Trends in the incidence of thyroid cancer, Israel, 1980-2012

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Israel Center for Disease Control
Israel Ministry of Health
Cancer of the thyroid

• Most commonly diagnosed endocrine cancer
• Incidence has risen worldwide over the past thirty years
• Primary histologic types:
  ▫ papillary (75-85% of cases)
  ▫ follicular (10-20%)
  ▫ poorly differentiated (medullary, anaplastic)
• Risk factors:
  ▫ Exposure to ionizing radiation
  ▫ Gender (3 times as common in women than in men)
  ▫ Age
  ▫ Family history
Table 1: Increase of thyroid cancer incidence rate in different countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Years</th>
<th>Variation of incidence (APC)</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>[27]</td>
<td>1982-2007</td>
<td>—</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>(Patients aged 15–30 years)</td>
<td></td>
<td>2000-2007</td>
<td>13.8</td>
<td>2000-2007</td>
<td>4.0</td>
</tr>
<tr>
<td>Canada</td>
<td>[28]</td>
<td>1970/72-1994/96</td>
<td>3.5*</td>
<td>3.5*</td>
<td>3.2*</td>
</tr>
<tr>
<td>[29]</td>
<td>2002-2008</td>
<td>7.3</td>
<td></td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>China (Shanghai)</td>
<td>[30]</td>
<td>1983-2000</td>
<td>—</td>
<td>2.6</td>
<td>—</td>
</tr>
<tr>
<td>UK</td>
<td><a href="http://info.cancerresearchuk.org/cancerstats/">http://info.cancerresearchuk.org/cancerstats/</a></td>
<td>1993-2008</td>
<td>2.3</td>
<td>2.3</td>
<td>0.6</td>
</tr>
<tr>
<td>USA</td>
<td>[12]</td>
<td>1998-2005</td>
<td>7.0</td>
<td>7.0</td>
<td>6.3</td>
</tr>
</tbody>
</table>

APC: annual percent change.
* Average annual percent increase.
† Percent temporal change (% increase) in the indicated period.
‡ Incidence increase in the indicated period.

Population of Israel

- **8.2 million as of December 31, 2014**
  - Jewish—75.0%
  - Arab—20.7%
  - Ages 0-14: 28.2%
  - Ages 65+: 10.7%

- **Life expectancy at birth, 2013**
  - Males 80.3 years
  - Females 83.9 years

- **Immigrants**
  - 24.7% of the Jewish population born overseas
Population of Israel, 2014

Jewish

Arab

population in thousands

age group

population in thousands

age group
Israel National Cancer Registry (INCR)

- National, population-based, passive cancer registry, receiving reports of cancer cases diagnosed in the Israeli population
- Member, Middle East Cancer Consortium (MECC)
- Receive approximately 150,000 reports per year (pathology, hospital discharge summaries, oncology program patient registries, death certificates)
- Currently includes data on over 700,000 cancer cases; approximately 30,000 new cancer cases added per year
- Data complete through calendar year 2013
Study objectives

- To examine temporal trends in the incidence of thyroid cancer in Israel, overall and by age, gender and ethnicity
- To determine whether changes in incidence are driven by specific morphologies
- To identify population groups at highest risk for a diagnosis of cancer of the thyroid
Thyroid cancer—case definition

- ICD-O-3 typography code 73.9
- Diagnosis years 1980-2012
- Morphology groups:
  - Papillary carcinoma (ICD-O-3 8050, 8260, 8340-8341, 8343-8344, 8350)
  - Follicular carcinoma (ICD-O-3 8290, 8330-8332, 8335)
  - Medullary carcinoma (ICD-O-3 8345-8346, 8510)
  - Anaplastic carcinoma (ICD-O-3 8012, 8020-8021, 8030-8032)
  - Other
Thyroid cancer incidence, by gender and ethnic group, Israel, 1980-2012
Thyroid cancer incidence by gender and ethnic group, Israel 1980-2013—joinpoint model

1983-2012
APC=4.21*

1982-2012
APC=6.93*

1987-2012
APC=3.98*

*p<0.05
Thyroid cancer, Israel, 1980-2012, by morphology group
Papillary thyroid cancer, by gender and ethnicity, 1980-2013-joinpoint model
“Other” (non-papillary) thyroid cancers, Israel, 1980-2012-Joinpoint model

1997-2012 APC=-3.44*

1992-2012 APC=-2.58*

*p<0.05
Stage at diagnosis*, thyroid cancers, Israel 2000-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Unknown stage (Stage 9)</th>
<th>Localized (Stage 1)</th>
<th>Regional (stages 2,3,4,5)</th>
<th>Distant (stage 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>56.0%</td>
<td>28.8%</td>
<td>60.3%</td>
<td>10.9%</td>
</tr>
<tr>
<td>2001</td>
<td>54.7%</td>
<td>29.1%</td>
<td>64.8%</td>
<td>6.1%</td>
</tr>
<tr>
<td>2002</td>
<td>49.1%</td>
<td>37.5%</td>
<td>57.8%</td>
<td>4.7%</td>
</tr>
<tr>
<td>2003</td>
<td>41.8%</td>
<td>48.4%</td>
<td>50.1%</td>
<td>1.5%</td>
</tr>
<tr>
<td>2004</td>
<td>47.9%</td>
<td>42.7%</td>
<td>52.5%</td>
<td>4.8%</td>
</tr>
<tr>
<td>2005</td>
<td>47.5%</td>
<td>42.5%</td>
<td>53.8%</td>
<td>3.7%</td>
</tr>
<tr>
<td>2006</td>
<td>46.6%</td>
<td>43.9%</td>
<td>50.9%</td>
<td>5.2%</td>
</tr>
<tr>
<td>2007</td>
<td>43.3%</td>
<td>42.7%</td>
<td>53.7%</td>
<td>3.6%</td>
</tr>
<tr>
<td>2008</td>
<td>34.5%</td>
<td>48.6%</td>
<td>47.9%</td>
<td>3.5%</td>
</tr>
<tr>
<td>2009</td>
<td>28.8%</td>
<td>50.5%</td>
<td>47.6%</td>
<td>1.8%</td>
</tr>
<tr>
<td>2010</td>
<td>24.1%</td>
<td>55.2%</td>
<td>42.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>2011</td>
<td>25.8%</td>
<td>58.1%</td>
<td>40.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>2012</td>
<td>20.9%</td>
<td>56.1%</td>
<td>42.2%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

*SEER summary stage  
**p<0.001 Mantel-Haenszel chi-square
Mean age at thyroid cancer diagnosis, by morphologic group

<table>
<thead>
<tr>
<th>Morphology</th>
<th>N</th>
<th>Mean age at diagnosis (years)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>anaplastic</td>
<td>313</td>
<td>72.1</td>
</tr>
<tr>
<td>follicular</td>
<td>1678</td>
<td>50.4</td>
</tr>
<tr>
<td>medullary</td>
<td>488</td>
<td>52.8</td>
</tr>
<tr>
<td>other</td>
<td>997</td>
<td>60.2</td>
</tr>
<tr>
<td>papillary</td>
<td>13665</td>
<td>48.6</td>
</tr>
</tbody>
</table>
Thyroid cancer mortality*, Israel, 1980-2012

*as reported on death certificates
Summary:

- Thyroid cancer incidence increased dramatically during the observation period.
- This observed trend is driven by a rise in the incidence of papillary carcinoma.
- The proportion of thyroid cancers diagnosed at an early stage increased significantly during the observation period.
- No substantial change in mortality was observed during the observation period.
True increase?

- Exposure to ionizing radiation (for diagnosis or treatment)
- Obesity
- Fertility treatments

VS.

Over-diagnosis?

- Increased availability and utilization of diagnostic studies
- Rise in incidence limited to papillary cancer
- Decrease in proportion of cases diagnosed at advanced stage
- No change in mortality
THANK YOU!