Analysis of Trends in Utilization and Cost of Insulins in Canada and the US

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Presenter Disclosures

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(1)   The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

Employed by the MCPHS University Industry Fellowship Program
- Host Company: Becton Dickinson

Learning Objectives

- Describe trends and analyze differences in insulin utilization and cost in Canada and the US

- Discuss potential reasons explaining the substantial differences in insulin utilization in the US and Canada

Diabetes Snapshot

Canada

- 9.3% prevalence (2015)
  - 3.4 million people
- 22.1% with pre-diabetes
  - 5.7 mm people
- Est. 2025 prevalence: 12.1%

- $14 bn cost of diabetes

- **2008/09**
  - 6.8% (2.4 mm) had DM

USA

- 9.3% prevalence (2012)
  - 30 million people
- 37% with pre-diabetes
  - 86 mm people
- 1 in 3 will have diabetes in 2050 if trends continue

- $176 bn direct cost
  - $69 bn indirect
- 2.3x more health care costs

- **2008**
  - 7.8% (23.6 mm) had DM

ADA and CDA Website

Definitions

- Diabetes mellitus (DM)
  - a group of diseases that affect how your body uses blood sugar

- Insulin Unit
  - Measurement of insulin dose
  - 100 insulin units = 1 mL
    - In "regular strength" insulins

Methods

- Data was extracted from the IMS Dataview database

- Evaluated:
  - Volume of insulin sold
    - In insulin units
  - Ex-manufacturer sales in USD
    - Company-reported sales
  - Info broken down into *Total, Retail, Hospital, Pen, Vial*

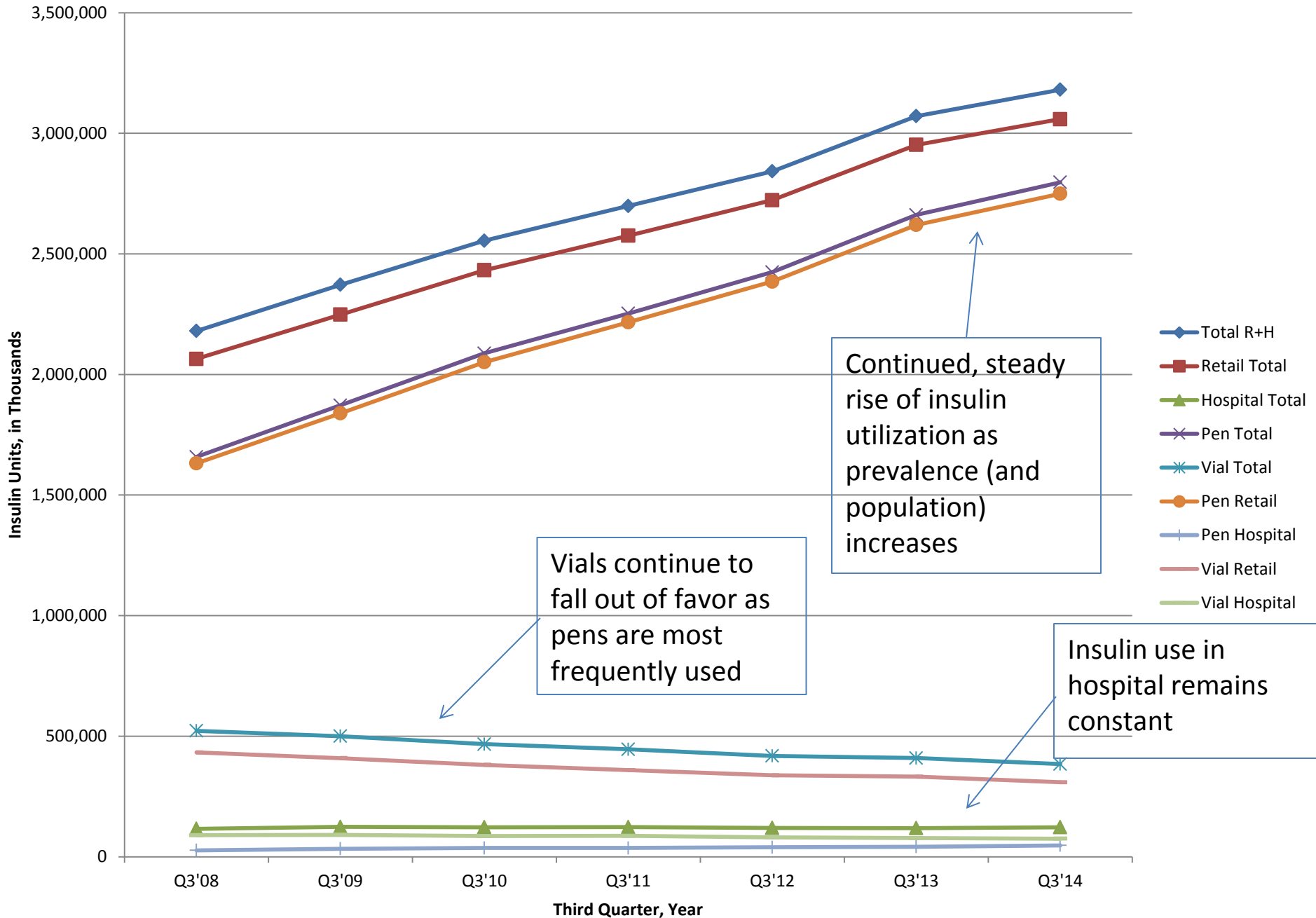- Descriptive statistics used to analyze trends

Significance

- Insulin has recently been increasing in price

- Higher prices can make insulin unaffordable for some

- If patients do not take their insulin, a potentially larger problem can be created when diabetes complications arise

- The increasing amount of money spent on insulin cannot be sustained (*think of the amount of diabetes patients on Medicare*)
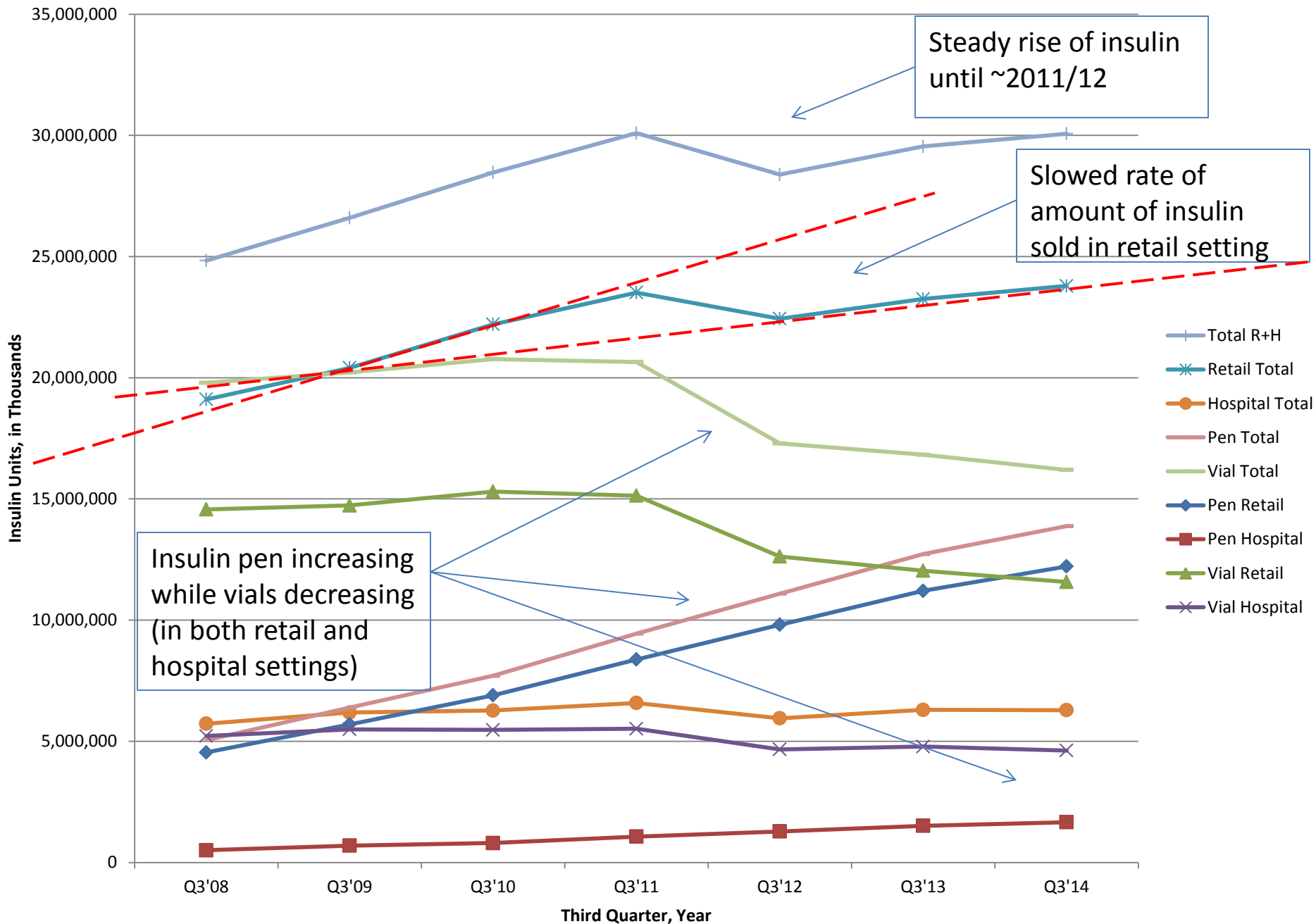
Utilization of Insulin
Volume of Insulin Sold in Insulin Units

	Canada		US	
	2008	2014	2008	2014
Total population	33.25 mm	35.5 mm	304 mm	319 mm
Total insulin sold in Q3 Insulin units, thousands	2,180,602	3,181,004	24,833,244	30,069,840
Unadjusted increase	Increase of 46%		Increase of 21%	
Adjusted for total population	**Increase of 37%**		**Increase of 15%**	
Insulin sold in retail setting, adjusted for population	Increase of 39%		Increase of 18%	
Prevalence of diabetes	6.8%	9.3% *(in 2015)*	7.8%	9.3% *(in 2012)*
	Increase of 37%		Increase of 19%	

Canada Insulin Trends from Q3'08 to Q3'14

Continued, steady rise of insulin utilization as prevalence (and population) increases

Vials continue to fall out of favor as pens are most frequently used

Insulin use in hospital remains constant

Legend:
- Total R+H
- Retail Total
- Hospital Total
- Pen Total
- Vial Total
- Pen Retail
- Pen Hospital
- Vial Retail
- Vial Hospital

Y-axis: Insulin Units, in Thousands

X-axis: Third Quarter, Year (Q3'08, Q3'09, Q3'10, Q3'11, Q3'12, Q3'13, Q3'14)
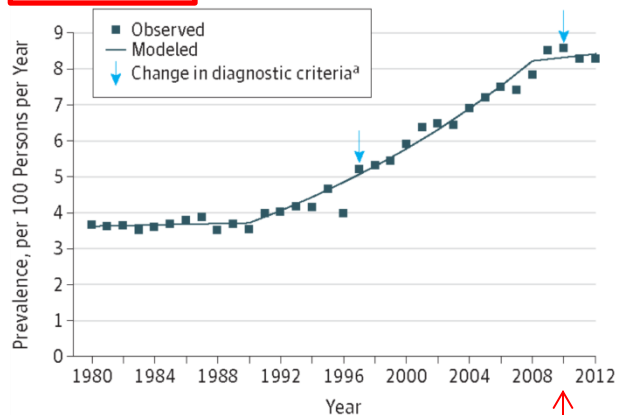
US Insulin Trends from Q3'08 to Q3'14
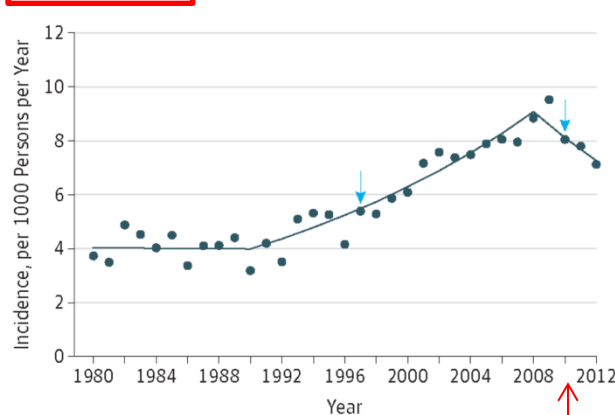
From: **Prevalence and Incidence Trends for Diagnosed Diabetes Among Adults Aged 20 to 79 Years, United States, 1980-2012**

Trends in Age-Adjusted Diagnosed Diabetes Prevalence and Incidence Among Adults Aged 20-79 Years, 1980-2012Data are from the National Health Interview Survey. Joinpoint regression was conducted using the natural logarithm of the age-adjusted rate as the dependent variable and year as the independent variable.

[a]In 1997, the diabetes diagnostic criteria for fasting plasma glucose was lowered from 140 mg/dL or more to 126 mg/dL or more; in 2010, hemoglobin A_{1c} was adopted for the diagnosis of diabetes. To convert glucose to mmol/L, multiply by 0.0555.
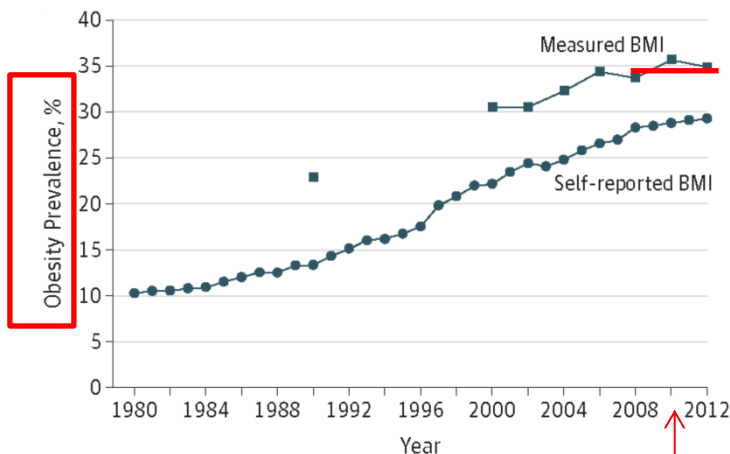
Trends in Age-Adjusted Prevalence of Obesity Among Adults Aged 20 to 79 Years, 1980-2012BMI indicates body mass index (calculated as weight in kilograms divided by height in meters squared). The prevalence of obesity was based on BMI derived from self-reported height and weight data from the National Health Interview Survey. Prevalence of obesity among adults aged 20 years or older was based on measured BMI from the National Health and Nutrition Examination Surveys (NHANES) from 1988 to 1994 (NHANES III) and 1999 to 2012 (continuous NHANES). Line is not drawn through noncontiguous surveys.

Explanations for US Slow-Down?

- US utilizing more orals or non-insulin injectable

- US is waiting longer to "insulinize" its patients

- Prevalence of diabetes is leveling off in the US[1]

- Less patients able to afford their insulin

- Less insulin waste in pen vs. vial

Drug[2]	Year
Januvia (sitagliptin)	2006
Onglyza (saxagliptin)	2009
Victoza (liraglutide)	2010
Tradjenta (linagliptin)	2011
Bydureon (exenatide ER)	2012
Nesina (alogliptin)	2013
Invokana (canagliflozin)	2013
Trulicity (dulaglutide)	2014
Tanzeum (albiglutide)	2014
Jardiance (empagliflozin)	2014
Farxiga (dapagliflozin)	2014

1. Geiss et al. JAMA 2014, Prevalence and Incidence Trends for Diagnosed Diabetes Among Adults Aged 20 to 79 Years, United States, 1980-2012
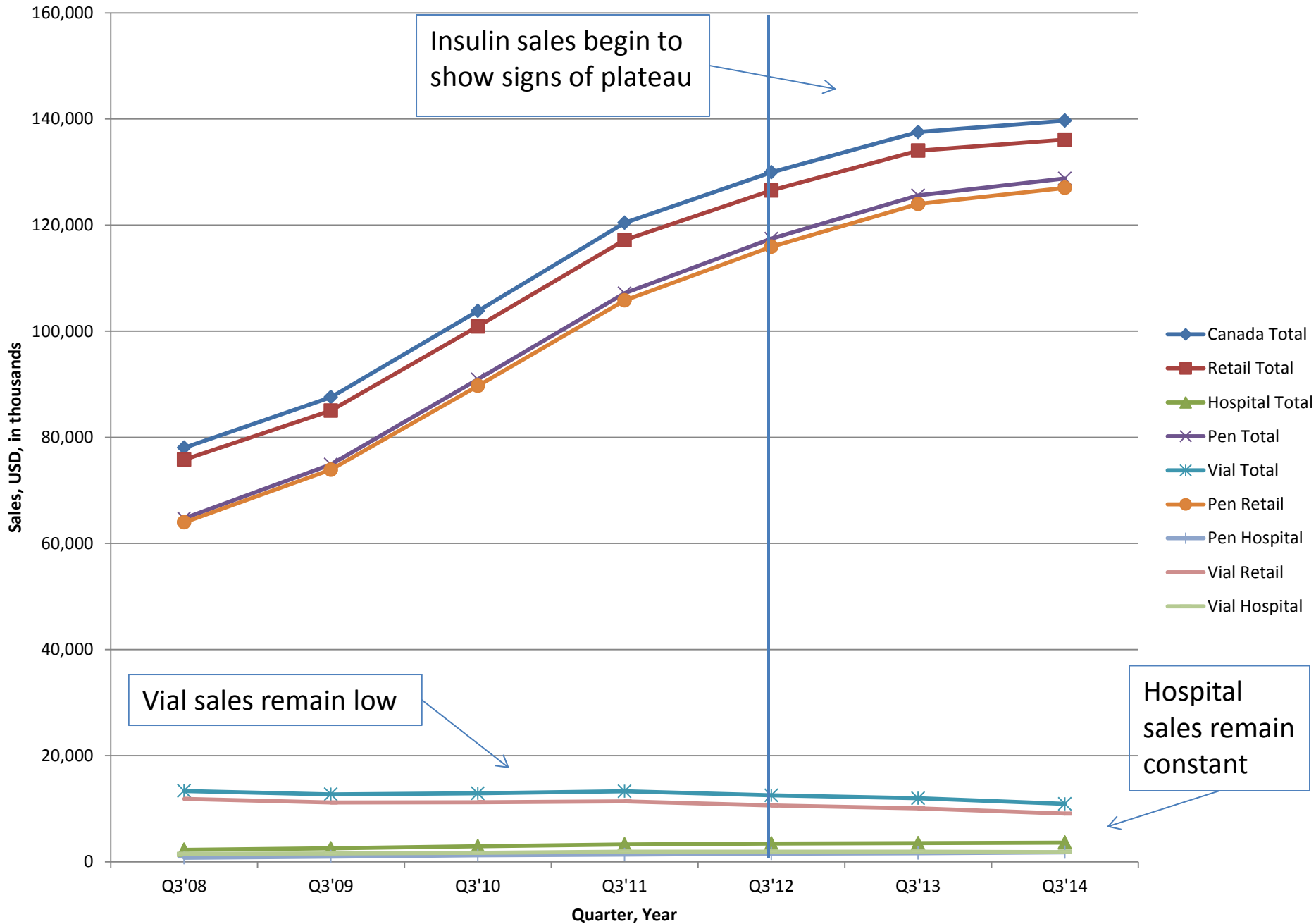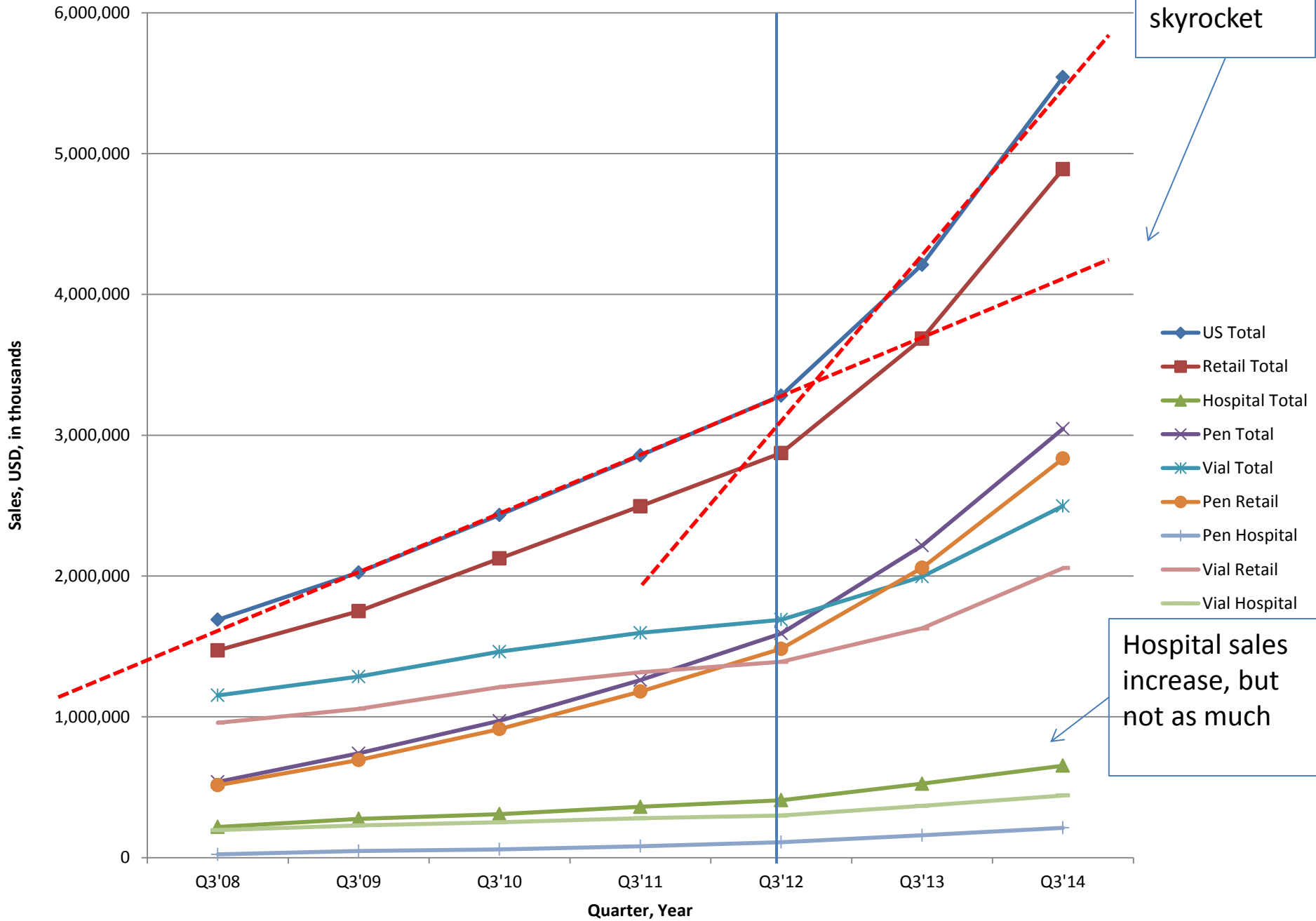2. FDA

Manufacturer Sales
Amount of Insulin Sold in USD

	Canada		US	
	2008	2014	2008	2014
Total population	33.25 mm	35.5 mm	304 mm	319 mm
Total Sales Q3, (USD, 1000's)	78,036	139,672	1,689,652	5,542,367
Unadjusted increase	79% increase		228% increase	
Adjusted for total population	**68% increase**		**212% increase**	

Canada Insulin Sales

Insulin sales begin to show signs of plateau

Vial sales remain low

Hospital sales remain constant

Legend:
- Canada Total
- Retail Total
- Hospital Total
- Pen Total
- Vial Total
- Pen Retail
- Pen Hospital
- Vial Retail
- Vial Hospital

Y-axis: Sales, USD, in thousands (0, 20,000, 40,000, 60,000, 80,000, 100,000, 120,000, 140,000, 160,000)

X-axis: Quarter, Year (Q3'08, Q3'09, Q3'10, Q3'11, Q3'12, Q3'13, Q3'14)

US Insulin Sales

Price/Insulin Unit
Total Insulin Units Sold/Total Sales, USD

	Canada		US	
	2008	2014	2008	2014
Average USD/unit, **All insulin**	0.036	0.044	0.068	0.184
	12.2% increase		171% increase	
Average USD/unit, **Retail**	0.037	0.044	0.077	0.206
	19% increase		168% increase	
Average USD/unit, **Pen Retail**	0.039	0.046	0.113	0.232
	18% increase		105% increase	

Canada Price/Unit of Insulin
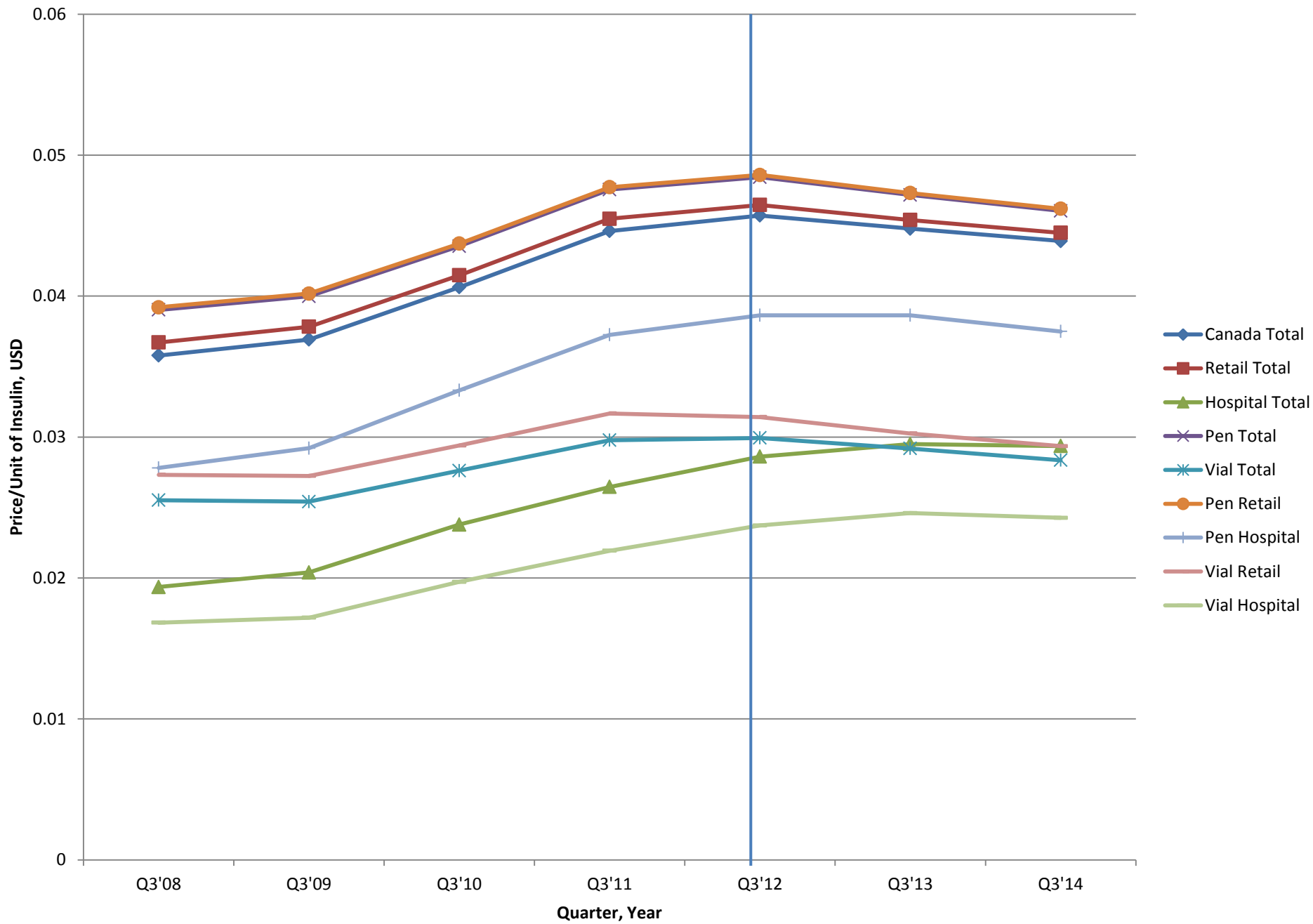
US Price/Unit of Insulin
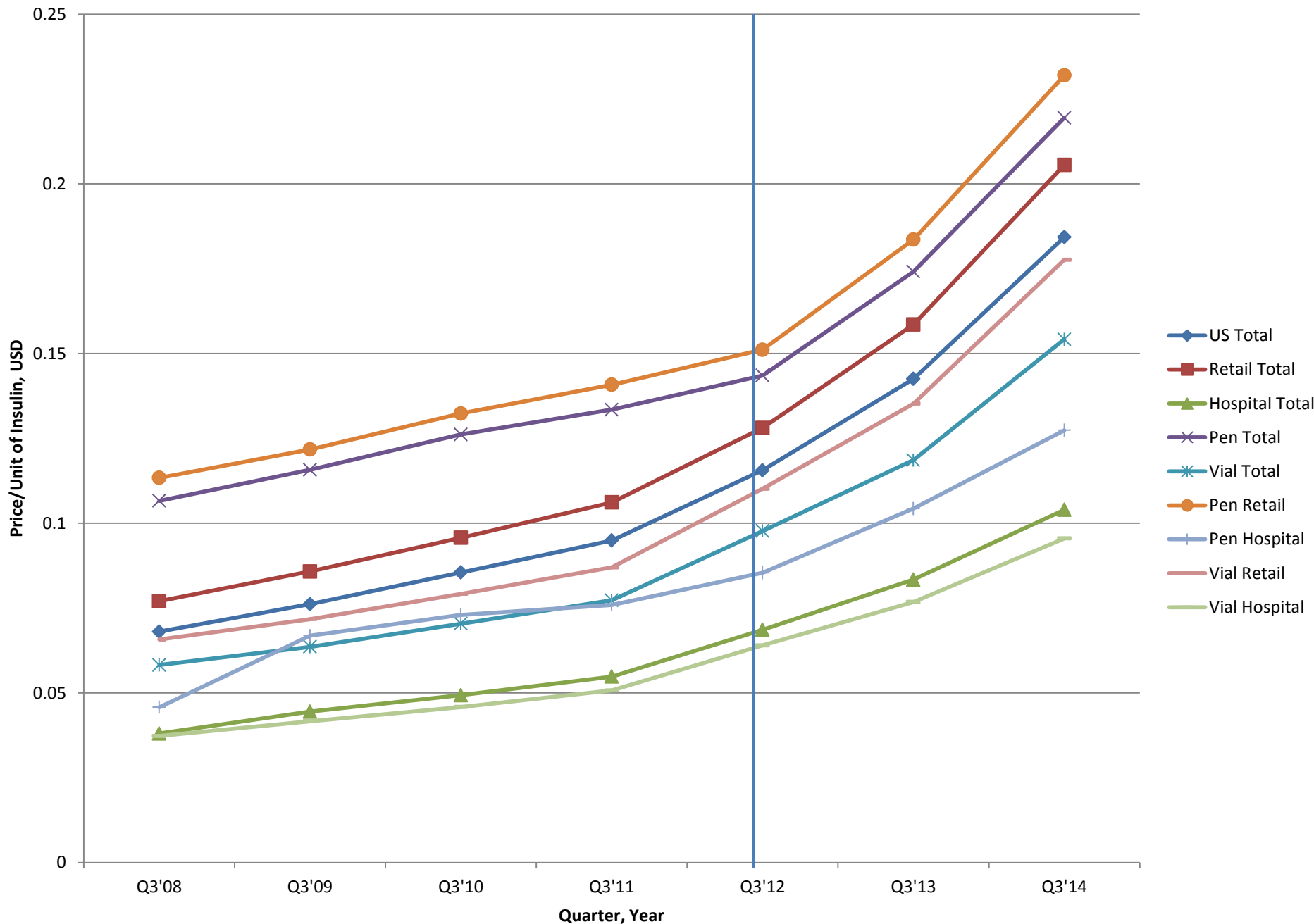
Our Findings Similar to Others

Average price/unit for insulin sold in a pen in the US retail setting = $0.232

This means average price/mL = $23.20

Shadow Pricing

Prices for some competing drugs go up in lockstep, rising the same amount at about the same time.

Source: Bloomberg Intelligence analysis of Symphony Health Solutions data

Explanations for Price Differences?

- May expect initial prices to be higher in the U.S.
  - Do not expect to see prices growing exponentially

- Government in Canada limits prices
  - To ensure they are not excessive

- No such system exists in the U.S.

Explanations for Price Differences?

- U.S. cannot buy in bulk
- Medicare cannot negotiate with pharma
- No comparative research group

- Insulin market monopoly
  - Only a few companies play in this space
- Analogue insulins nearing the end of patents
  - Contributing most to price increase
  - Collect profits before biosimilars (price cut of 20-30%)

- Quite simply, price increases occur because they can

N.A. has 7% of World's diabetes patients, but accounts for over 50% of insulin sales

Diabetes Prevalence, % Insuln-Rx'ed Patients, Share of Sales
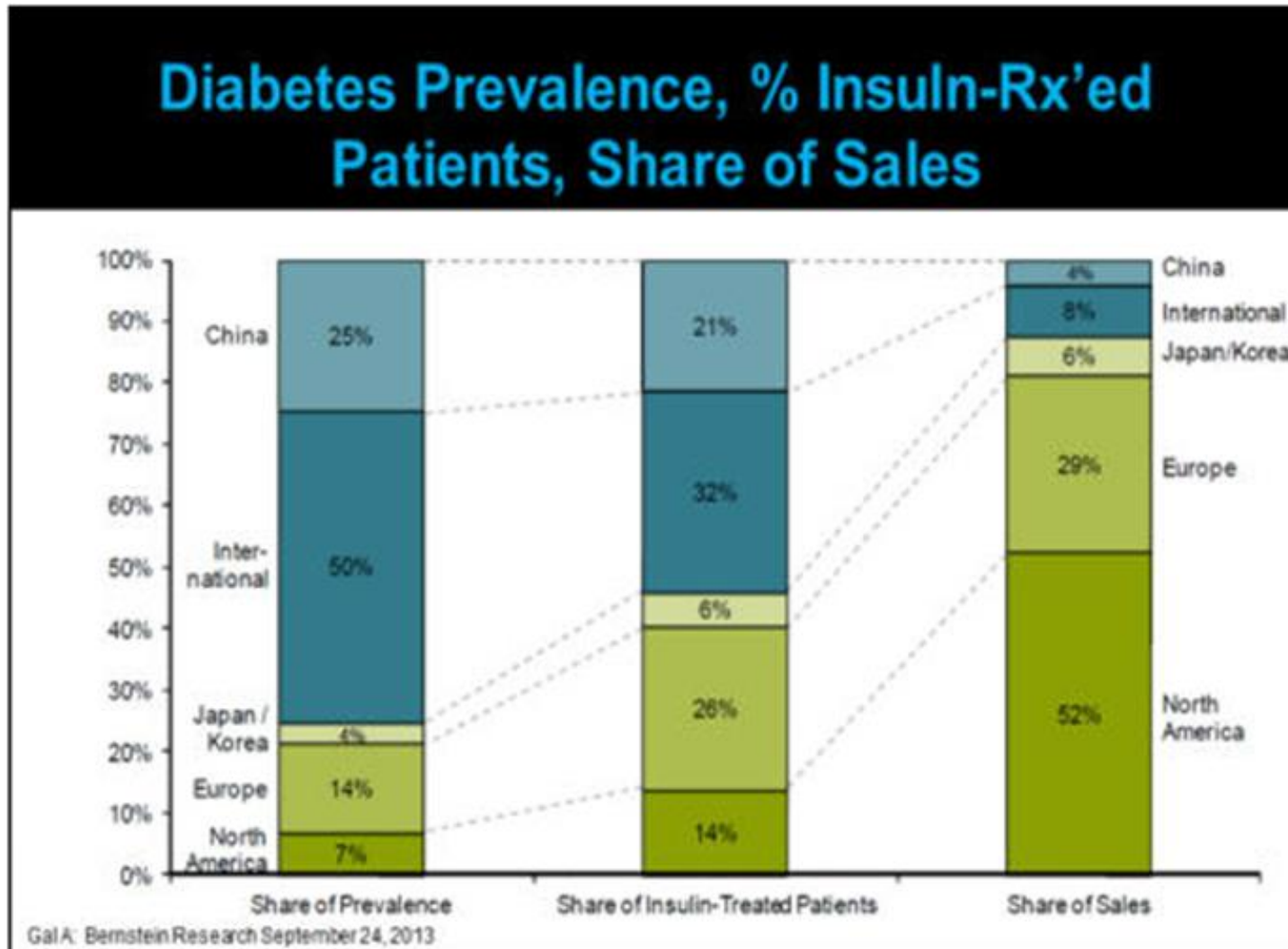
Implications

- Insulin prices (and drug prices in general) cannot continue to grow at their current rate

- Measures for setting and controlling drug prices need to be put into place
  - "Free market" price control in the US not working, largely because it is not a free market

- US should not have to pay more than other developed countries for the same drug

- Look to Canada and EU for their success

Thank you!