The economic burden of preventable chronic diseases in Rhode Island

Deborah N. Pearlman, PhD; Darren Kaw, MPH; Sophie O’Connell, MA; Yongwen Jiang, PhD; Dona Goldman, RN, MPH

The Centers for Disease Control and Prevention (CDC) have identified seven chronic conditions where a comprehensive approach to prevention could save tremendous health care costs and reduce premature disability and death in the US. These potentially “preventable” chronic diseases include heart disease, stroke, some cancers, diabetes, arthritis, and asthma.

In 2014, the Milken Institute study estimated the impact on the US economy of seven chronic diseases—cancer, diabetes, hypertension, stroke, heart disease, pulmonary conditions, and mental illness—at $1.3 trillion annually. Projected costs were $28 billion more than that forecast in 2007. The leading drivers of health care costs were increases in treatment intensity, and the dramatic rise in the obesity rate among US adults age ≥20 years, now at 34.9%. Obesity has long been recognized as a modifiable risk factor for osteoarthritis, and more recently rheumatoid arthritis in women. It costs an estimated $185 billion to treat osteoarthritis [in 2007 US dollars], and $8.4 billion to treat rheumatoid arthritis (2005 US dollars). If trends in adult obesity persist, the economic burden to the US health care system for treating arthritis will significantly surpass previous estimates. Depression is a frequent concomitant of most medical problems, and it makes treatment of both disorders more challenging and costly.

This report examines the prevalence of arthritis, current asthma, diabetes, and cardiovascular disease, with and without current obesity and current depression, to estimate the public health burden of preventable chronic diseases. We also explore the economic impact of these chronic conditions on Rhode Island’s health care system.

**Methods**

**Study sample.** We analyzed data from the 2011 and 2012 Rhode Island Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a cross-sectional survey that uses a multistage-cluster design based on random-digit dialing of landline and cell phones to select a representative sample from each state’s noninstitutionalized civilian population aged 18 and older. The 2011–2012 sample used in this analysis included adults 20 years and older (N=11,726).

**Variables.** Respondents were asked whether a doctor, nurse, or other health professional had ever diagnosed the following health conditions: (1) a heart attack, also called a myocardial infarction; (2) coronary artery disease; (3) a stroke; (4) asthma; (5) arthritis (defined in this questionnaire as rheumatoid arthritis, gout, lupus, or fibromyalgia); (6) diabetes; and (7) high blood pressure. Adults ever diagnosed with asthma were asked if they still had asthma (current asthma). The presence or absence of each condition was determined by a “yes” or “no” response, respectively. Women reporting diabetes or high blood pressure only when pregnant were excluded from these respective variables.

Cardiovascular disease was based on a “yes” response to having one or more of the following diagnosed conditions: high blood pressure, myocardial infarction, coronary artery disease, or a stroke. This variable was computed from the 2011 BRFSS as the question regarding hypertension is asked every other year in the BRFSS questionnaire, on the odd years.

Current depression (yes/no) was defined as having a score of three or higher on the Patient Health Questionnaire-2 (PHQ-2), which requires further evaluation for major depression, or reporting feelings of stress, depression, and problems with emotions for ≥14 days in the past month. Body mass index (BMI=weight [kg]/height [m]²; ≥25, overweight; ≥30, obese) was based on respondents’ self-reported weight and height at the time of the survey.

**Statistical analysis.** Statistical significance tests were performed to compare the differences in the prevalence of four categories of chronic disease health status: (1) self-reported diagnosed chronic condition without current obesity or current depression; (2) self-reported diagnosed chronic condition with current obesity but not current depression; (3) self-reported diagnosed chronic condition with current obesity, but not current depression; (4) self-reported diagnosed chronic condition with current obesity and current depression (Table 1). Analyses conducted in SAS v.9.3 (SAS Institute, Cary NC) accounted for the complex survey design.

The CDC Chronic Disease Cost Calculator version 2 was used to generate estimates of direct medical expenditures (of all payers, including the uninsured) and absenteeism costs for arthritis, asthma, depression, diabetes, and cardiovascular disease (congestive heart failure, coronary heart disease, hypertension, stroke, and other cerebrovascular disease). Data for the analysis of obesity-related health care costs in Rhode Island came from Bending the Obesity Cost Curve in Rhode Island, which drew on micro health simulation models published in a peer-reviewed study.
RESULTS

The prevalence of a chronic disease with co-occurring obesity, but not current depression, was highest for adults with diabetes (36.6%, Table 1). Adults with current asthma had the highest prevalence of a chronic disease with co-occurring depression, but not obesity (21.7%). The 95% confidence intervals (CIs) for adults with asthma, however, slightly overlapped those for adults with arthritis and co-occurring depression but not obesity. Having a chronic condition with co-occurring obesity and depression was more common among adults with diabetes than arthritis (16.7% and 11.3%, respectively). Additional analyses found that among adults who reported that they had not been diagnosed with cardiovascular disease, arthritis, asthma, or diabetes, 2.5% were currently depressed and obese (n = 7,803); 15.2% were obese but not currently depressed (n = 46,944); 11.3% were currently depressed but not obese (n = 34,901); and 70.9% were not obese or depressed (n = 218,606; data not shown).

The four potentially preventable chronic conditions shown in Table 1 cost Rhode Island $2.15 billion in direct medical expenditures in 2010 (all payers), which increased to more than $2.35 billion when treatment for depression was included (Table 2). Loss in economic productivity, as measured by costs associated with absenteeism, totaled $164 million (including for depression), and was highest for people with arthritis [$57 million]. In 2020, costs for treating preventable chronic diseases in Rhode Island are projected to increase dramatically over costs in 2014. The estimated cost increases range from 28.3% for depression to 33.4% for cardiovascular disease (Table 3). Annual obesity-related health care spending in Rhode Island could increase from $2.0 billion in 2010 to as high as $2.4 billion in 2030, based on the predicted rise in the state’s adult obesity rates from 26.0% in 2010 to 53.8% in 2030 (Table 4).

DISCUSSION

Our study showed that in a statewide population-based sample of Rhode Island adults ages ≥ 20 years with arthritis,

Table 1. Percentage of Rhode Island adults age ≥ 20 years with a self-reported diagnosed chronic disease, obesity,1 and depression,2 2011 and 20123

<table>
<thead>
<tr>
<th>Chronic conditions with and without obesity and depression</th>
<th>Weighted % (95% CI)4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>Current Asthma</td>
</tr>
<tr>
<td>Has a chronic condition without current obesity or current depression</td>
<td>48.4 (46.3 – 50.5)</td>
</tr>
<tr>
<td>Has a chronic condition with current obesity but not current depression</td>
<td>23.6 (21.8 – 25.3)</td>
</tr>
<tr>
<td>Has a chronic condition with current depression but not current obesity</td>
<td>16.7 (15.0 – 18.5)</td>
</tr>
<tr>
<td>Has a chronic condition with both current depression and current obesity</td>
<td>11.3 (9.9 – 12.7)</td>
</tr>
</tbody>
</table>

1. BMI = (weight [kg]/height [m²]): Obesity = BMI > 30.
2. Current depression, anxiety, stress for 14 or more days in the past month and/or depression for two or more weeks defined by a score of 3 or higher on the Patient Health Questionnaire-2.
3. Data are from the 2011-2012 Rhode Island Behavioral Risk Factor Surveillance System (BRFSS), except for cardiovascular disease (CVD), which is calculated from the 2011 BRFSS to include respondents with diagnosed hypertension.
4. CI = confidence interval.

Table 2. Medical cost estimate for chronic diseases in Rhode Island, 2010

<table>
<thead>
<tr>
<th>Medical Expenditures (Direct Cost)</th>
<th>Indirect Cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Payers</td>
<td>Medicaid</td>
</tr>
<tr>
<td>Arthritis</td>
<td>$427</td>
<td>$29</td>
</tr>
<tr>
<td>Asthma</td>
<td>$123</td>
<td>$40</td>
</tr>
<tr>
<td>Depression</td>
<td>$205</td>
<td>$22</td>
</tr>
<tr>
<td>Diabetes</td>
<td>$446</td>
<td>$57</td>
</tr>
<tr>
<td>CVD</td>
<td>$1,153</td>
<td>$126</td>
</tr>
</tbody>
</table>

1. Costs reported in millions of dollars for the entire state population.
2. Annual expenditures inflated to 2010 $ following recommendations from the Agency for Healthcare Research and Quality. Costs include expenditures for office-based visits, hospital outpatient visits, emergency room visits, inpatient hospital stays, dental visits, home health care, vision aids, other medical supplies and equipment, prescription medicines, and nursing homes.
3. All results generated from the tool are estimates. Actual costs may be larger or smaller than those reported.
4. The costs for cardiovascular disease (CVD) include diseases of the heart, stroke, and an estimate of hypertension costs that avoids double-counting of costs with other diseases.
Table 3. Projected medical costs for chronic diseases in Rhode Island, 2014-2020^3

<table>
<thead>
<tr>
<th>Year</th>
<th>Arthritis</th>
<th>Asthma</th>
<th>Depression</th>
<th>Diabetes</th>
<th>CVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$587</td>
<td>$168</td>
<td>$279</td>
<td>$617</td>
<td>$1,599</td>
</tr>
<tr>
<td>2015</td>
<td>$615</td>
<td>$175</td>
<td>$291</td>
<td>$647</td>
<td>$1,677</td>
</tr>
<tr>
<td>2016</td>
<td>$643</td>
<td>$183</td>
<td>$304</td>
<td>$678</td>
<td>$1,757</td>
</tr>
<tr>
<td>2017</td>
<td>$672</td>
<td>$191</td>
<td>$317</td>
<td>$711</td>
<td>$1,842</td>
</tr>
<tr>
<td>2018</td>
<td>$703</td>
<td>$200</td>
<td>$330</td>
<td>$744</td>
<td>$1,932</td>
</tr>
<tr>
<td>2019</td>
<td>$735</td>
<td>$208</td>
<td>$344</td>
<td>$780</td>
<td>$2,028</td>
</tr>
<tr>
<td>2020</td>
<td>$770</td>
<td>$218</td>
<td>$358</td>
<td>$819</td>
<td>$2,133</td>
</tr>
<tr>
<td>Percent increase ^6 2014-2020</td>
<td>31.1%</td>
<td>29.8%</td>
<td>28.3%</td>
<td>32.7%</td>
<td>33.4%</td>
</tr>
</tbody>
</table>

1. Costs reported in millions of dollars for the entire state population.
2. The projections: 1) are medical costs only, including nursing home costs but excluding absenteeism costs; 2) are based on default inputs; 3) are reported in 2010 $ and do not project inflation; and 4) assume no changes in policy or technology and exclude changes due to the Affordable Care Act.
3. All results generated from the tool are estimates. Actual costs may be larger or smaller than those reported.
4. The costs for cardiovascular disease (CVD) include diseases of the heart, stroke, and an estimate of hypertension costs that avoids double-counting of costs with other diseases.
6. Percent increase is calculated at Time 2 – Time 1 / Time 1.

Table 4. Adult obesity rates in Rhode Island and obesity-related health care spending in Rhode Island if current obesity trends continue, 2010 to 2030

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult obesity rates^1</td>
<td>26.0%</td>
<td>36.0%</td>
<td>53.8%</td>
</tr>
<tr>
<td>Health care costs^2,^3</td>
<td>$2000</td>
<td>$2200</td>
<td>$2400</td>
</tr>
<tr>
<td>Percent increase in costs ^4</td>
<td>10.0%</td>
<td>9.1%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

2. Data are from Bending the Obesity Cost Curve in Rhode Island, September 2012. Trust for America’s Health and Robert Wood Johnson Foundation.
3. Costs are in millions of dollars.
4. Percent increase is calculated at Time 2 – Time 1 / Time 1.

As a result of the cross-sectional design used in the study, we could not test bidirectional associations between obesity and depression. Some evidence exists for a bidirectional association between obesity and depression, especially among middle- and older-age women. A better understanding of the mechanisms for this bidirectional risk is needed, with and without co-occurring, preventable chronic diseases. This topic is largely unexplored, especially in relation to health care costs.
References


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Disclosures

The authors and/or spouses/significant others have no financial interests to disclose.

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