**hfma** first illinois chapter

healthcare financial management association

# How to Leverage Analytics to Transform Healthcare Delivery:
## Lowering the Cost of Care

April 2014

**TREXIN**

TRUST • EXPERIENCE • INNOVATION

# Learning Objectives

- Understand the dimensions of healthcare cost

- Evaluate how US costs compare to other countries

- Illustrate where the money goes

- Identify where we can impact healthcare costs

- Leverage analytics to transform healthcare delivery

TREXIN

# Speakers

## Ngan MacDonald

**Role:** Analytics SME and Industry Thought Leader

**Background:**

Ngan MacDonald has over 15 years of experience in healthcare and information services and is an experienced health care professional with broad knowledge of health care reform, information strategy, and business transformation. She has a deep understanding of how to use analytics and information to drive business outcomes and support enterprise strategy. In addition, she has led projects in enterprise information management, business intelligence, metadata management, information governance and stewardship, healthcare analytics, and enterprise performance metrics.

## Walter Linde-Zwirble

**Role:** Trexin Chief Healthcare Data Scientist and Industry Thought Leader

**Background:**

Walter Linde-Zwirble is a nationally recognized Data Scientist and Analytics Industry Thought Leader. He has over 20 years of experience in health outcomes and data science research. In addition, Walter has over 35 peer reviewed publications, and over a 100 presented research abstracts. Walter has analyzed and modeled most aspects of healthcare delivery across all healthcare industry segments and has developed health state measures and prognostic measures for improved communication between stakeholders. In addition, his experience includes simulating the Medicare payment system and calculation of cost to charge ratios and modeling the impact of managed care on hospital outcomes.

TREXIN

# Agenda

| | |
|:---:|:---|
| **1** | **Why Does Healthcare Cost So Much?** |

| | |
|:---:|:---|
| **2** | **Understanding Where the Money Goes** |

| | |
|:---:|:---|
| **3** | **Where Can We Control Cost?** |

| | |
|:---:|:---|
| **4** | **How Do We Get Started?** |

| | |
|:---:|:---|
| **5** | **Questions** |

Source: Cooper, Robert G., and Scott J. Edgett.  *Lean, Rapid and Profitable: New Product Development*. New Product Development Institute, 2005.
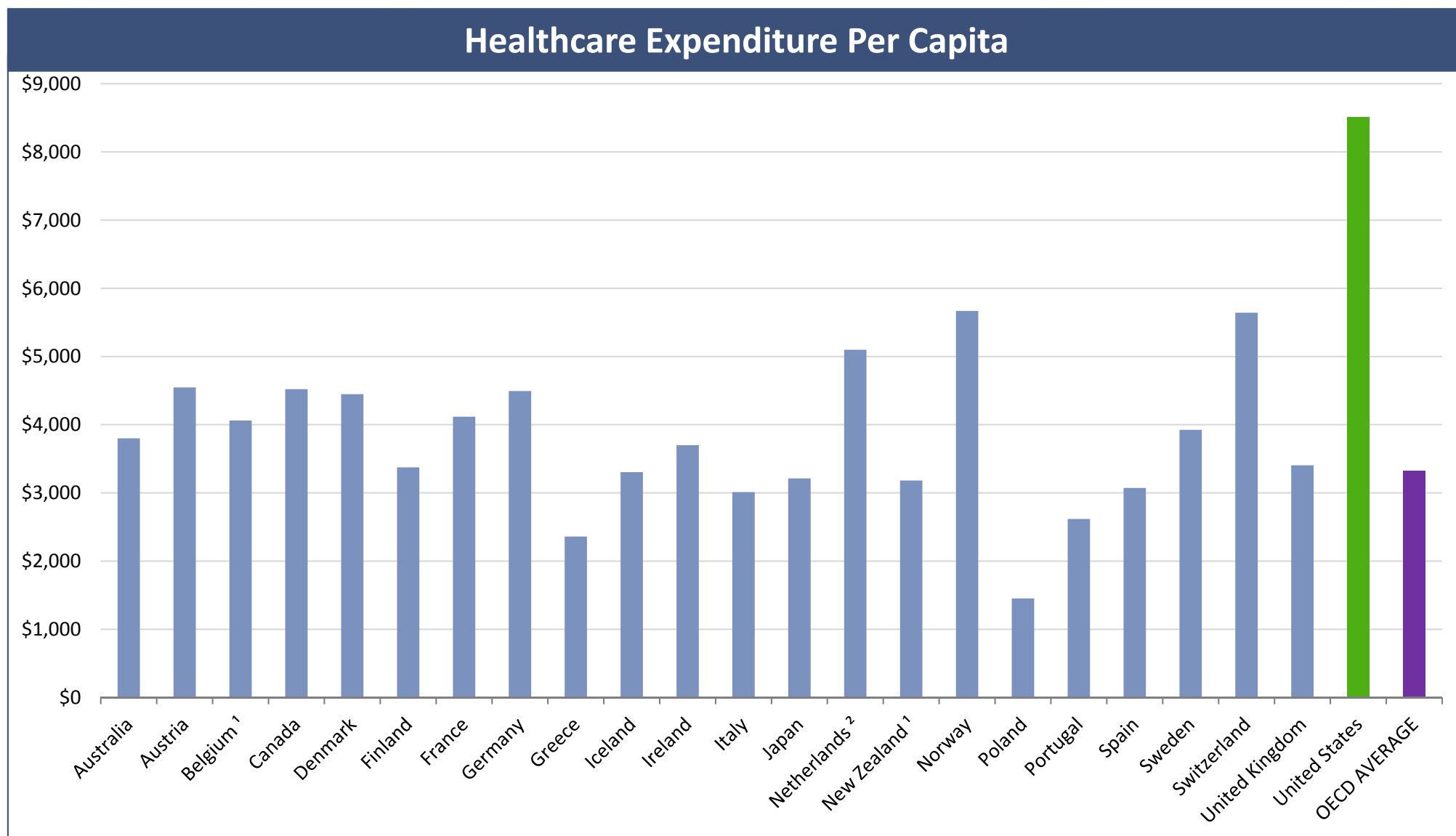
# Agenda
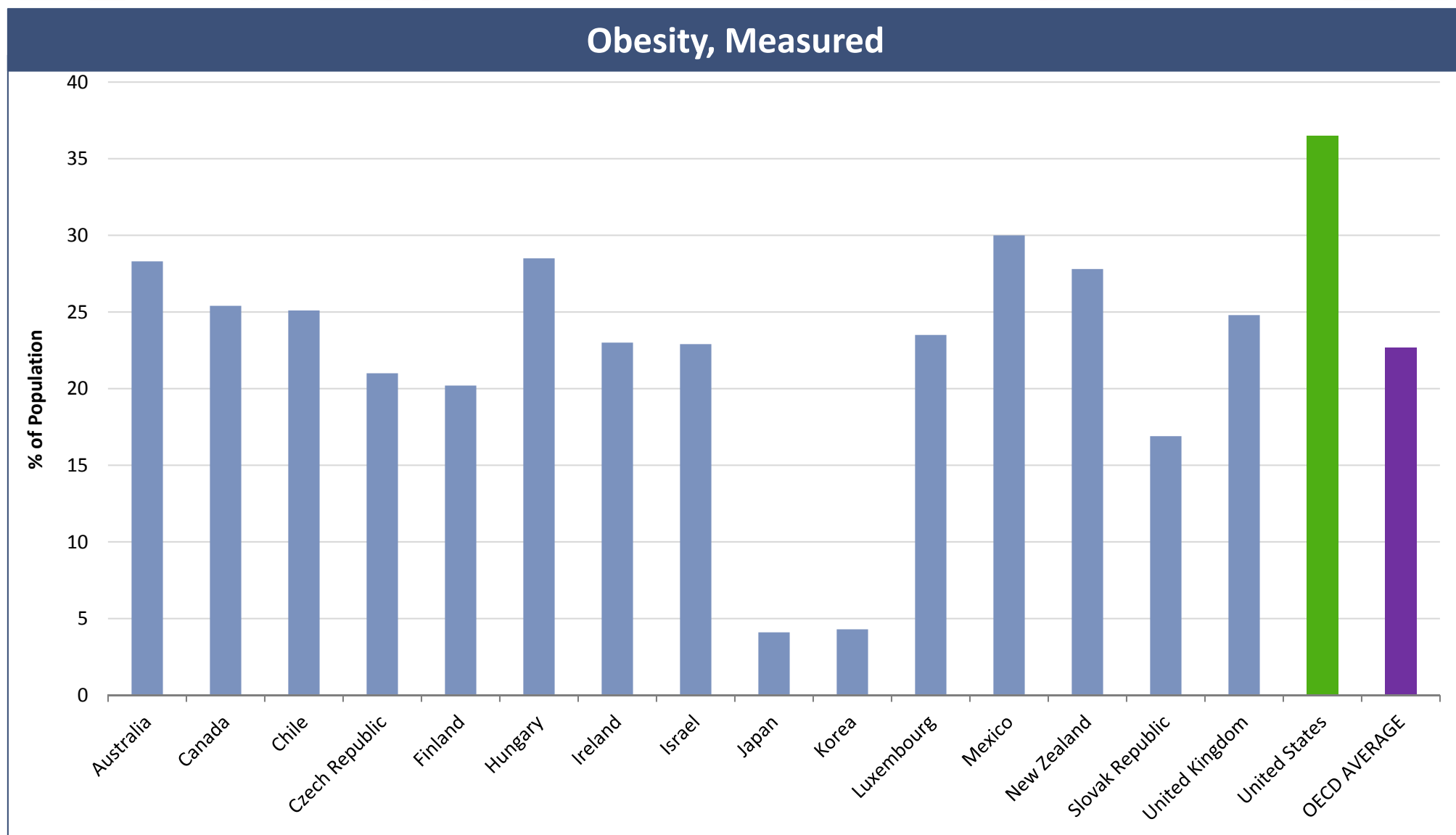
**1**  **Why Does Healthcare Cost So Much?**

➢ **Theory 1: US Population is less healthy**

➢ **Theory 2: We use more healthcare resources**

➢ **Theory 3: US has better outcomes**

TREXIN

# US Spending on Healthcare is Highest Per Capita



## Healthcare Expenditure Per Capita

Data is for 2011 or nearest year
Source: OECD Health Data 2013

TREXIN

# US Population is Less Healthy?



**Obesity, Measured**
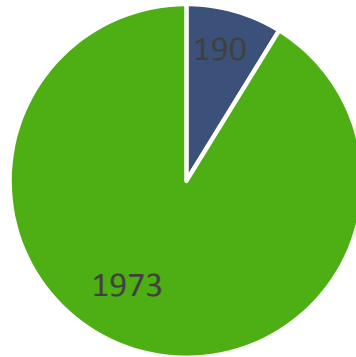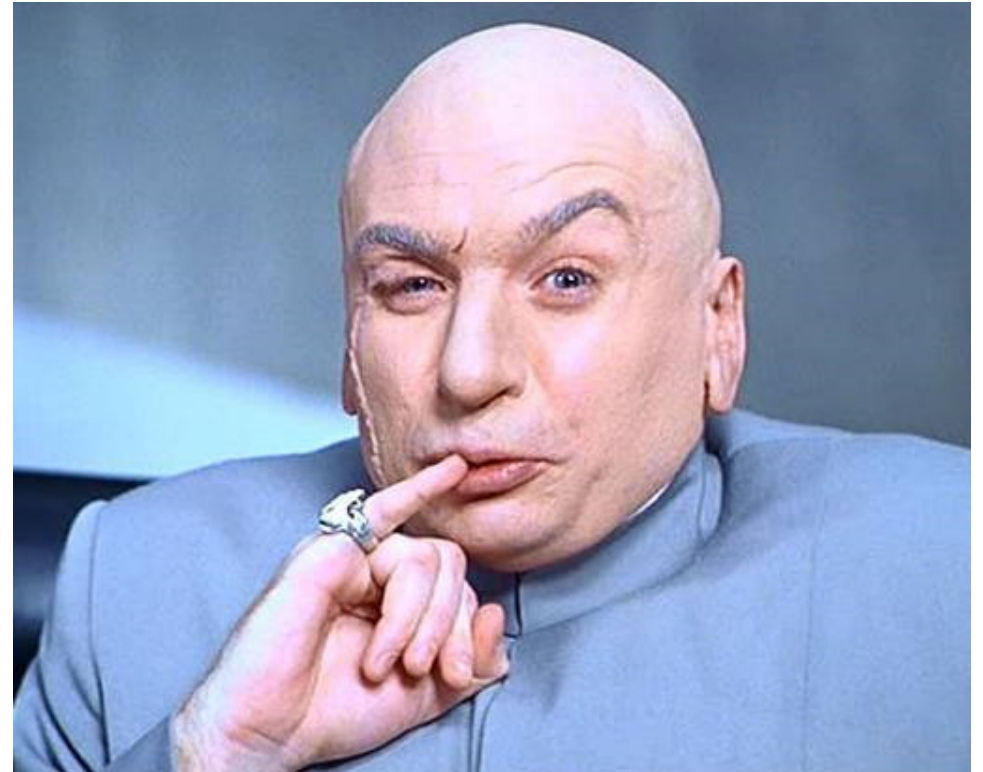
Data is for 2011 or nearest year
Source: OECD Health Data 2013
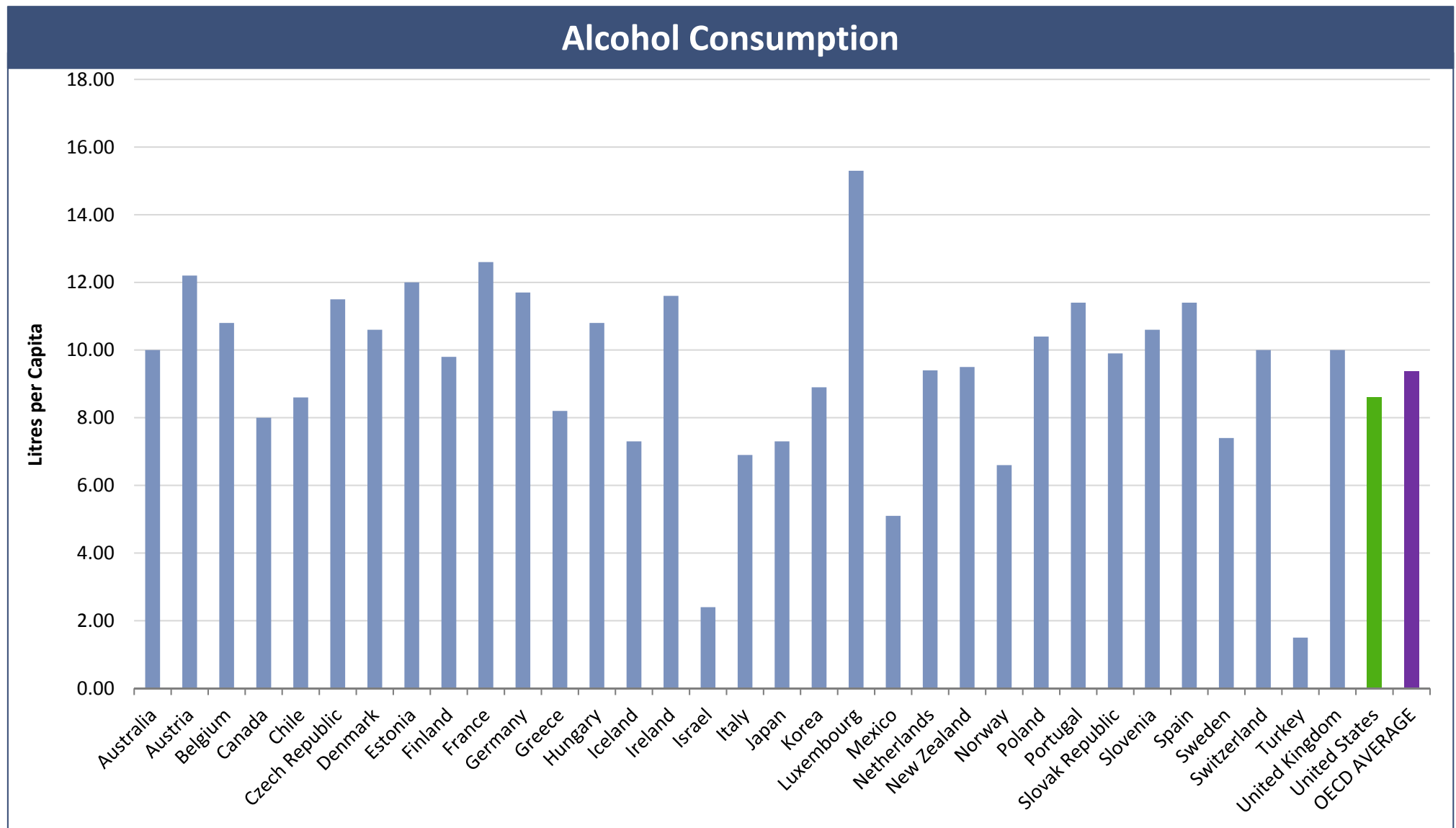
TREXIN

# Obesity Spending in 2005

Obesity vs. Overall Healthcare Expenditure

190

1973

■ Obesity Expenditure   ■ National Healthcare Expenditure

TREXIN

# US Population is Less Healthy?



Alcohol Consumption — Litres per Capita, by country (Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, OECD AVERAGE)

Data is for 2011 or nearest year
Source: OECD Health Data 2013

TREXIN

# US Population is Less Healthy?



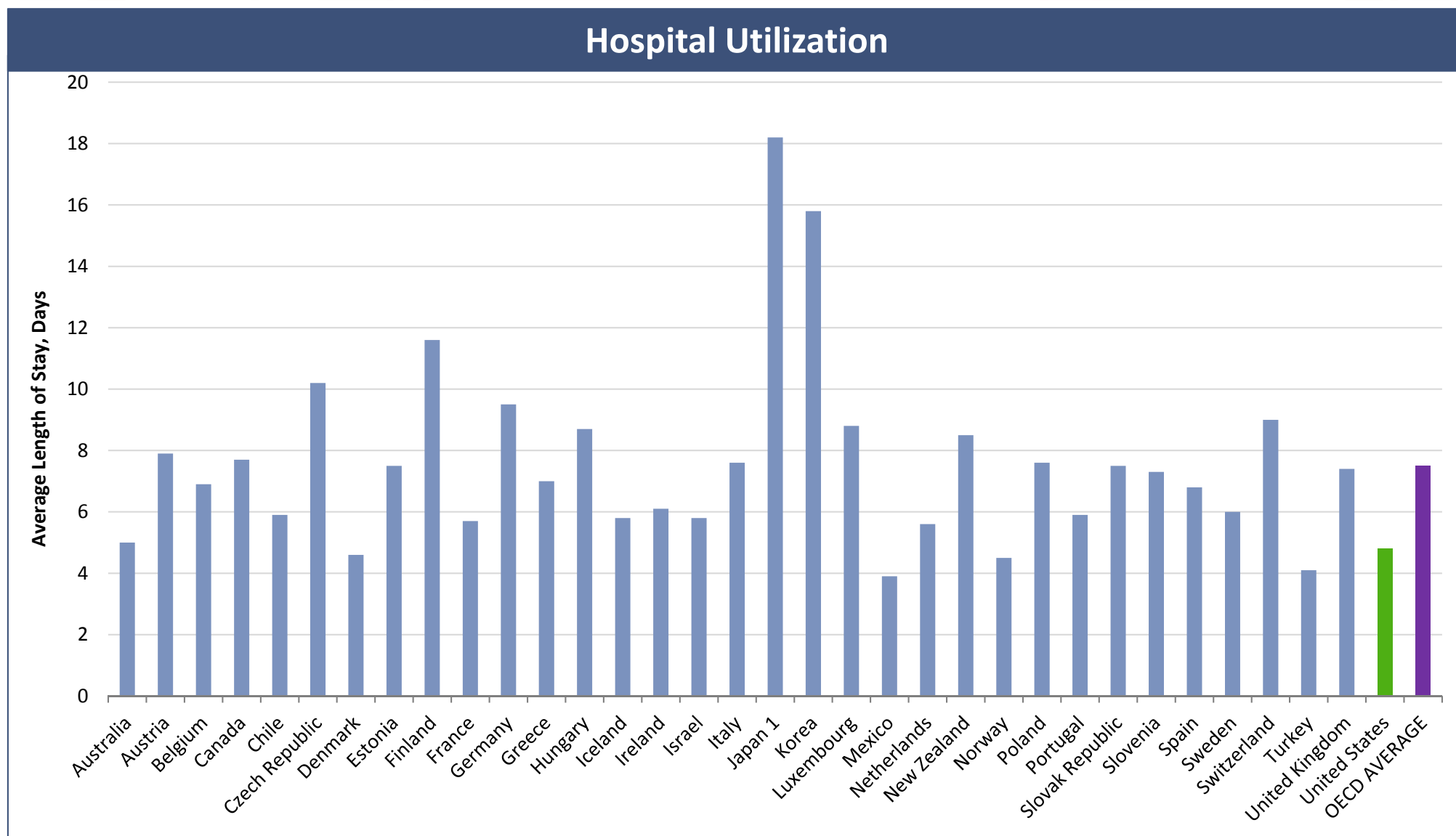**Tobacco Consumption, Daily Smokers**

Data is for 2011 or nearest year
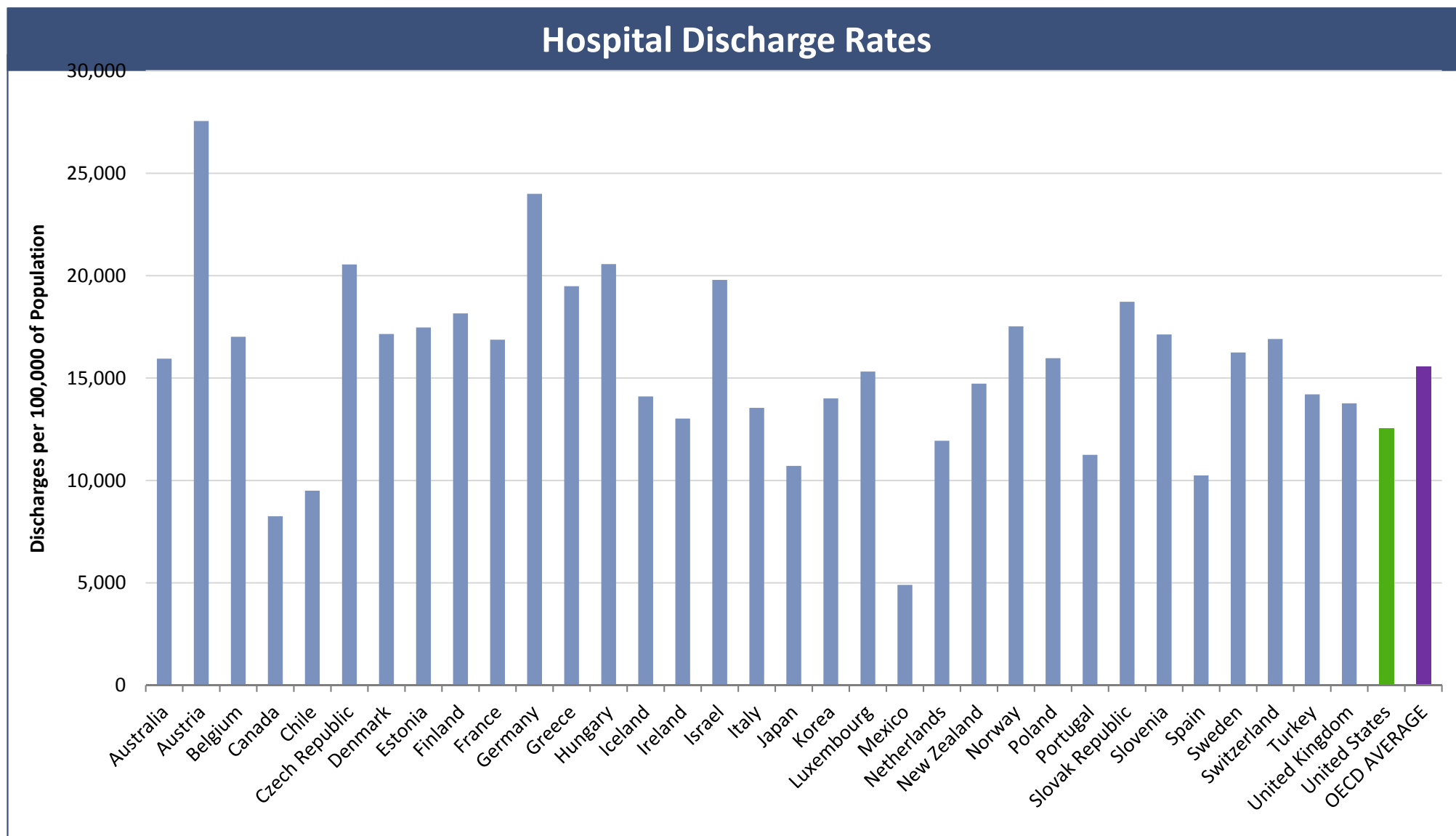Source: OECD Health Data 2013

# US Population Less Healthy?

- Obesity is higher ($190 Billion)

- Alcohol is lower

- Tobacco is lower

- Unlikely that population health is the reason for high US expenditure

TREXIN

# Higher Utilization?



Hospital Utilization — Average Length of Stay, Days. Data is for 2011 or nearest year. Source: OECD Health Data 2013

# Higher Utilization?



**Hospital Discharge Rates**

Y-axis: Discharges per 100,000 of Population (0 to 30,000)

Countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, OECD AVERAGE

Data is for 2011 or nearest year
Source: OECD Health Data 2013

TREXIN

# Higher Utilization?

## Doctor Visits



Bar chart titled "Doctor Visits" showing Number per Capita (y-axis, 0 to 14) by country:

- Australia: 6.7
- Canada: 7.4
- Finland: 4.2
- France: 6.8
- Germany: 9.7
- Hungary: 11.8
- Iceland: 6.1
- Ireland: 3.8
- Italy: 7.0
- Japan: 13.1
- Korea: 13.2
- Mexico: 2.7
- Netherlands: 6.6
- New Zealand: 4.1
- Norway: 5.2
- Poland: 6.8
- Portugal: 4.2
- Spain: 7.4
- Sweden: 3.0
- Switzerland: 4.0
- United Kingdom: 5.0
- United States: 4.1
- OECD AVERAGE: 6.6

Data is for 2011 or nearest year
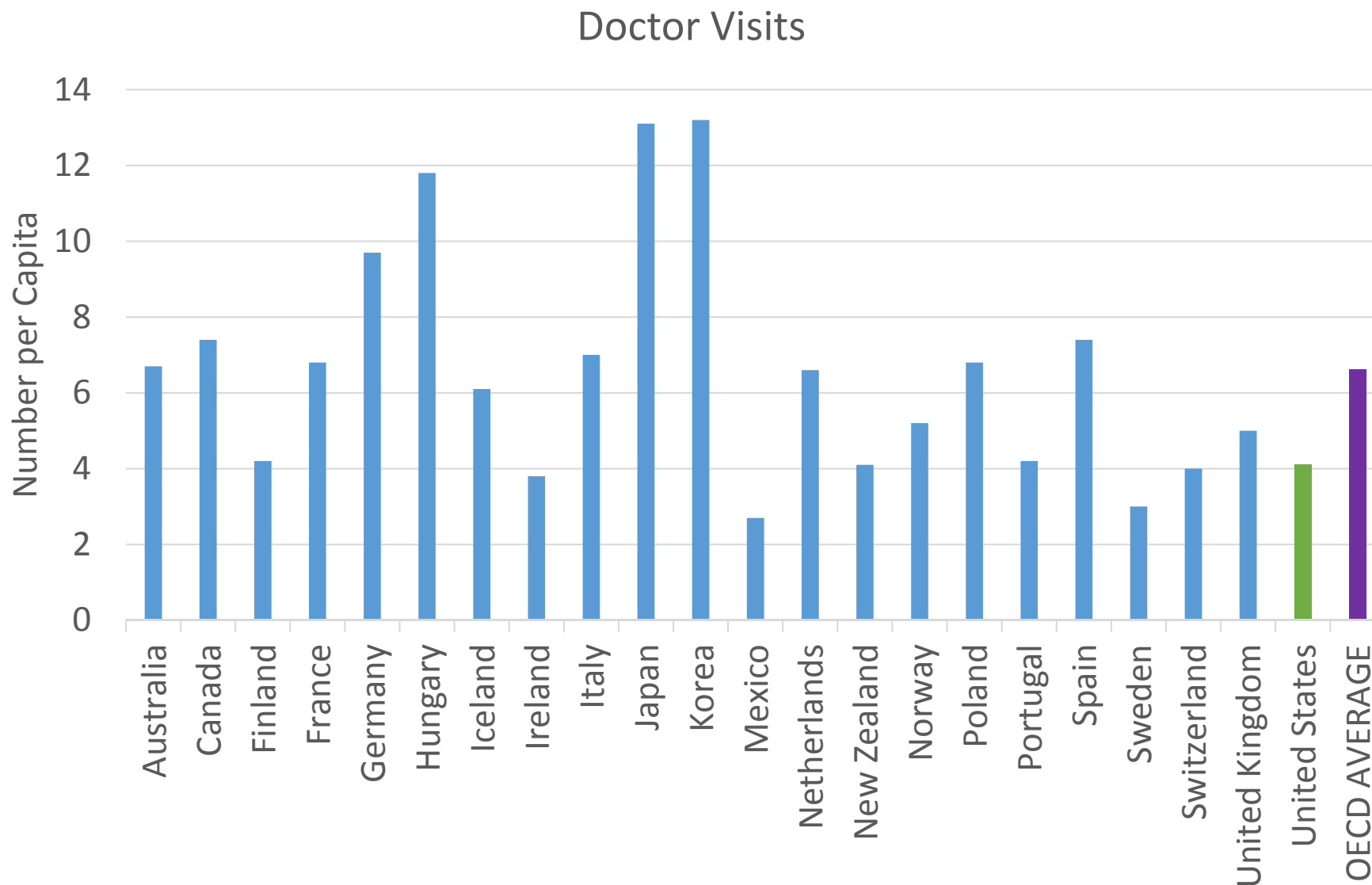Source: OECD Health Data 2013

TREXIN

# Higher Utilization?
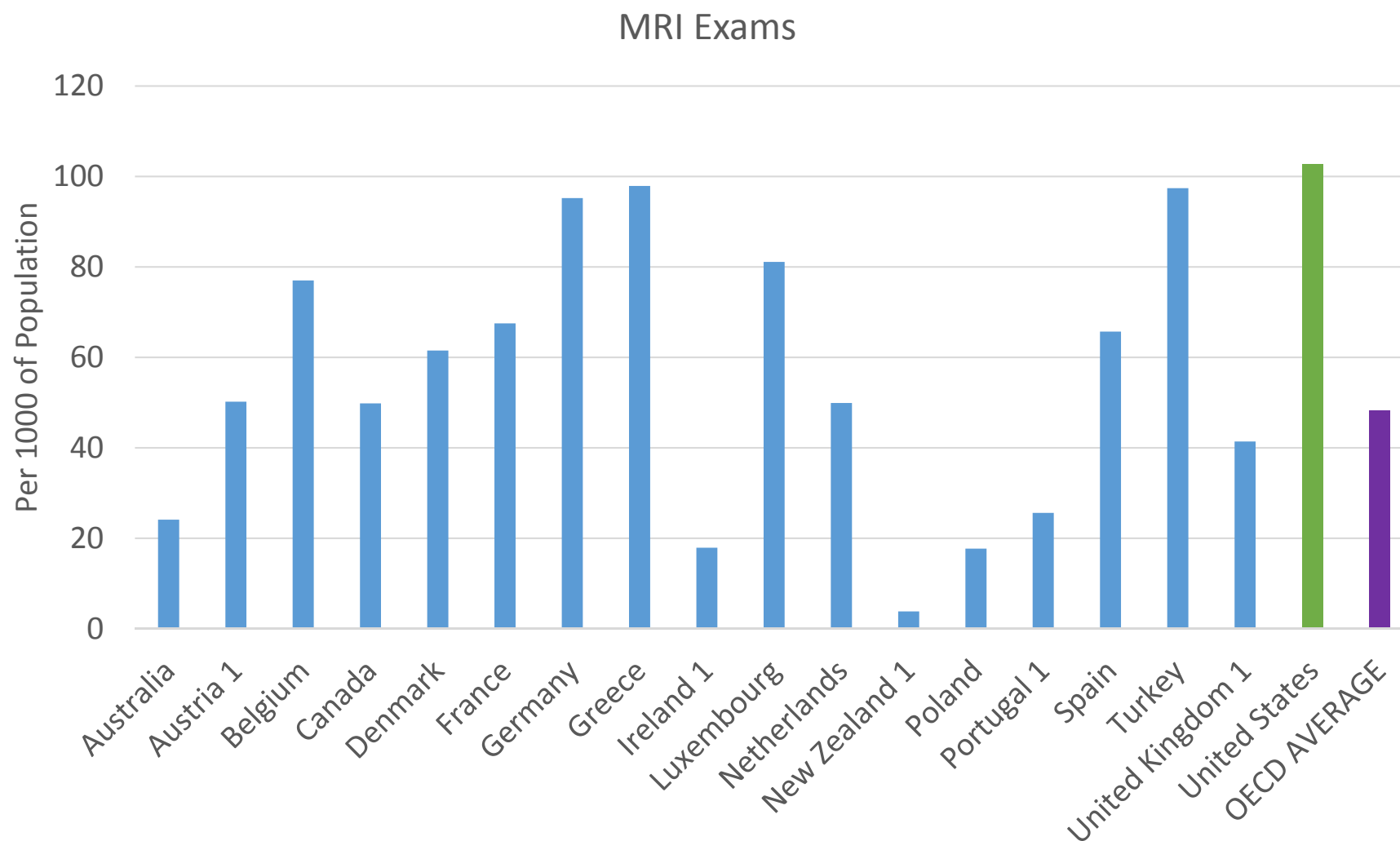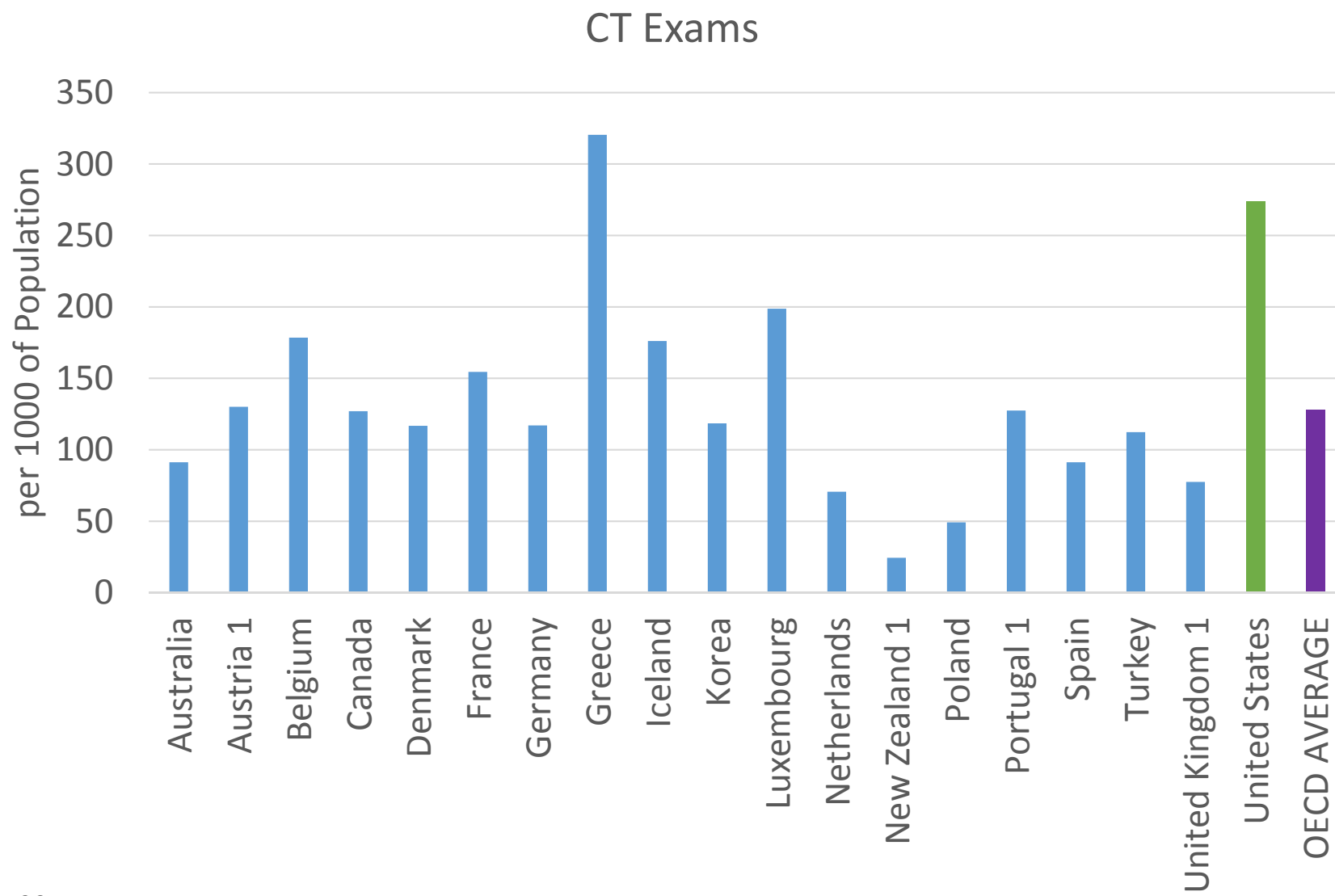


MRI Exams

Data is for 2011 or nearest year
Source: OECD Health Data 2013
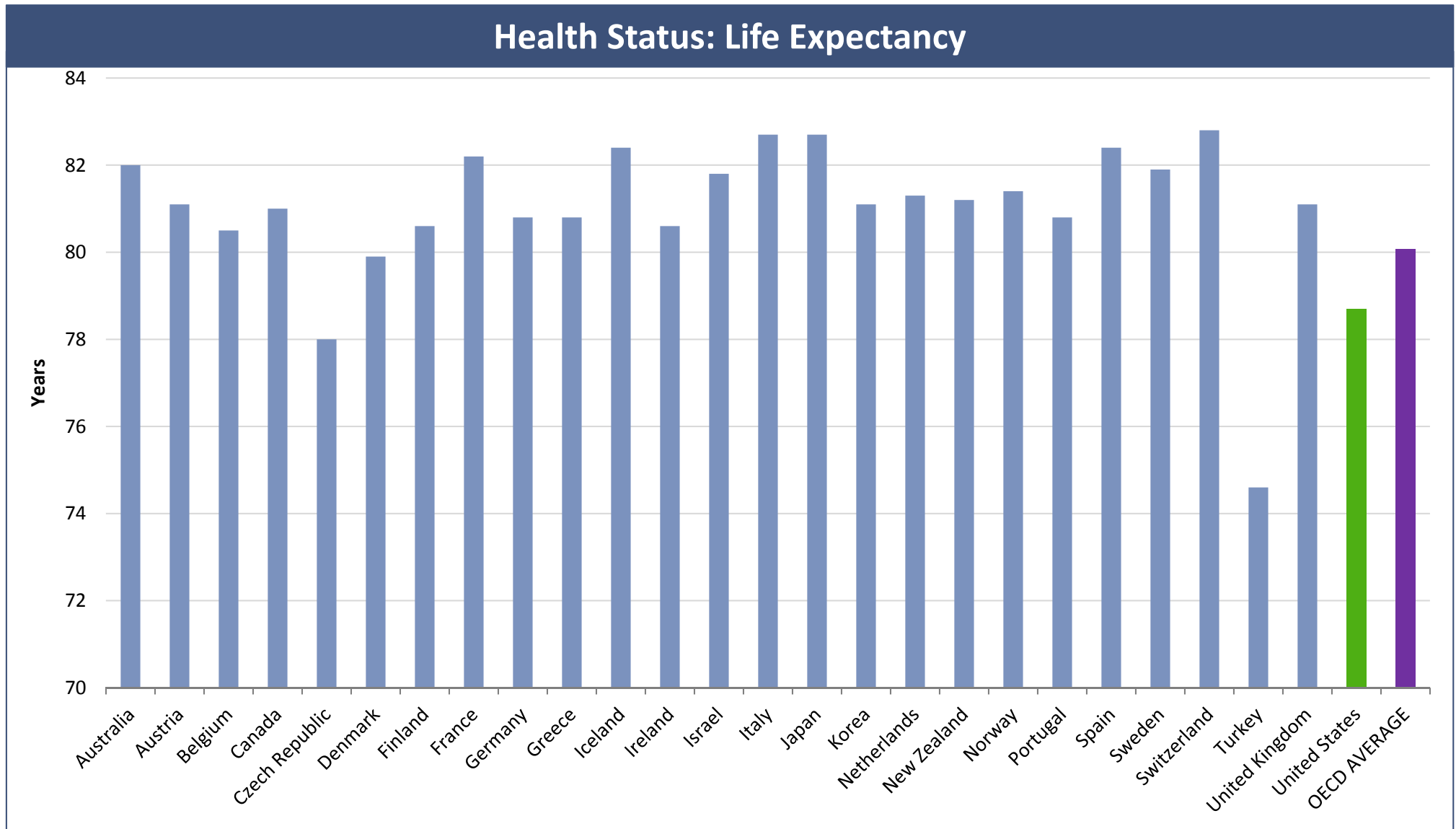
# Higher Utilization?



CT Exams

Data is for 2011 or nearest year
Source: OECD Health Data 2013

TREXIN

# Higher Utilization?

- Lower Hospital and Physician visits
- Higher technology use, but not out of line with all other countries

TREXIN

# Better Outcomes?



**Health Status: Life Expectancy**

Data is for 2011 or nearest year
Source: OECD Health Data 2013

# Longer Life Expectancy Leading to Higher Costs?



Life Expectancy vs. Expenditure per Capita

Year 1960 to 2010: 5 year intervals

Life Expectancy — Expenditure

TREXIN

# Better Outcomes?

- Lower life expectancy
- We are spending a lot of money, but not getting a lot for it.

TREXIN

# Why does healthcare cost so much?

- It's complicated and systematic

- We can't change the system overnight

- Where does the change start?

# Agenda

**2**    **Understanding Where the Money Goes**

➢ **CBO Study on High-Cost Medicare Beneficiaries**

Source: Cooper, Robert G., and Scott J. Edgett. *Lean, Rapid and Profitable: New Product Development*. New Product Development Institute, 2005.

# 2005 Congressional Budget Office Study on High-Cost Beneficiaries

10% of Beneficiaries use 62% of resources

25% of Beneficiaries use 85% of resources

- Looking at the High-Cost (HC) beneficiaries can help understand patient factors associated with high utilization.

- **CBO Goal:** Identify a relatively small proportion of potential HC beneficiaries and find strategies to reduce spend.

TREXIN

# CBO Analysis – Key Findings

> **The CBO looked at the beneficiaries in the top quartile to see if patient characteristics would predict future costs**

- Findings among the top quartile.

  - 7% of the top 10% have regular ongoing resource use (ESRD, etc.)

  - Many were over 85 years of age

  - 3 out of 4 had one or more of 7 key morbidities during the year (Asthma, COPD, Chronic Renal Disease, Congestive Heart Failure, Coronary Artery Disease, Diabetes, Dementia)

  - 75% had at least one hospitalization (1.3 hospitalizations per beneficiaries in the top quartile od cost)

TREXIN

# CBO Analysis – Key Disappointments

- Why CBO did not achieve its goals:

  – Not Predictive

  – Not Specific

  – The upper cost quartile had higher rates, but the lower three quartiles had more cases. (? Why does this matter?)

  – Not Repeatable? Ongoing?

# CBO Analysis – What was left out

- Analysis of Resource Use Patterns

- Only used Descriptive Analytics and not Predictive

TREXIN

# Agenda

**3**  Where Can We Control Cost?

➢ **Going Beyond CBO**

➢ **Modeling Health State and Resource Use**

➢ **Potential High Cost Beneficiaries**

➢ **Sensitivity Analysis and the Opportunities for Saving**

TREXIN

# Beyond the CBO – Further Analysis

- Step 1: Analyze characteristics of resource usage in the top 10% High Cost individuals

- Step 2: Create predictive models for resource use and patient characteristics

- Step 3: Run models to identify a small group of patients at risk for being High Cost

- Step 4: Determine strategies related to patient resource use that are linked to reduced spend

# High Cost Pathways

Two ways to end up in High Cost Group:

    1. Ongoing high cost care (ESRD, major disability)

    2. Having an expensive event or two in the year (Hip replacement, hospitalization for pneumonia)

# Specific Pathways

- Based on analyses of resource use in the top 10% High Cost group we identified four basic pathways to become High Cost.

- **Deterministic**

  - **Ongoing**: Continuing regular intense resource use such as ongoing dialysis

  - **Single Event**: Specific planned inpatient or outpatient procedures

- **Probabilistic**

  - **Random:** A healthy person with an unexpected serious event or illness (e.g. car accident, stroke in someone with no prior symptoms.)

  - **High Risk:** Beneficiaries with a poor health state who are at an identifiable high risk of poor outcome, resulting in hospitalization and high spend.

TREXIN

# High Cost Pathways

| | Population | Top Decile | Pay |
|---|---|---|---|
| No Claims | 24.4% | 0.0% | 0.0% |
| No hospitalizations | 57.7% | 5.9% | 22.0% |
| 1 Hospitalization | 9.6% | 23.0% | 21.1% |
| 2 Hospitalizations | 3.8% | 28.6% | 18.3% |
| 3+ Hospitalizations | 2.9% | 28.0% | 26.0% |
| Single High Cost Surgery | 0.8% | 8.0% | 5.3% |
| End Stge Renal Disease | 0.8% | 6.4% | 7.4% |
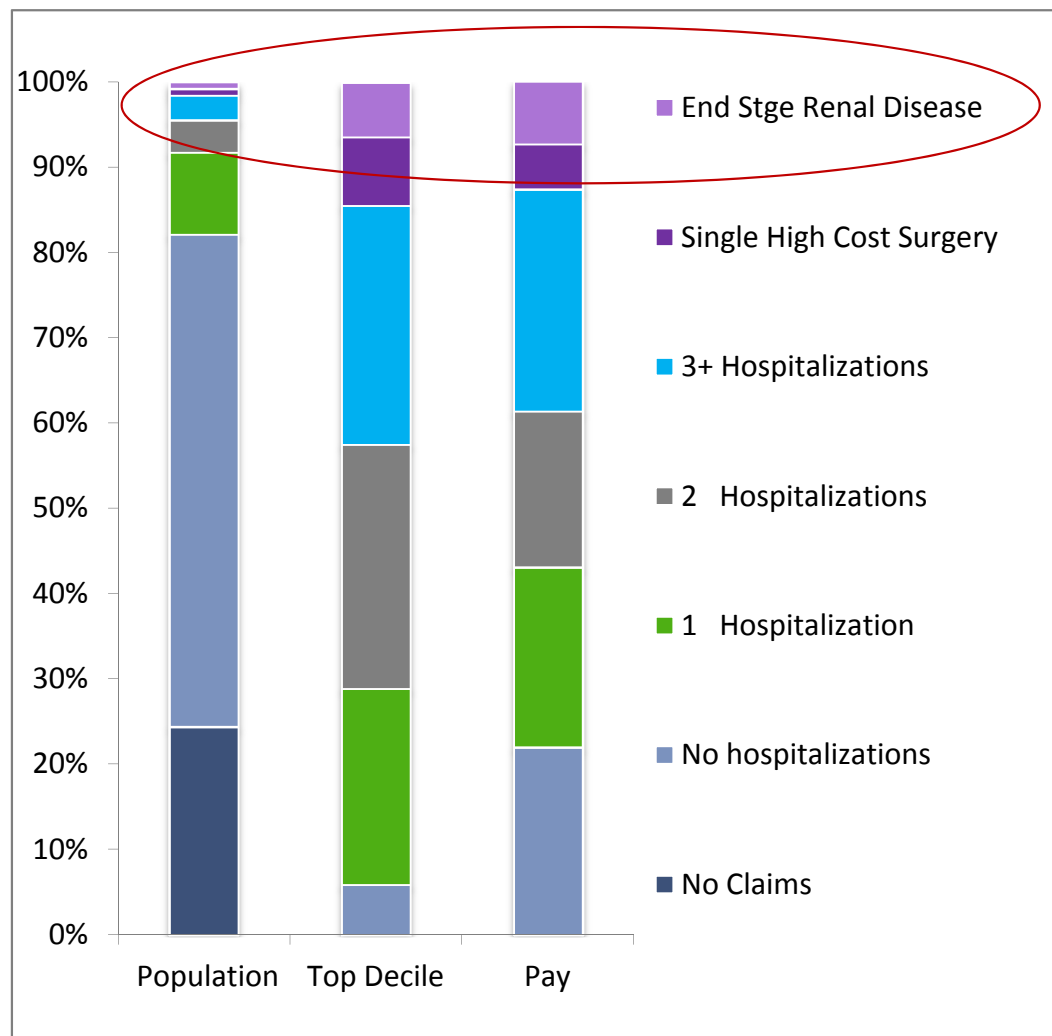


- **While the deterministic cases are easy to identify, they are only 1.6% of the population and 14.5% of the top 10% High Cost group.**

# Predictive Models: Beneficiary Health State

- The CBO did descriptive analysis of individual beneficiary characteristics but did not try to synthesize then.

- We constructed models using demographics and 52 health state categories to understand the probability of one year mortality, multiple hospitalizations and being in the top 10% High Cost group

- The score is based on the prior year healthcare encounters

  - There are 1-7 points per category

  - 55% of beneficiaries had 0-2 points

  - The probability of being in the top 10% HC ranged from 3.2% to 50%

  - Only 6 of the 52 categories were included in the CBO work

    - The simple forms of conditions like asthma and diabetes have little association with resource use.

    - Other conditions like Coronary Artery Disease may be associated with care now but have little predictive power in the future.

TREXIN

# Predictive Models – Health State Categories

- While a few of the categories occur in more than 5% of the population, most are less common. Because of this a wide net must be cast to capture a full picture of health state.

| Chronic Conditions | Description | Frequency |
|---|---|---|
| 01 | Heart Failure | 13.9% |
| 02 | Neoplasm of Digestive, Bone, GU, Lymphoma | 13.0% |
| 03 | Dsyrhythmias and Conduction Disorders | 13.0% |
| 04 | Chronic Bronchitis | 12.1% |
| 05 | Dementia | 8.1% |
| 06 | Depression | 7.4% |
| 07 | Other Peripheral Vascular Disease | 7.2% |
| 08 | non-Aortic Artherosclerosis | 6.3% |
| 09 | Psychoses | 5.0% |
| 10 | Other Pulmonary Conditions | 4.6% |
| 11 | Parkinsons Disease /Deterioration | 3.6% |
| 12 | Other Neurologic Conditions | 3.5% |
| 13 | Late Effects of Cerebrovascular Disease | 2.5% |
| 14 | Emphysema | 2.3% |
| 15 | Eating Disorders and Malnutrition | 2.2% |
| 16 | Aneurysm | 2.1% |
| 17 | Seizures | 2.1% |
| 18 | Metastatic Neoplasm | 2.0% |
| 19 | Pulmonary and CNS Neoplasm | 1.9% |
| 20 | Diabetes with Peripheral Circulatory Disorders | 1.7% |
| 21 | Post-inflamatory pulmonary fibrosis | 1.6% |
| 22 | Pulmonary Heart Disease | 1.5% |
| 23 | Paralysis | 1.3% |
| 24 | Hypertensive Kidney Disease | 1.3% |
| 25 | Diabetes with Other Manifestations | 1.1% |
| 27 | Diabetes with Renal Manifestations | 1.0% |
| 28 | Joint Contracture | 0.5% |
| 29 | Complex Liver Disease | 0.3% |

| Acute Conditions | Description | Frequency |
|---|---|---|
| 01 | Electrolyte Disorders | 10.5% |
| 02 | Anemias | 6.3% |
| 03 | Pneumonia | 6.3% |
| 04 | Cerebrovascular Accident | 5.2% |
| 05 | Unspecified Renal Failure | 5.0% |
| 06 | Renal Disease NOS | 4.9% |
| 07 | Skin Ulcers | 3.8% |
| 08 | Pleurisy | 3.3% |
| 09 | Altered Awareness | 2.7% |
| 10 | Infectious Organism Identified | 2.6% |
| 11 | Pulmonary Congestion | 2.1% |
| 12 | Respiratory Failure | 1.9% |
| 13 | Septicemia/Sepsis | 1.9% |
| 14 | Brain Injury | 1.7% |
| 15 | Other Hematologic Conditions | 1.5% |
| 16 | Abdominal Mass | 1.4% |
| 17 | Acute Renal Failure | 1.4% |
| 18 | Delirium | 1.3% |
| 19 | Thrombocytopenias | 1.0% |
| 20 | Enlarged Lymph Nodes | 0.8% |
| 21 | Pneumonitis | 0.6% |
| 22 | Other Impaired Renal Function | 0.3% |
| 23 | Gastrostomy Complications | 0.3% |

# Health State Model Calibration



Health State Model Calibration
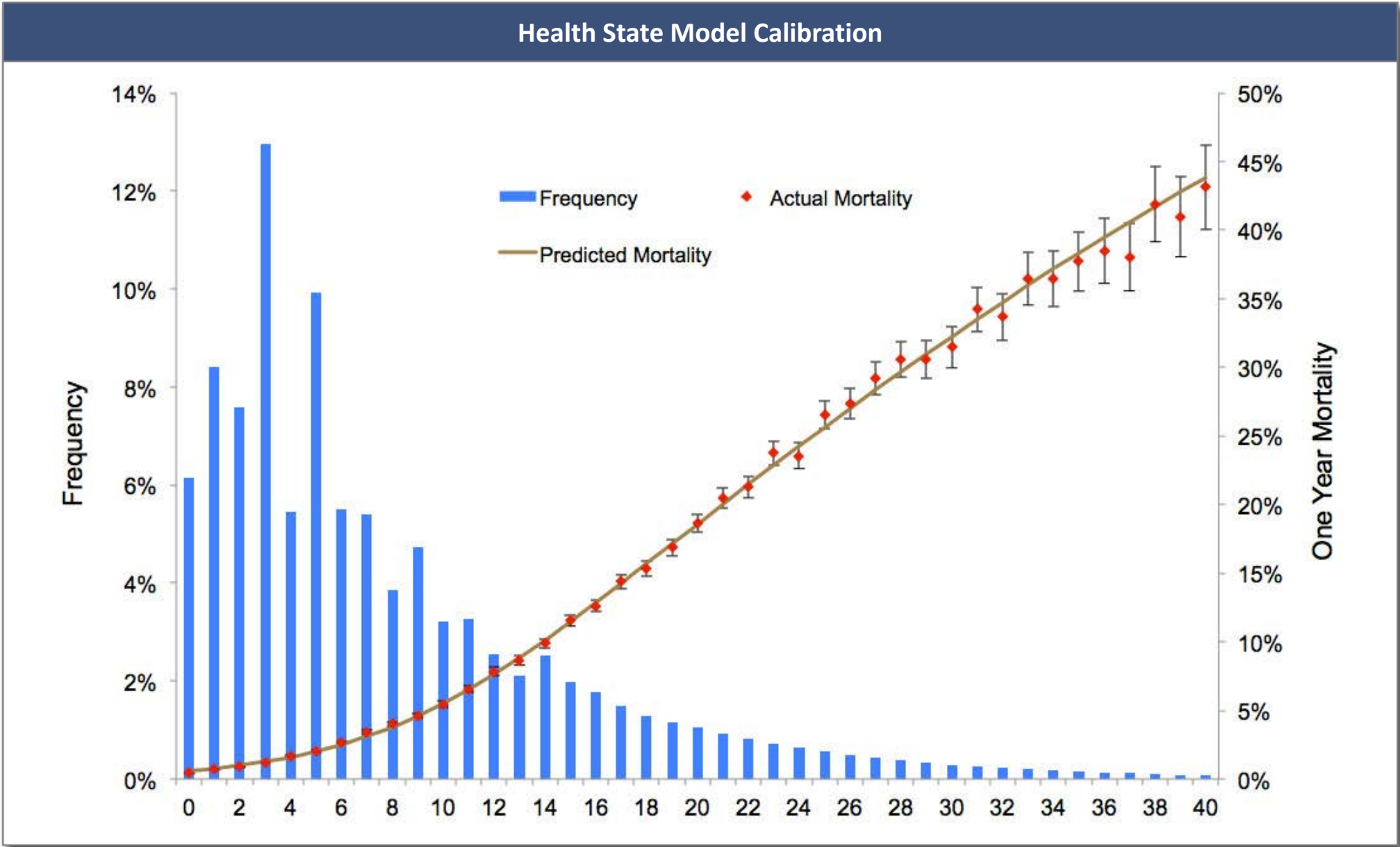
# Predictive Model – Probability of HC and Multiple Hospitalization

- The constructed score had a wide range of probabilities, 4%-35%, across a score range of 0-25.

- However, 80% of beneficiaries had a score <8 and 90% <13.

- Across the range of scores the probability of being the the top 10% of HC was 1.2*the probability of multiple hospitalization.
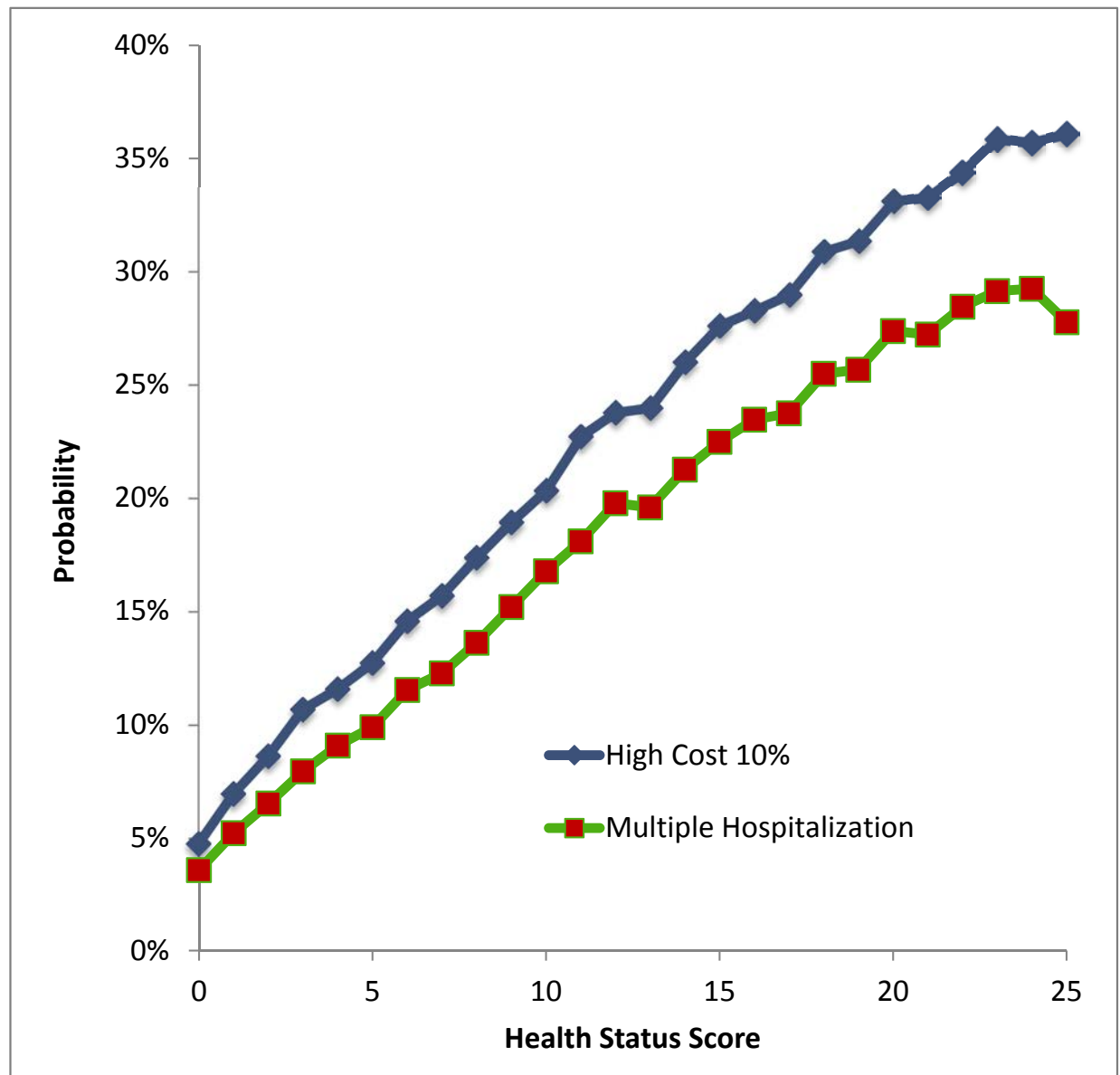
# Potential HC Beneficiaries

- Very High Risk group is one in nine people, but is a third of the HC group, payments and hospitalizations

- One top 10% HC beneficiary will be captured for every three VHR beneficiaries followed.

- The high risk group has almost as many members, but includes only half of the HC group, payments and hospitalizations.

- The low risk group has 5 times as many members as the VHR group but a similar amount of total resource use.
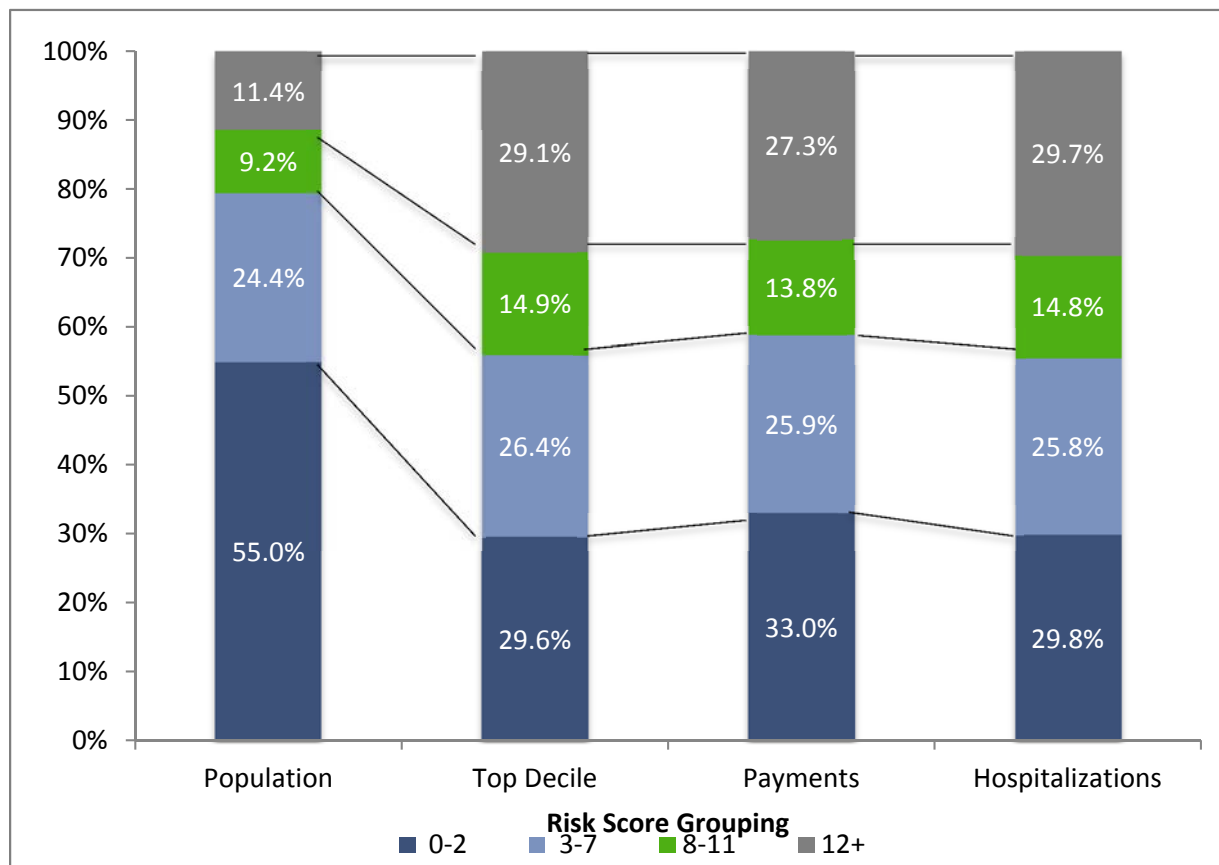


| Risk group | N % | HC Rate | % of HC | % of Hosp | NNI |
|---|---|---|---|---|---|
| Very High Risk (12+) | 11.4% | 33.8% | 29.1% | 29.7% | 3.0 |
| High Risk (8-11) | 9.2% | 21.6% | 14.9% | 14.8% | 4.6 |
| Moderate Risk ( 3-7) | 24.4% | 14.3% | 26.4% | 25.8% | 7.0 |
| Low Risk ( 0-2) | 55.0% | 7.1% | 29.6% | 29.8% | 14.1 |

TREXIN

# CBO Goal 1 – Identify a relatively small proportion of probable HC

- The VHR group (score 12+) is only 11.4% of the population but yield 29.1% of the HC beneficiaries, consume 27.3% of all resources and 29.7% of hospitalizations.

- One in three are high cost in the next year (mean $37,098)

- The other 2/3 were generally also expensive

  - 32% were in the 2nd decile of cost (mean $9,613)

  - 19% were in the 3rd decile of cost (mean $4,224)

  - 15% were in the 4th decile of cost (mean $2,163)

- All together, half of the non-HC group among the VHR were in the second or third decile.

- All risk group assignments were prospectively identified.

TREXIN

# The VHR Group Over Time

- Looking at the VHR group over the second follow up year:

  - 9.4% of all living beneficiaries

  - 21.3% of the next year HC group

- Importantly, those in the VHR group who were not in the top 10% HC group in the first year were among those most likely to be in it the following year.

  - Calendar cutoffs that result in being lower cost one year were often associated with being higher cost the next.

# The Low Risk Group

- More than half of all beneficiaries (55%)

- Only one in 14 in the top 10% HC (7.1%)

- There are so many in the group that it accounts for nearly a third of all hospitalizations and of the top 10% HC group

- This group makes up for in size what it looses by rate.

  - Only 0.9% had a Single Event HC surgery, but the Low Risk group accounted for almost half (45.9%) of the Single Event HC class.

  - While only 4.5% had multiple hospitalizations, the Low Risk group still accounted for 28% of all multiple hospitalization beneficiaries.

TREXIN

# Opportunity to Reduce Spend

- Having prospectively identified a relatively small group of potential HC beneficiaries we now turn to the next goal: reducing spend.

- Corresponding to specific HC pathways there are particular approaches.

  - Structural

    o On Going: Active case management to avoid gaps and unnecessary resource use

    o Single Event: Be certain that no other less costly or less risky option is available

  - Probabilistic

    o Random: While low risk beneficiaries have a lower rate of hospitalization (13.6%) those that have a hospitalization are at high risk for another hospitalization in the same year (33%). The simplest opportunity here is post-discharge case management to avoid additional hospitalizations.

    o Likely: Because of their very high risk for multiple hospitalizations in a year the High Risk and Very High Risk groups are ideal candidates for active case management.

# Case Management for the High Risk Groups

- The High Risk groups are expensive because of the high rate that they consume hospital resources and services that have migrated from the inpatient to outpatient hospital setting.

  - The VHR group has a 25% multiple hospitalization rate and a 33% of entering the top 10% HC group.

  - On average these beneficiaries have 9 of the 52 health status categories in their recent history, with three of the these categories (5 points) associated with recent acute conditions.

  - Active case management that avoids acute conditions and leads to resolution of some chronic conditions can greatly reduce the probability of hospitalizations and HC status.

TREXIN

# Sensitivity Analysis

- Armed with a predictive model we can use it to undertake a sensitivity analysis and determine the possible health benefits and cost savings from different success levels in case management.

- For this simulation we imagine doing proactive case management for the 20% of beneficiaries in the VHR and HR groups comprising 20% of all beneficiaries and using 40% of all resources.

- This group has on average 12 health status points and 8 health related conditions of interest per beneficiary

- We Calculated the impact of reducing the burden on average by 2,4,6 and 8 points per managed beneficiary and calculated the saving to the Medicare Program.

TREXIN

# Sensitivity Analysis Results

- With the $300 B Medicare spend at this time 3.6% is $10.8B

- Even modest improvement in case management among HR Medicare beneficiaries can yield substantial savings.

- With more optimistic scenarios as much as 15% ($46 B) might be saved.

- This analysis shows that while substantial benefits are available through active case management of HR populations, this can at best compensate for a third of excess healthcare spend.

| HS change | Saving as % of System Cost | System Savings | Savings per Managed Case |
|---|---|---|---|
| 2 (17%) | 3.6% | $10.8 B | $1,180 |
| 4 (33%) | 7.4% | $22.2 B | $2,397 |
| 6 (50%) | 11.1% | $33.3 B | $7,141 |
| 8 (67%) | 15.3% | $45.9 B | $8,498 |

TREXIN

# That was then, this is now

| 2000 Medicare Expenditures | $215.1B | % of Total Increase |
|---|---|---|
| Consumer Price Index Adjustment | $58.1B | 18.7% |
| Medicare Population Increase | $55.2B | 17.8% |
| Additional Cost of Physician Visits | $12.6B | 4.1% |
| Additional Outpatient Cost | $12.6B | 4.1% |
| Additional Inpatient Cost | $64.8B | 20.9% |
| Remainder of Additional Cost | $107.2B | 34.5% |
| Total Increase | $310.5B | |
| 2010 Medicare Expenditures | $525.6B | |

TREXIN

# Real World Example: Analytics in the Care Cycle

- Patients had from 0 to 27 other health related conditions

  - 12.5% had no other conditions, 10% had 10 or more

- Health state organized by Recent History of Acute and Chronic Illness score

  - Used to predict chance of hospitalization in the next year and chance of death in the next year

- Micro-segment based on age, sex, zip code, etc.,

| | Lower 10% | | Upper 10% | |
|---|---|---|---|---|
| | **Expected** | **Actual** | **Expected** | **Actual** |
| **1-year Mortality** | 2.5% | 3.6% | 33.6% | 33.2% |
| **1-year Hospitalization rate** | 21.8% | 21.8% | 62.3% | 68.0% |
| **1-year Total Cost** | | $6,374 | | $37,464 |
| **1-year Hospital Cost** | | $3,781 | | $23,381 |
| **1-year Hospital/Total Costs** | | 59% | | 62% |

TREXIN

# HEALTHCARE OUTCOMES – THE CHALLENGE

- With healthcare reform, we moved from controlling access to controlling care and we moved from cost shifting to managing health

The Industrial Productions Approach:

| Uniform Inputs | ➤ | Uniform Processes | ➤ | Uniform Output |
|---|---|---|---|---|

The Healthcare Approach:

| Varied Inputs | ➤ | Varied Processes | ➤ | Personalized Output |
|---|---|---|---|---|

- There is no uniform approach for healthcare. Healthcare Analytics allows to understand impacts of varied inputs, find appropriate processes to get the personalized output

# Real World Example: Health State in the Medicare Population

A Health State score was assigned for 5% of the Medicare population.

A model was built which predicted mortality.

A logistic regression model identified the 53 conditions independently associated with mortality along with age and gender.

The identified factors included both chronic and acute conditions.

The model fit well and accounted for more variation than prior severity scores (Charlson and Elixhauser).

# Converting Risk Scores to Effective Age

| Score | Frequency | Four-year Mortality | Effective Age | Life Expectancy |
|-------|-----------|---------------------|---------------|-----------------|
| 0 | 6.1% | 3.0% | 56 | 25.8 |
| 1 | 8.4% | 4.5% | 61 | 21.7 |
| 2 | 7.6% | 5.3% | 64 | 19.4 |
| 3 | 13.0% | 7.2% | 67 | 17.1 |
| 4 | 5.4% | 9.4% | 70 | 15.0 |
| 5 | 9.9% | 12.0% | 73 | 13.0 |
| 6 | 5.5% | 14.5% | 75 | 11.7 |
| 7 | 5.4% | 17.8% | 77 | 10.5 |
| 8 | 3.9% | 20.0% | 79 | 9.3 |
| 9 | 4.7% | 23.7% | 80 | 8.8 |

- Risk score and probabilities are difficult tools to communicate.

- Converting scores and probabilities to effective age makes it easier to forecast.

- A score is converted to an effective age by comparing multi-year mortality to published life tables.

- Given the effective age, expected survival can also be estimated.

- Effective age and life expectancy makes it easier to understand and predict the outcome.

TREXIN

# Benefit of Hip replacement Surgery
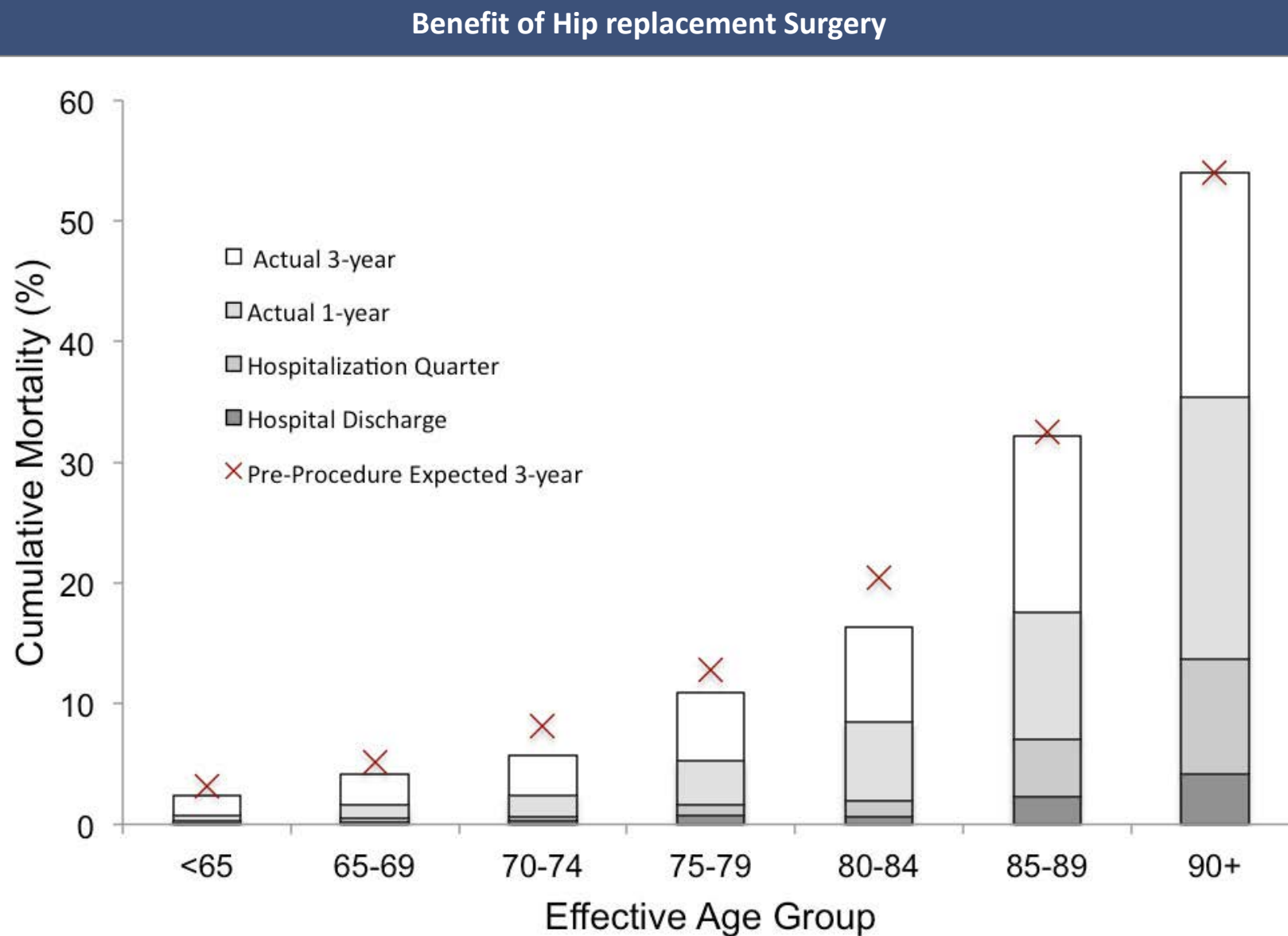
# Benefit of Hip Replacement Surgery

|  | <65 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90+ | total |
|---|---|---|---|---|---|---|---|---|
| Entire cohort eage distribution | 22.1% | 13.0% | 15.4% | 14.8% | 13.8% | 9.9% | 11.2% | 1,287,952 |
| Hip Replacement eage distribution | 18.7% | 11.5% | 15.7% | 18.0% | 16.6% | 10.4% | 9.0% | 13,107 |
| Hip Replace Rate | 0.9% | 0.9% | 1.0% | 1.2% | 1.2% | 1.1% | 0.8% | |
| | | | | | | | | |
| Pre-procedure | | | | | | | | |
| Health State Effective Age | 61 | 67 | 72 | 77 | 82 | 87 | 94 | 75.3 |
| Expected 3-y mortality (%) | 3.2 | 5.2 | 8.1 | 12.8 | 20.4 | 32.5 | 54.0 | |
| Expected mean survival | 21.8 | 17.1 | 13.8 | 10.6 | 7.8 | 5.5 | 3.3 | 12.3 |
| | | | | | | | | |
| Post procedure Cumulative Mortality (%) | | | | | | | | |
| Hospital Discharge | 0.2 | 0.1 | 0.2 | 0.8 | 0.6 | 2.3 | 4.2 | 0.9 |
| Hospitalization Quarter | 0.3 | 0.5 | 0.6 | 1.6 | 2.0 | 7.0 | 13.6 | 2.8 |
| 1-year | 0.7 | 1.6 | 2.4 | 5.3 | 8.5 | 17.6 | 35.4 | 8.1 |
| 3-year | 2.4 | 4.2 | 5.7 | 10.9 | 16.3 | 32.1 | 54.0 | 14.7 |
| | | | | | | | | |
| Observed Effective Age | 58 | 65 | 68 | 75 | 80 | 87 | 94 | 78.5 |
| Expected mean survival (years) | 24.2 | 18.6 | 16.4 | 11.7 | 8.8 | 5.5 | 3.3 | |
| | | | | | | | | |
| Difference between Prior year expectation and procedure related outcomes | | | | | | | | |
| Change in eage | -3.0 | -2.0 | -4.0 | -2.0 | -2.0 | 0.0 | 0.0 | |
| Change in exp surv | 2.4 | 1.5 | 2.6 | 1.1 | 1.0 | 0.0 | 0.0 | |

**Patients with effective age less than 85 had enhanced survival following hip replacement surgery. Those with effective age of 90 and over (one in nine cases) had an increase in one year mortality (35.4% verse the expected 25%) with no improvement in 3-year survival.**

TREXIN

# Agenda

| 4 | How Do We Get Started? |
|---|---|

| 5 | Questions |
|---|---|

Source: Cooper, Robert G., and Scott J. Edgett.  *Lean, Rapid and Profitable: New Product Development*. New Product Development Institute, 2005.

TREXIN

# How do we get started

- Step 1: Outcome Measure Assessment (show value)

    - Identify primary stakeholders

    - Interview primary stakeholders to determine measures

    - Request data for analysis

    - Determine primary conditions with the most variation in outcomes and cost

- Step 2: Healthcare Analytics Implementation

    - Create information factory

    - Integrate data

    - Align procedures and processes

    - Implement analytic models

TREXIN

# Speakers Contact Information

## Ngan MacDonald

**Role:** Analytics SME and Industry Thought Leader

**Email:** ngan.macdonald@trexin.com

**LinkedIn:** www.linkedin.com/in/nganmacdonald/

**Twitter:** @nmac38

## Walter Linde-Zwirble

**Role:** Data Scientist and Industry Thought Leader

**Email:** walter.linde-zwirble@trexin.com

**LinkedIn:** www.linkedin.com/pub/walter-linde-zwirble/79/5a3/403

**Twitter:** @WalterLZwirble

TREXIN

www.trexin.com