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# Egg Demand in Canada

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Presented for the Coop Symposium  
2005

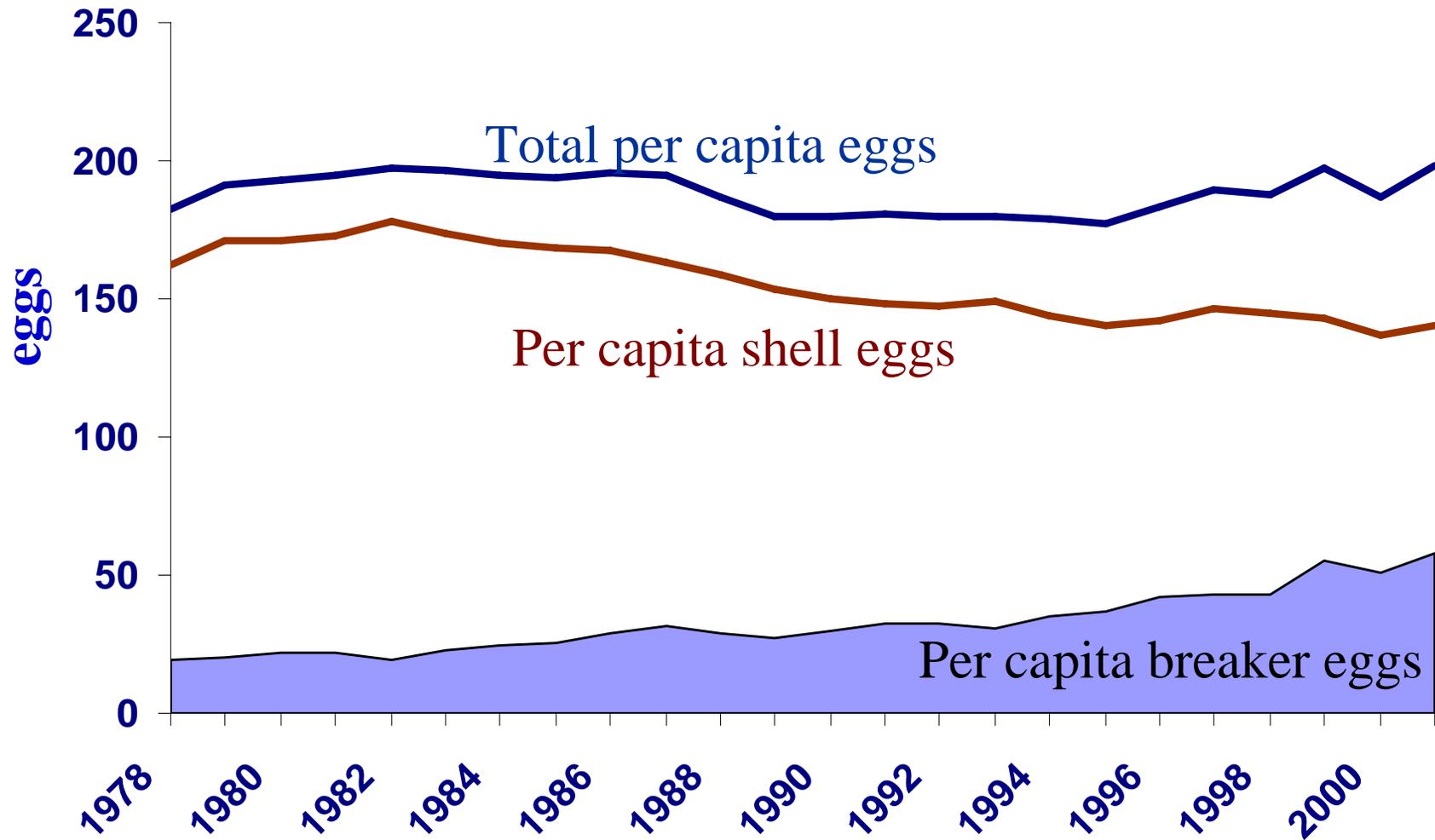
Ellen Goddard,  
Getu Hailu, JP Emunu, Glen Doll, Alesha Hill,  
Shawna Ference, Tyler Schultz

# Issues

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- Egg demand has been and continues to be affected by
  - *Health information and*
  - *Nutritional concerns*
- Egg consumption has declined from as high as 300 eggs per person per annum in 1957 to 185 eggs per person per annum in 2002.

# Trend in Per Capita Egg Consumption



# Media Information

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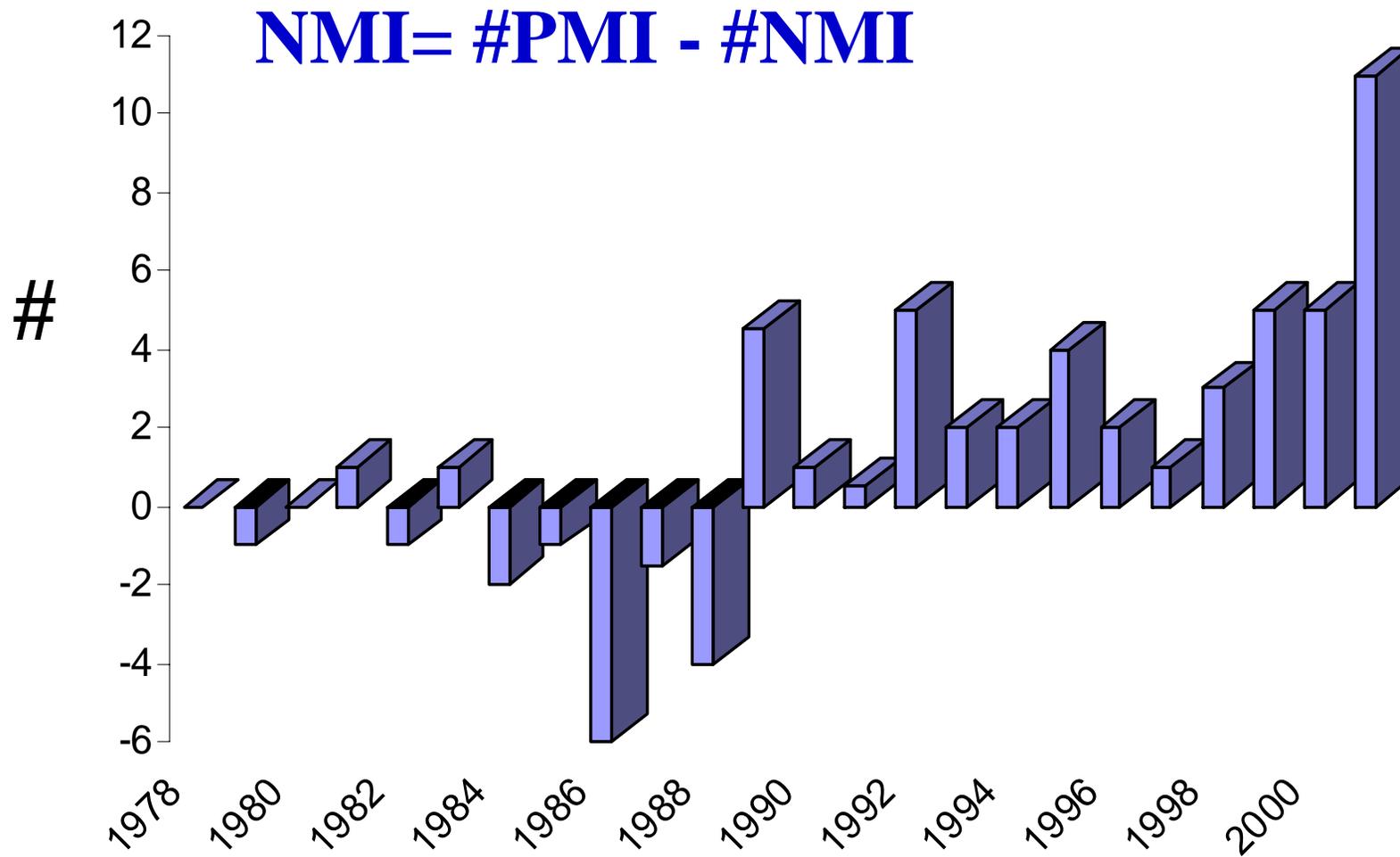
- Media coverage on the health and nutritional implications of egg consumptions
  - Cardio-vascular diseases (mixed and confusing)
    - Cholesterophobia
- Primary producers generic advertising
- Processing firms brand advertising
- Advertising of egg substitute products

# Functional Eggs Development

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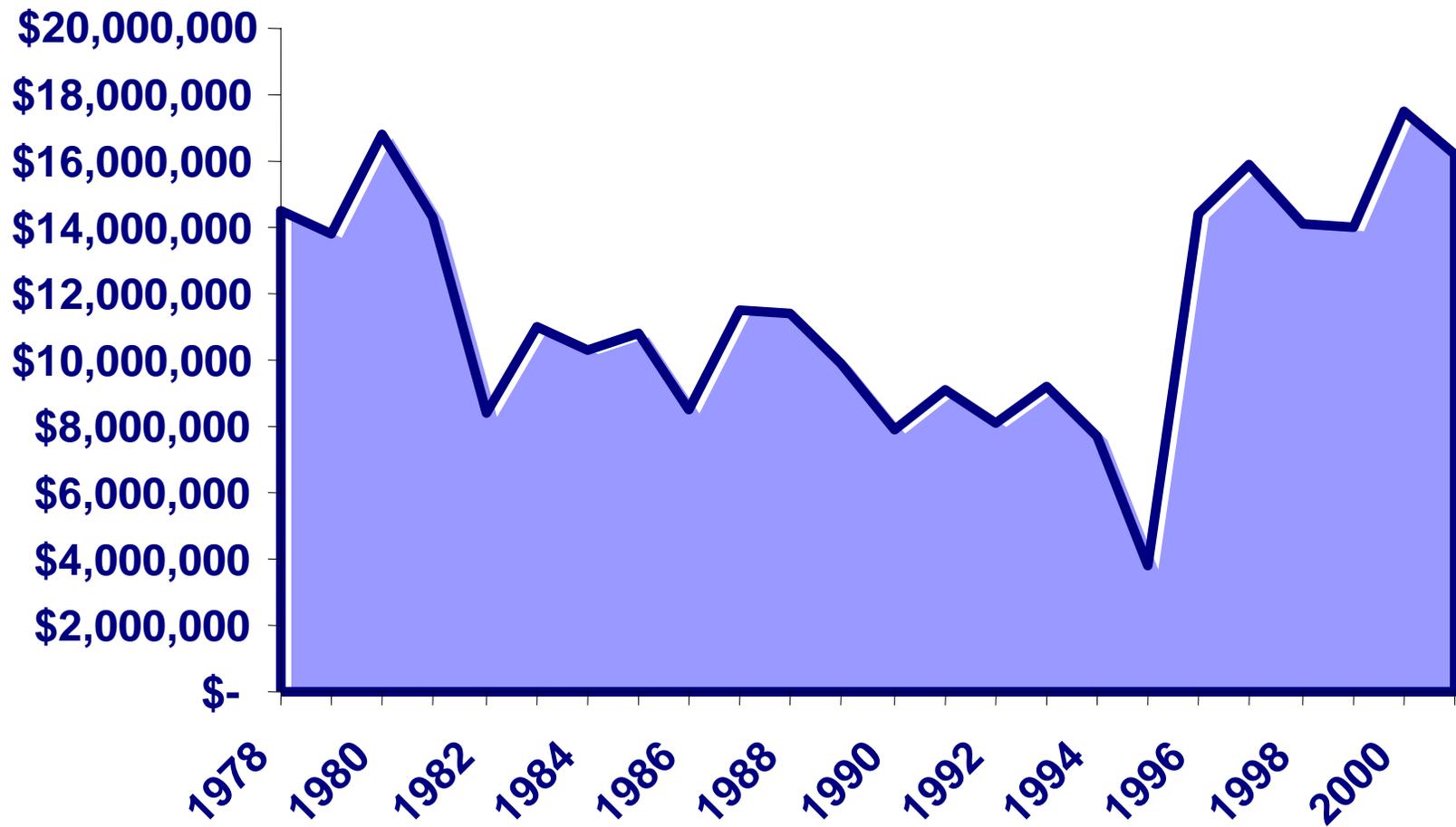
- Since the mid 90's ascribed, in part, to Atkins diet and to the development of functional eggs, total egg consumption has increased both in Canada and the U.S.
- Research on nutritional attributes of egg and development of functional eggs
  - $\Omega$ -3 enhanced eggs,
  - Vitamin-enriched eggs,
  - Celiac Eggs, etc

# Net Media Information



# Generic Advertising by the Industry

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# Previous Studies

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- Egg parametric demand analysis has been widely undertaken in Canada and the U.S.
  - Schmit and Kaiser (1998); Schmit, Reberte, and Kaiser (1997); Wang, Jensen, and Yen (1996); Yen, Jensen, and Wang (1996); Chyc and Goddard 1994); McCutcheon and Goddard (1992); [Brown and Schrader \(1990\)](#); Putler 1987; Loyns and Lu (1973); Kulshreshtha and Ng (1977); Roy and Johnson 1973; Kulshreshtha 1971;

# Why look at eggs?

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- ❑ Not very much recent research published on the Canadian egg market
- ❑ Appears to be changing trend in consumption of eggs
- ❑ Significant product differentiation occurring in the marketplace

# Aggregate Egg Disappearance

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- Two Stage
  - First Stage:
    - Total Expenditure function (Double-log)
  - Second Stage:
    - Almost Ideal Demand System is used in the estimation (share equations)
- Two products
  - Shell eggs
  - Breaker eggs (frozen, dried; cakes, cookies, etc..)

# Data Sources

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- Quarterly data from 1978 to 2001
  - Retail prices, per capita shell and breaker egg disappearance, income, price indices, population
  - Statistics Canada CANSIM database
  - FACTIVA database (Dow Jones/Reuters)
  - A C Neilson
  - Media information index = # (+ve) - #(-ve)
    - New product development
    - Atkins Diet
    - Cholesterol

# Price Elasticities

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	Shell Eggs	Breaker Eggs
Shell Eggs	-0.704***	-3.193***
Breaker Eggs	-0.064***	-0.310***
Breakfast Cereal	0.020	-0.021
Ham and Bacon	-0.020**	0.214**

Ham and bacon are gross complements to shell eggs and gross substitutes for breaker eggs.

# Responses to other variables

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- Shell egg and breaker egg demand appear to respond to their own advertising expenditures
- Media information also affects egg demand and affects directly the size of advertising elasticities (interaction between advertising and media coverage)

# Advertising-Media Interaction Effects

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- Positive media information has increased advertising elasticities of
  - Shell eggs by  $\sim 15\%$  %

# With aggregate data

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- Canadian egg consumption has undergone structural changes
  - Media influences
  - Popularization of Atkins' Diet
  - Introduction of functional eggs
  - Advertising etc
- Impacts of media information and advertising are significant and time varying
- Media information had a significant effect on the size of advertising effectiveness

# What about individual egg purchases?

- Normal / Generic
- Omega 3 enhanced
- Vitamin enhanced
- Organic
- Vegetarian
- Free Range
- Free Run
- Combinations

Source: <http://www.eggs.ca/eggfacts/eggstore.asp>

# Data

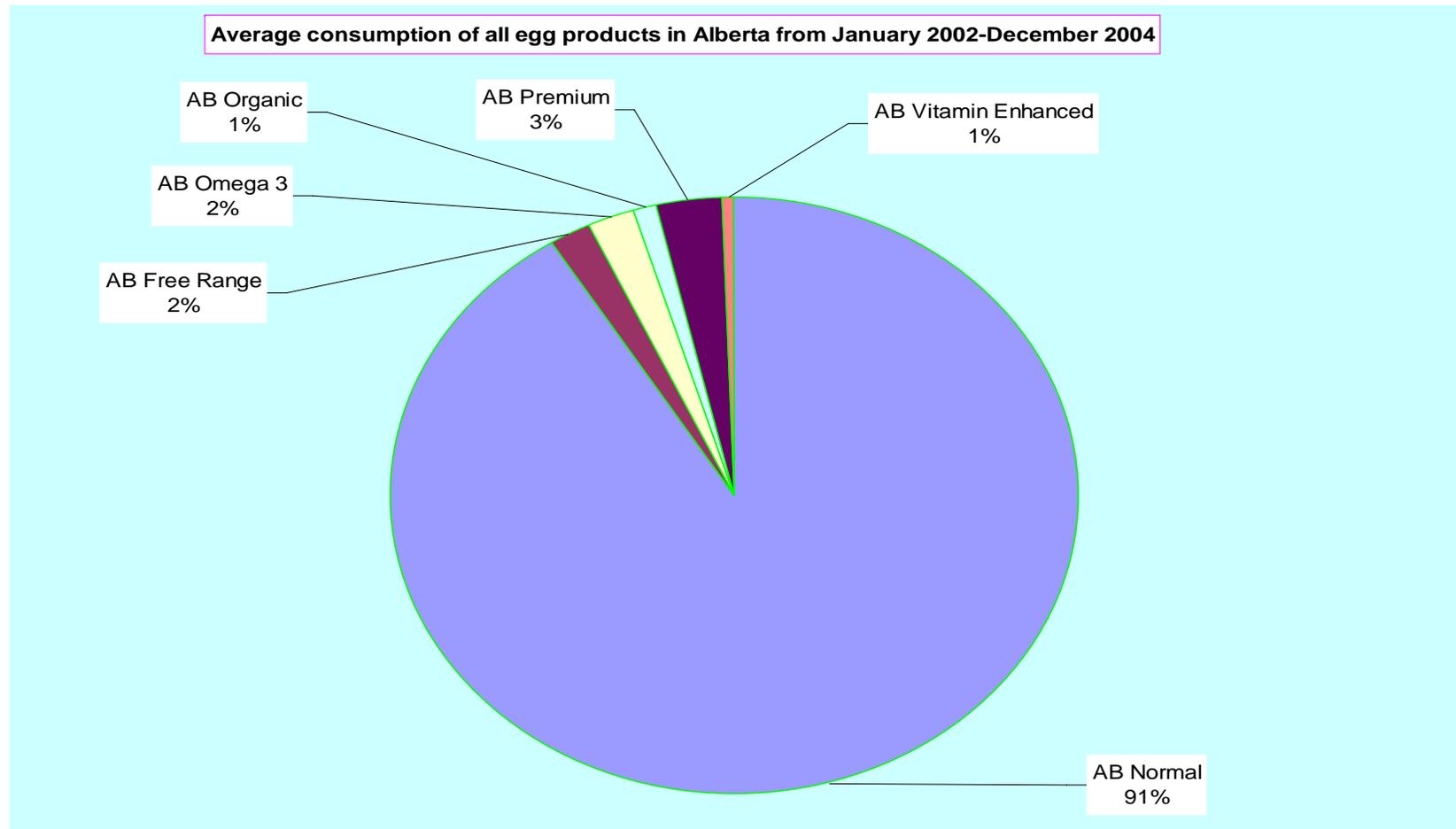
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- A. C. Neilson data- household purchases of egg products over time
  - - data from 2002-2004 on individual households
  - - data in this study from Alberta and Ontario
  - - some demographic data available for each household

# Is Ontario different from Alberta?

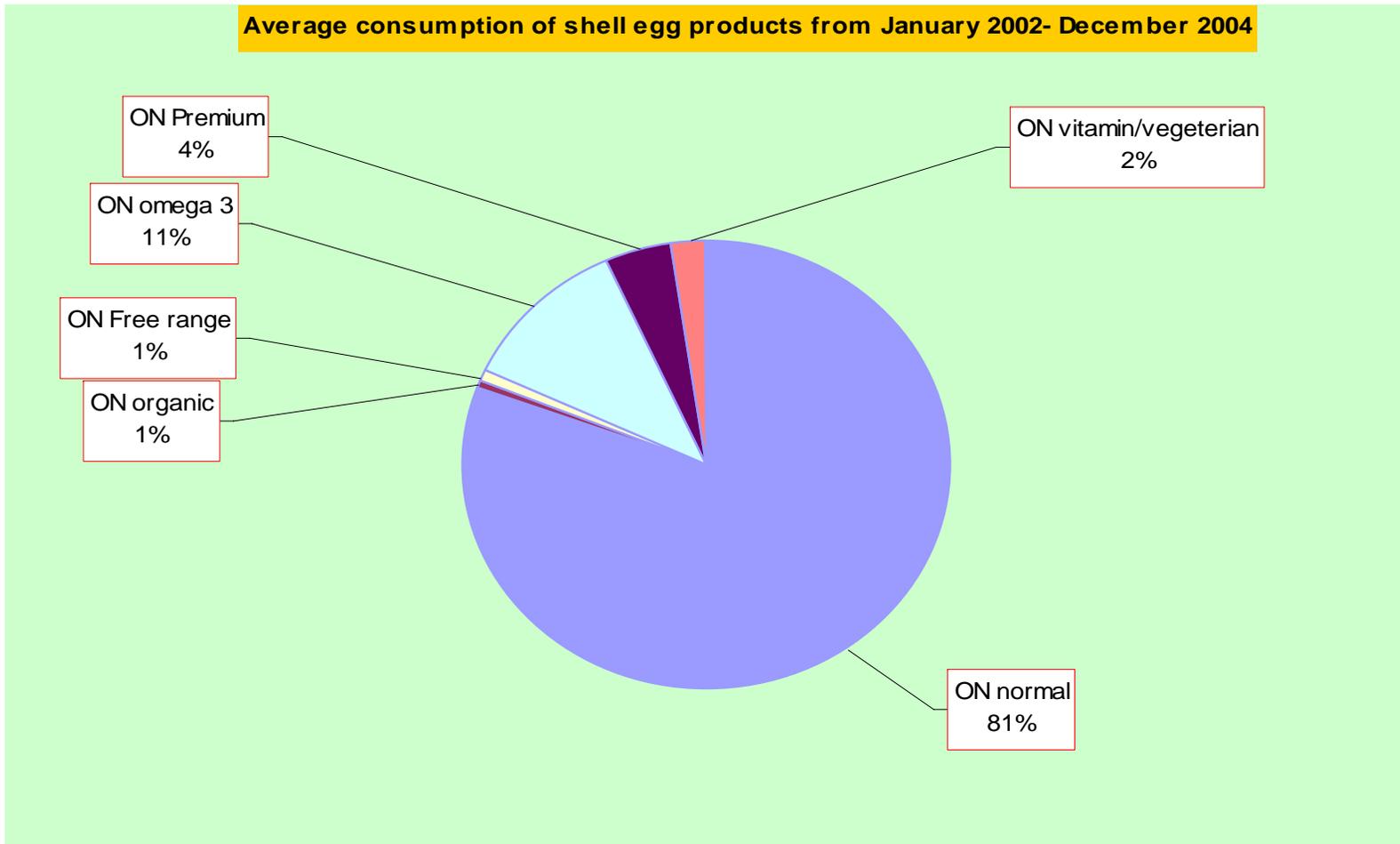
- ❑ Differences could appear in which eggs are purchased
- ❑ Differences could appear in what prices are charged – different retail chains
- ❑ Differences could appear in mix of products available
- ❑ Differences could appear in household characteristics

# Alberta Egg Purchases – 2002-2004

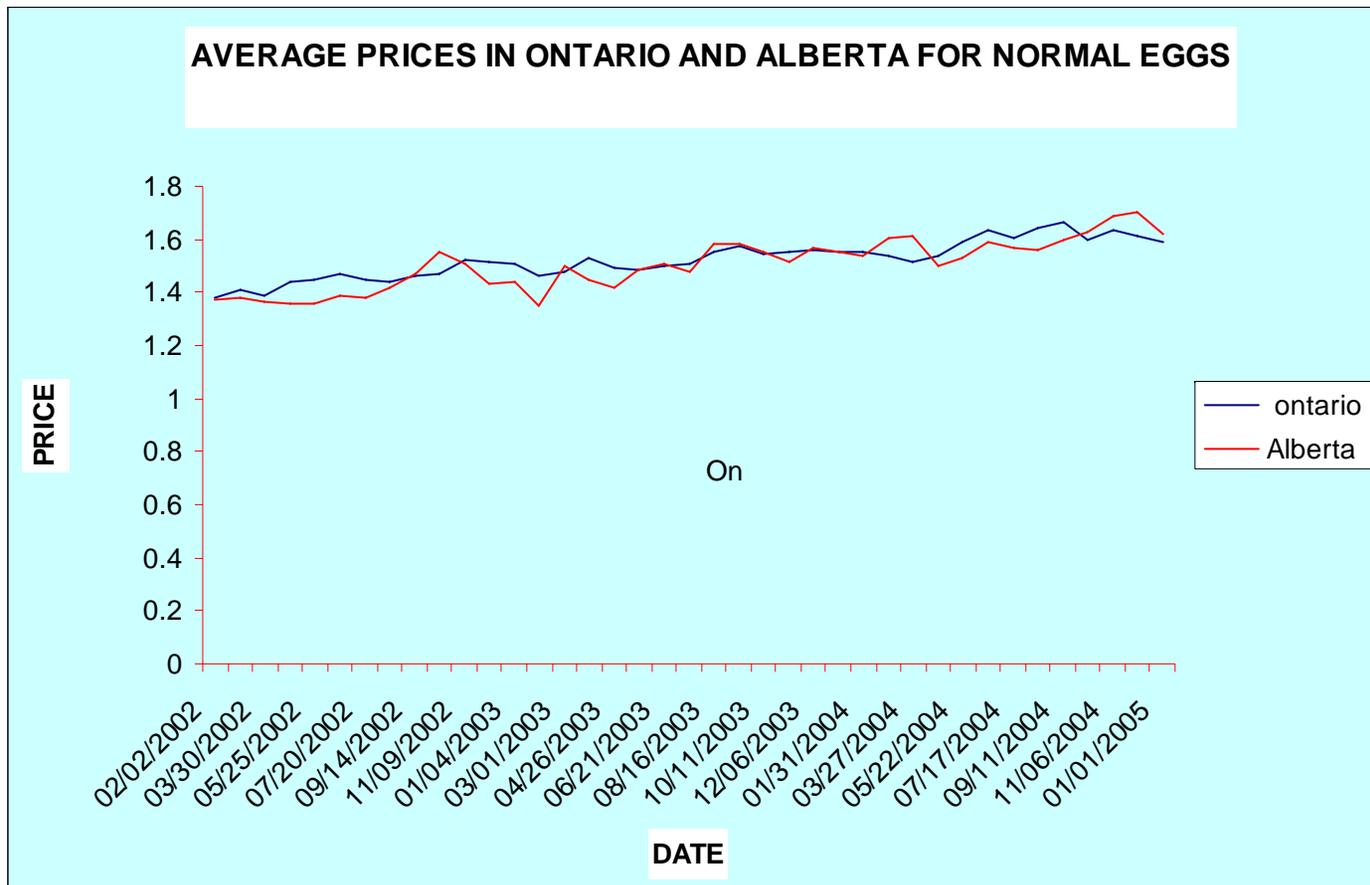


# Ontario Egg Purchases

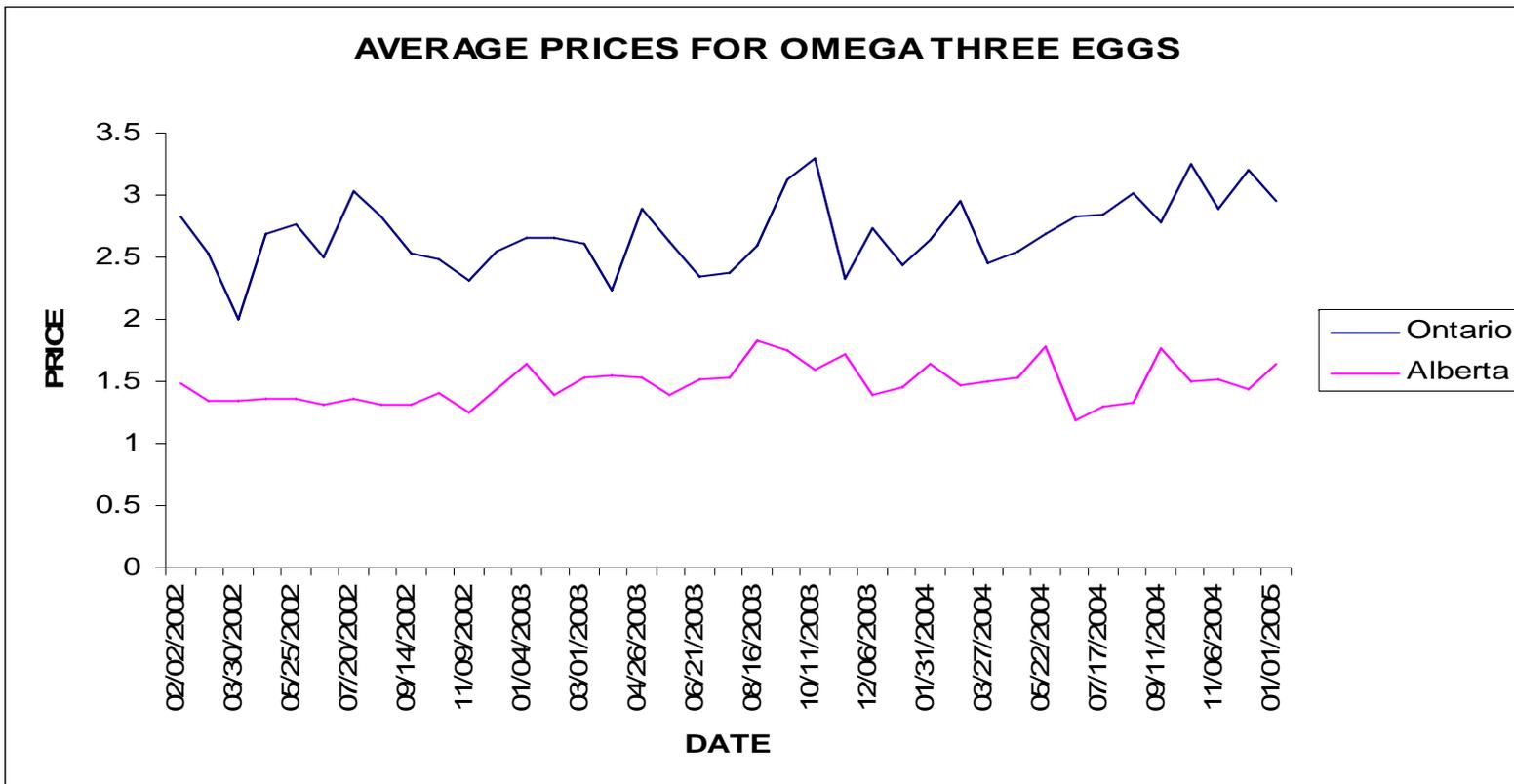
Average consumption of shell egg products from January 2002- December 2004



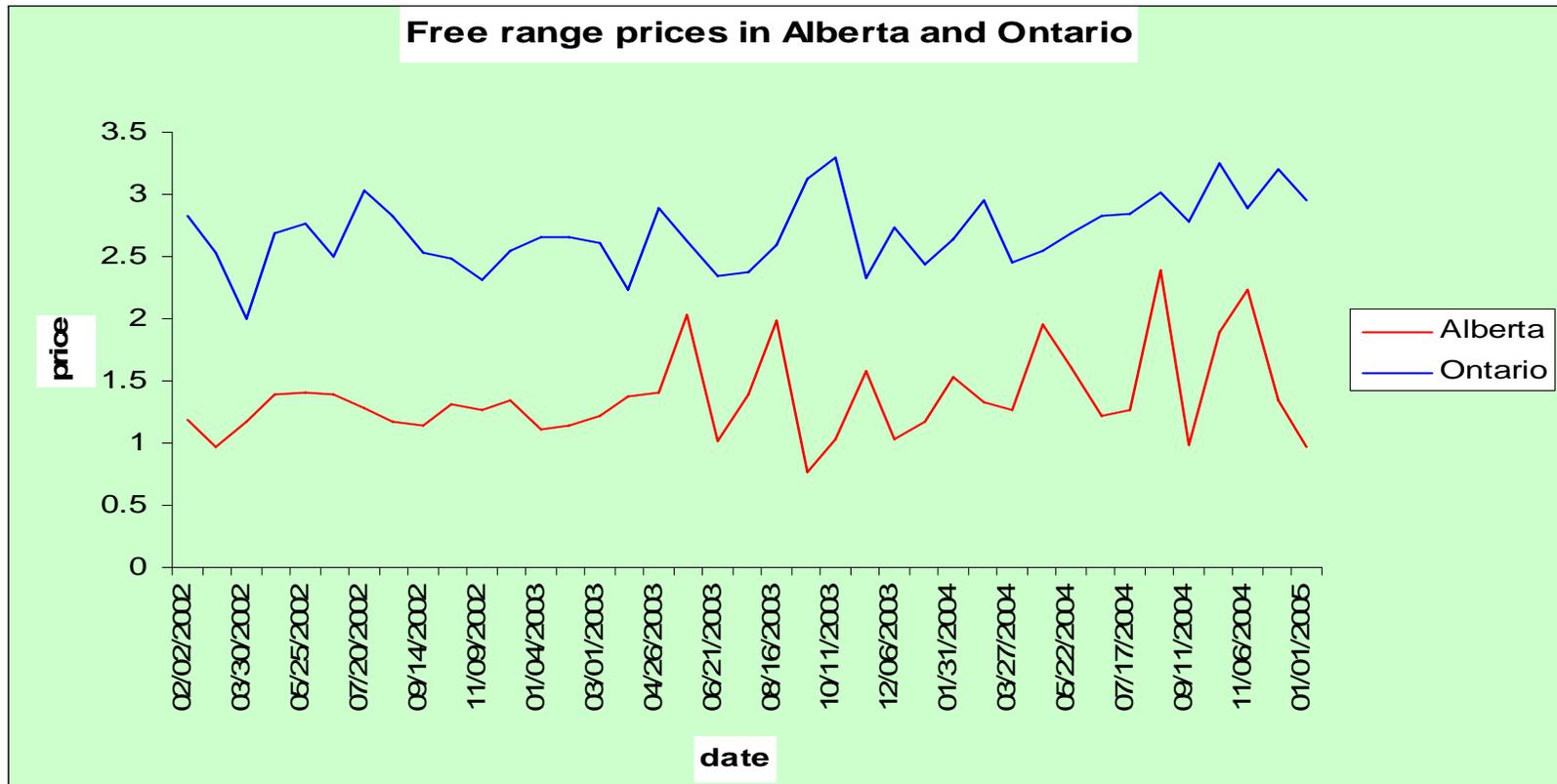
# 'Normal' Egg Prices



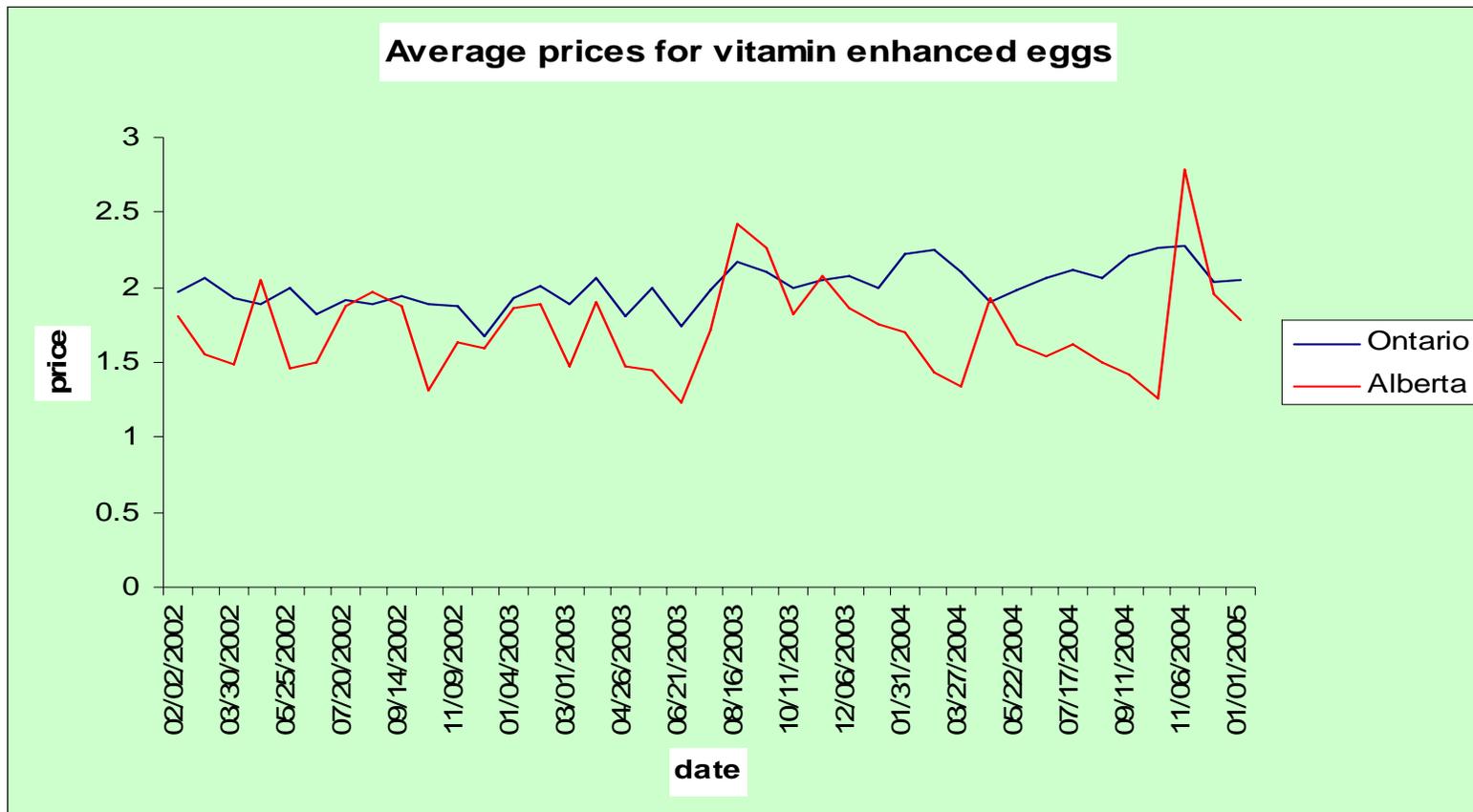
# Omega-3 Prices



# Free Range Egg Prices



# Vitamin- Enhanced Eggs



# Analysis to be done

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- What characterizes household egg purchases
  - Large proportion of households in both provinces purchase more than one type of egg regularly – 50% or more
  - Very small proportion of households in each province purchase only one specialty egg
  - In Ontario Omega-3 purchasers very loyal to Omega-3 eggs (appear to be more brands of Omega-3 eggs available to be sold)

Initial Analysis – done by students in undergraduate class (Glen Doll, Alesha Hill, Shawna Ference, Tyler Schultz)

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- households were segregated into those that only purchase 'normal' eggs and those that purchase any 'non-normal' eggs

# The Probit Model

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$$\square y_i = \beta_0 + \sum \beta_a x_{ai} + \beta_b x_{bi} + \beta_c x_{ci} + \beta_d x_{di} + \beta_e x_{ei} + \varepsilon_i$$

- Let  $i$  denote the respondent,  $y_i$  represents the probability that a consumer will purchase non-normal eggs (=1 if non normal purchase,=0 if only normal purchase)
- $\beta_0$  : Intercept that indicates the expected value of  $y_i$  when all  $x_i$  are equal to zero
- $\beta_a$  : Household size parameter
- $\beta_b$  : Household income parameter
- $\beta_c$  : Household Head Age
- $\beta_d$  : Children
- $\beta_e$  : Grocery Expenditure
- $\varepsilon_i$  : Error term

# Results

## Regression Analysis

Parameter	Estimate	Standard Error	t-statistic	P-value
Household size	-0.183	0.047	-3.895	[.000]
Household Income	0.025	6.57E-03	3.761	[.000]
Household Head Age	-0.077	0.035	-2.206	[0.027]
Children	-0.182	0.129	-1.41	[0.159]
Grocery Expenditure	5.43E-05	2.38E-05	2.283	[0.022]

## So what...

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- ❑ Purchases of non-normal eggs increased with an increase in household income and an increase in overall grocery expenditures
- ❑ Purchases of non-normal eggs decreased with an increase in household size, an increase in household head age and the increased presence of children.

# Other results

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- Subsequent regressions further showed that the major significant factors affecting the purchase of Free Range and Omega 3 are:
  - Household Income
  - Household Size

# Initial results for Ontario

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- Produce similar patterns to those achieved for Alberta
  - Purchase of specialty egg products is not related to presence of children as much as it is to income (relationship to education?)
  - Household head age appears to make purchasers somewhat more sceptical about purchasing specialty eggs.

# Further Analysis

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- More analysis of purchases with disaggregated analysis of the households purchasing one, two, three or five types of eggs
- Willingness to pay by egg type analysis- with higher willingness to pay by egg type should there be more pricing differentiation at the farm level?
- If purchases are this complex for eggs what might they be for other products?
  - - more differentiation, more forms, more brands etc.