1)</td>
<td>55.6 (52.8–58.5)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR (95% CI)</td>
<td>1.00</td>
<td>1.42 (1.21–1.68)</td>
<td>4.43 (3.82–5.15)</td>
</tr>
<tr>
<td>PAR (95% CI), %</td>
<td>0.0</td>
<td>12.7 (9.7–15.6)</td>
<td>51.4 (48.3–54.6)</td>
</tr>
</tbody>
</table>

Total deaths attributable to BP in men and women in China, 2005

Cardiovascular disease

Men: 1,395.4
Women: 935.3

Cerebrovascular diseases

Men: 1,076.4
Women: 786.1

Coronary heart disease

Men: 184.7
Women: 100.6

Premature deaths attributable to BP in men and women in China, 2005

Total deaths attributable to BP in rural and urban in China, 2005

Cardiovascular disease
- Rural: 1,485.6
- Urban: 845.1

Cerebrovascular diseases
- Rural: 1,240.4
- Urban: 622.0

Coronary heart disease
- Rural: 156.8
- Urban: 128.5

Premature deaths attributable to BP in rural and urban in China, 2005

<table>
<thead>
<tr>
<th></th>
<th>Percent (SE)</th>
<th>Estimated Number* (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>34.3 (0.5)</td>
<td>163,253 (2568)</td>
</tr>
<tr>
<td>Men</td>
<td>60.2 (0.8)</td>
<td>147,358 (2522)</td>
</tr>
<tr>
<td>Women</td>
<td>6.9 (0.4)</td>
<td>15,895 (963)</td>
</tr>
</tbody>
</table>

* In thousands.

Prevalence of current cigarette smoking by age in China, 2000-2001

Prevalence of current cigarette smoking by age in China, 2000-2001

Relative risk of all-cause mortality in ever-smokers compared to never-smokers according to pack years smoked in men

<table>
<thead>
<tr>
<th>Pack years smoked</th>
<th>0</th>
<th>&lt;16.1</th>
<th>16.1–30.3</th>
<th>≥30.3</th>
<th>P-value for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of events</td>
<td>3841</td>
<td>1297</td>
<td>1785</td>
<td>3108</td>
<td></td>
</tr>
<tr>
<td>Person-years of follow-up</td>
<td>198936</td>
<td>96420</td>
<td>113587</td>
<td>115382</td>
<td></td>
</tr>
<tr>
<td>Age-standardized rate, /100,000</td>
<td>1278.8</td>
<td>1487.8</td>
<td>1607.2</td>
<td>1740.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age adjusted RR</td>
<td>1.00</td>
<td>1.10</td>
<td>1.20</td>
<td>1.29</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Multivariable adjusted RR</td>
<td>1.00</td>
<td>1.10</td>
<td>1.18</td>
<td>1.26</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Relative risk of all-cause mortality in ever-smokers compared to never-smokers according to pack years smoked in women

<table>
<thead>
<tr>
<th>Pack years smoked</th>
<th>0</th>
<th>&lt;16.1</th>
<th>16.1–30.3</th>
<th>≥30.3</th>
<th>P-value for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of events</td>
<td>6195</td>
<td>644</td>
<td>457</td>
<td>418</td>
<td></td>
</tr>
<tr>
<td>Person-years of follow-up</td>
<td>493303</td>
<td>39221</td>
<td>21206</td>
<td>15661</td>
<td></td>
</tr>
<tr>
<td>Age-standardized rate, /100,000</td>
<td>1121.5</td>
<td>1380.5</td>
<td>1553.1</td>
<td>1585.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age adjusted RR</td>
<td>1.00</td>
<td>1.22</td>
<td>1.33</td>
<td>1.42</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Multivariable adjusted RR</td>
<td>1.00</td>
<td>1.22</td>
<td>1.29</td>
<td>1.38</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Multivariable-adjusted RR (95% CI)</th>
<th>Prevalence of smoking, %</th>
<th>Population attributable risk, %</th>
<th>Absolute number of deaths attributable to smoking in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–54</td>
<td>1.20 (1.07, 1.34)</td>
<td>72.1</td>
<td>12.7</td>
<td>55.6 (17.3, 93.8)</td>
</tr>
<tr>
<td>55–64</td>
<td>1.25 (1.15, 1.36)</td>
<td>70.6</td>
<td>15.0</td>
<td>82.4 (51.3, 113.6)</td>
</tr>
<tr>
<td>≥ 65</td>
<td>1.19 (1.12, 1.26)</td>
<td>67.8</td>
<td>11.2</td>
<td>400.2 (315.8, 484.6)</td>
</tr>
<tr>
<td>Total</td>
<td>1.21 (1.16, 1.26)</td>
<td>71.1</td>
<td>12.9</td>
<td>538.2 (455.8, 620.6)</td>
</tr>
</tbody>
</table>

RR, PAR and absolute number of deaths associated with tobacco smoking in Chinese women

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Multivariable-adjusted RR (95% CI)</th>
<th>Prevalence of smoking, %</th>
<th>Population attributable risk, %</th>
<th>Absolute number of deaths attributable to smoking in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–54</td>
<td>1.36 (1.13, 1.63)</td>
<td>7.8</td>
<td>2.7</td>
<td>7.6 (0, 15.7)</td>
</tr>
<tr>
<td>55–64</td>
<td>1.31 (1.17, 1.47)</td>
<td>11.4</td>
<td>3.4</td>
<td>12.7 (3.3, 22.1)</td>
</tr>
<tr>
<td>≥ 65</td>
<td>1.27 (1.18, 1.37)</td>
<td>15.3</td>
<td>4.0</td>
<td>114.6 (79.4, 149.8)</td>
</tr>
<tr>
<td>Total</td>
<td>1.33 (1.25, 1.41)</td>
<td>9.9</td>
<td>3.1</td>
<td>134.8 (108.9, 160.8)</td>
</tr>
</tbody>
</table>

### Multivariate-adjusted Relative Risk of Total and Cause-specific Mortality Associated with Cigarette Smoking in China

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause</td>
<td>1.21 (1.16, 1.26)</td>
<td>1.33 (1.25, 1.41)</td>
</tr>
<tr>
<td>Cancer</td>
<td>1.55 (1.41, 1.70)</td>
<td>1.62 (1.42, 1.85)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>1.14 (1.02, 1.26)</td>
<td>1.43 (1.25, 1.65)</td>
</tr>
<tr>
<td>Vascular</td>
<td>1.17 (1.09, 1.26)</td>
<td>1.21 (1.10, 1.34)</td>
</tr>
</tbody>
</table>

Adjusted for age, education, physical activity, alcohol consumption, hypertension, obesity, diabetes, geographic region (north vs. south) and urbanization (urban vs. rural)
Population attributable risk of total and cause-specific mortality associated with cigarette smoking in China

Absolute number of total and cause-specific deaths attributable to cigarette smoking in China


In 2000-2001, 64 million (13.7%) Chinese adults aged 35-74 years had the metabolic syndrome as defined by ATP III.
Age-Standardized Prevalence of Body Mass Index Cut-points Among Men and Women Aged 35-74 Years in China, 2000-2001

Estimated Number of Overweight and Obese Adults Aged 35-74 Years in China, 2000-2001

Age-Standardized Prevalences of Diabetes among Chinese Adults 20 Years of Age or Older

Age-Specific Prevalences of Diabetes among Chinese Adults 20 Years of Age or Older

Age-Standardized Prevalences of Pre-diabetes among Chinese Adults 20 Years of Age or Older

Age-Specific Prevalences of Pre-diabetes among Chinese Adults 20 Years of Age or Older

Prevalences of Diabetes and Pre-diabetes among Chinese Adults 20 Years of Age or Older, According to Urban or Rural Residence

Absolute Numbers of Diabetes and Pre-diabetes among Chinese Adults 20 Years of Age or Older, According to Urban or Rural Residence

Conclusion

• Chronic diseases, including cardiovascular disease and cancer, are the leading causes of death in China.
• Cardiovascular risk factors, including high blood pressure, cigarette smoking, obesity, and diabetes pose an important global public health burden.
• Without effective interventions, chronic diseases will continue to increase in China.
• Control of modifiable risk factors for chronic disease in the community should be a national public health priority.
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  Appel LJ, Beaty T, Brancati FL, Charleston JB, Coresh J, Klag MJ, Meoni L

• Loyola University Chicago
  Whelton PK

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  Jaquish C, Kusek J, Loria C, Obarzanek E