



# Physicians in Nova Scotia: Projection Using Enhanced Utilization-Based Demand Model

Kisalaya Basu  
Sameer Rajbhandary  
Tim Prendergast

Microsimulation Modelling and Data Analysis Division  
Applied Research and Analysis Directorate  
Health Canada

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[www.cihiconferences/datausers2008](http://www.cihiconferences/datausers2008)

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# Overview

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# Background

- Traditional HHR demand models are based on utilization
- Forecasts in these models are driven by population growth and distribution only
  - Other factors such as technological innovation, change in people's preferences, and epidemiological changes are ignored
- There is nothing inherent in utilization-based models that suggests that it cannot be driven by anything else other than the change in population and demographics

# Objective

- Develop and test an *enhanced* utilization-based model
  - Develop a theoretical framework of an enhanced utilization-based model by taking into account *other* factors such as technological innovation, changes in people's preferences, and epidemiological changes among others
  - Build an empirical model and demonstrate how to quantify the variables
  - Apply the model to project the required number of family physicians and other specialists in Nova Scotia

# Theoretical framework of a simple demand model

- Requirement for health service providers in the period  $t+n$  is

$$N^{r(t+n)} = \sum_{ij} \left( N_{ij}^{rt} \times \prod_{r=1}^n (1 + G_{P_{ij}}^{t+r-1, t+r}) \times (1 + G_{O_{ij}})^n \right)$$

# Theoretical framework of a simple demand model

- We assume that the average annual growth rate of *other* factors in the future will be the same as the average annual growth rate in the past periods

$$G_{O_{ij}} = \left( \prod_{r=1}^{\bar{s}} G_{O_{ij}}^{t-r, t-r+1} \right)^{\frac{1}{\bar{s}}} - 1$$

where

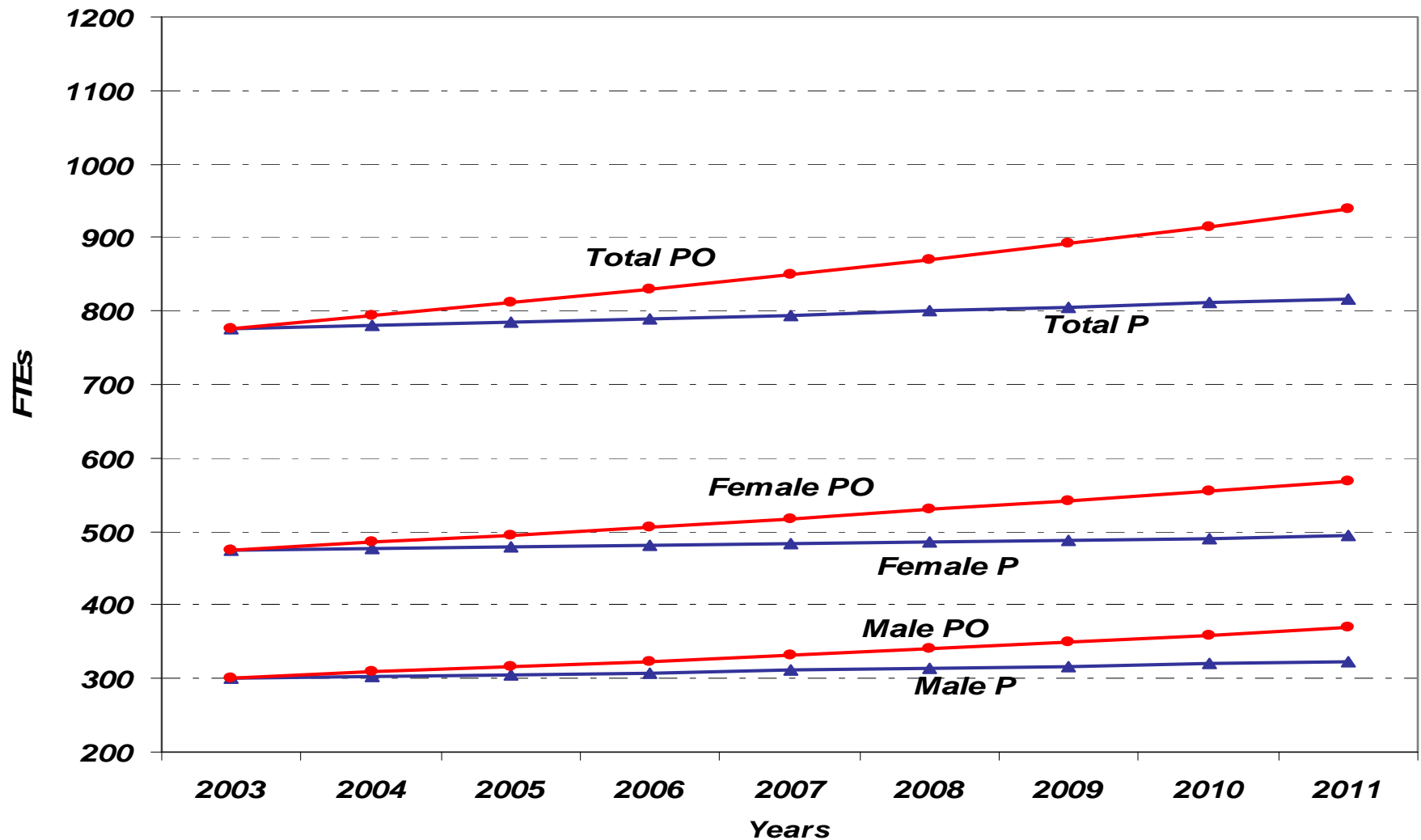
$$G_{O_{ij}}^{t-r, t-r+1} = \frac{N_{ij}^{t-r+1}}{N_{ij}^{t-r}} \bigg/ \frac{P_{ij}^{t-r+1}}{P_{ij}^{t-r}}$$

# Application of empirical framework: Physicians in Nova Scotia

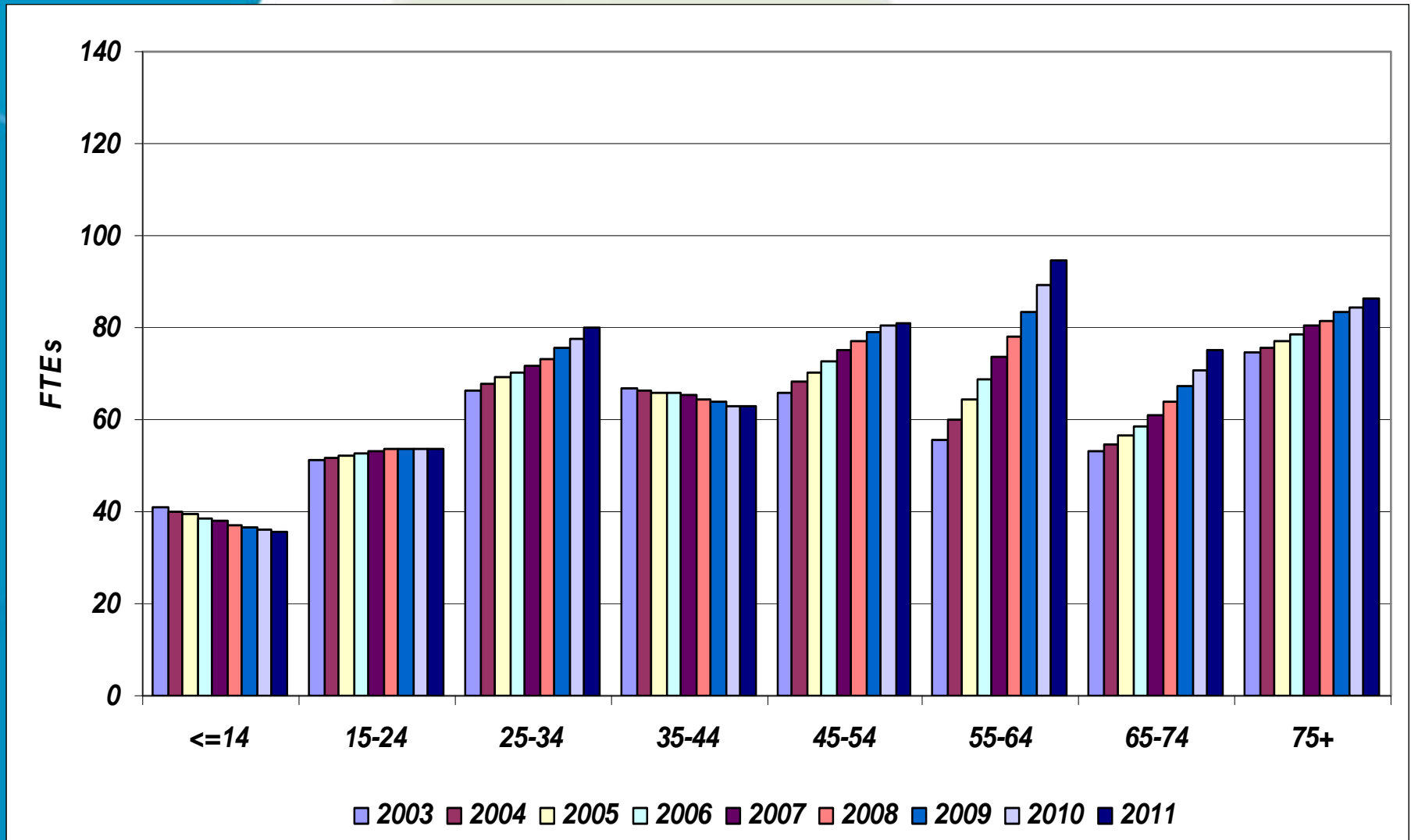
## Data Sources

- Nova Scotia Physician Billings Data, 1996-2004
  - Reliable shadow billing: There is a variable that indicates the fee that a salaried physician would have earned for performing a given service had the physician been remunerated through a FFS payment plan
  - Other Variables: Patients' age and sex, Physicians' Specialties, Physicians' ID, FFS
- Statistics Canada's Population Estimates for Nova Scotia, 1996-2005
- Statistics Canada's Population Projections for Nova Scotia, 2006-2011

Figure 1: Projected FPs in terms of FTEs, 2004/2005 to 2011/2012 (base year 2003/2004)



# Figure 2a: Projected FPs in terms of FTEs by age group, Females, 2003/2004 to 2011/2012



# Figure 2b: Projected FPs in terms of FTEs by age group, Males, 2003/2004 to 2011/2012

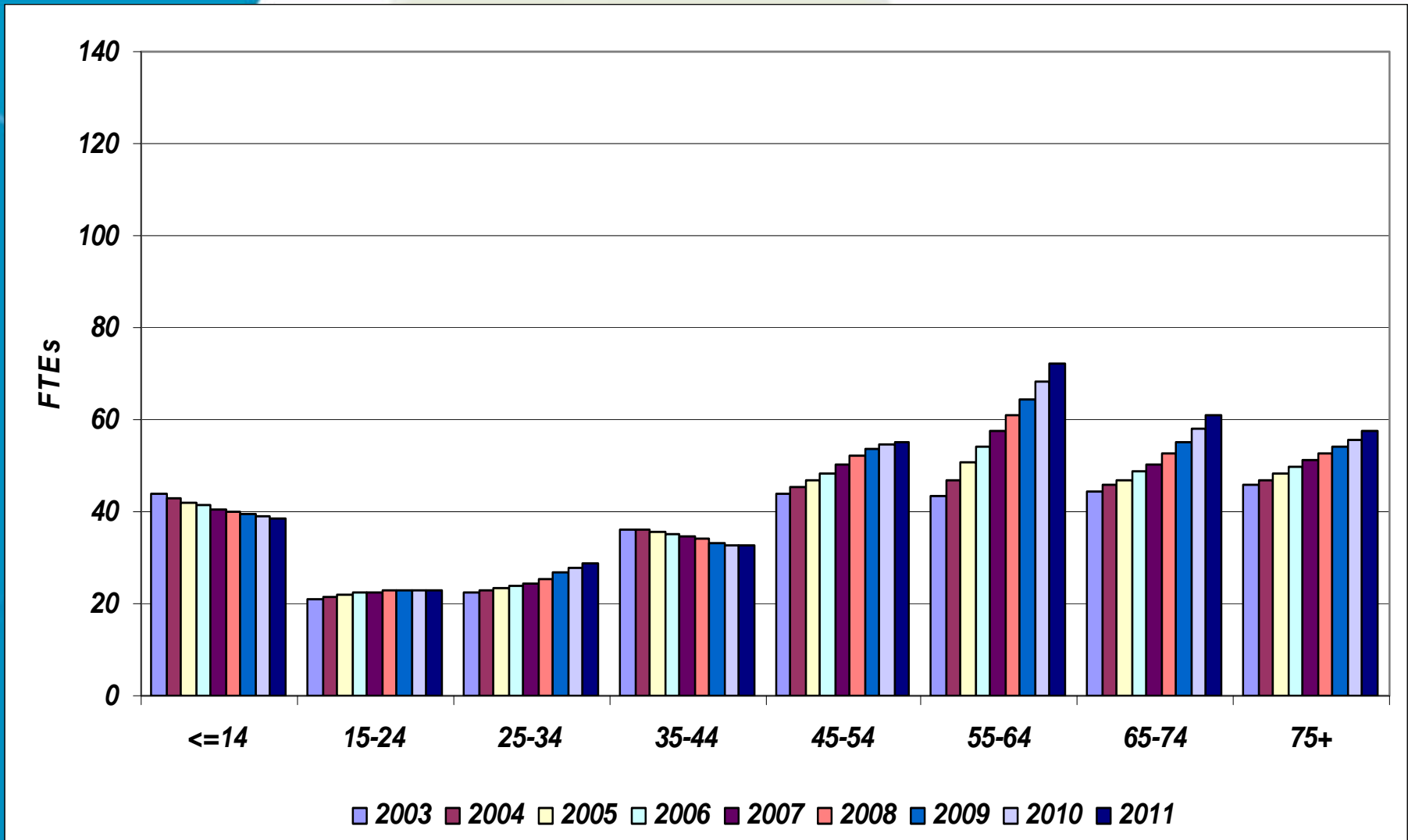


Figure 3a: Projected FPs in terms of FTEs per 100,000 population by age group, Females, 2003/2004 to 2011/2012

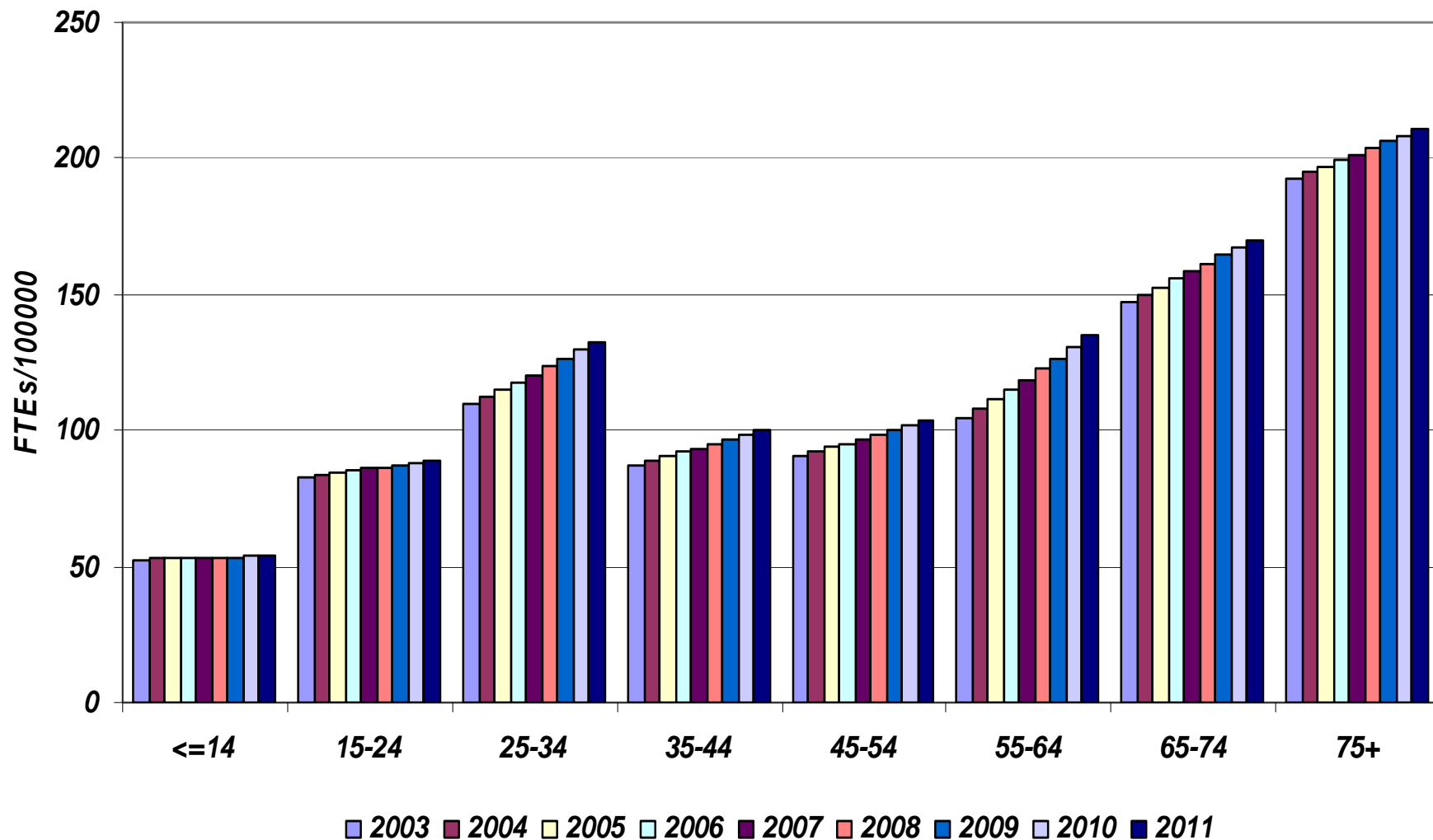
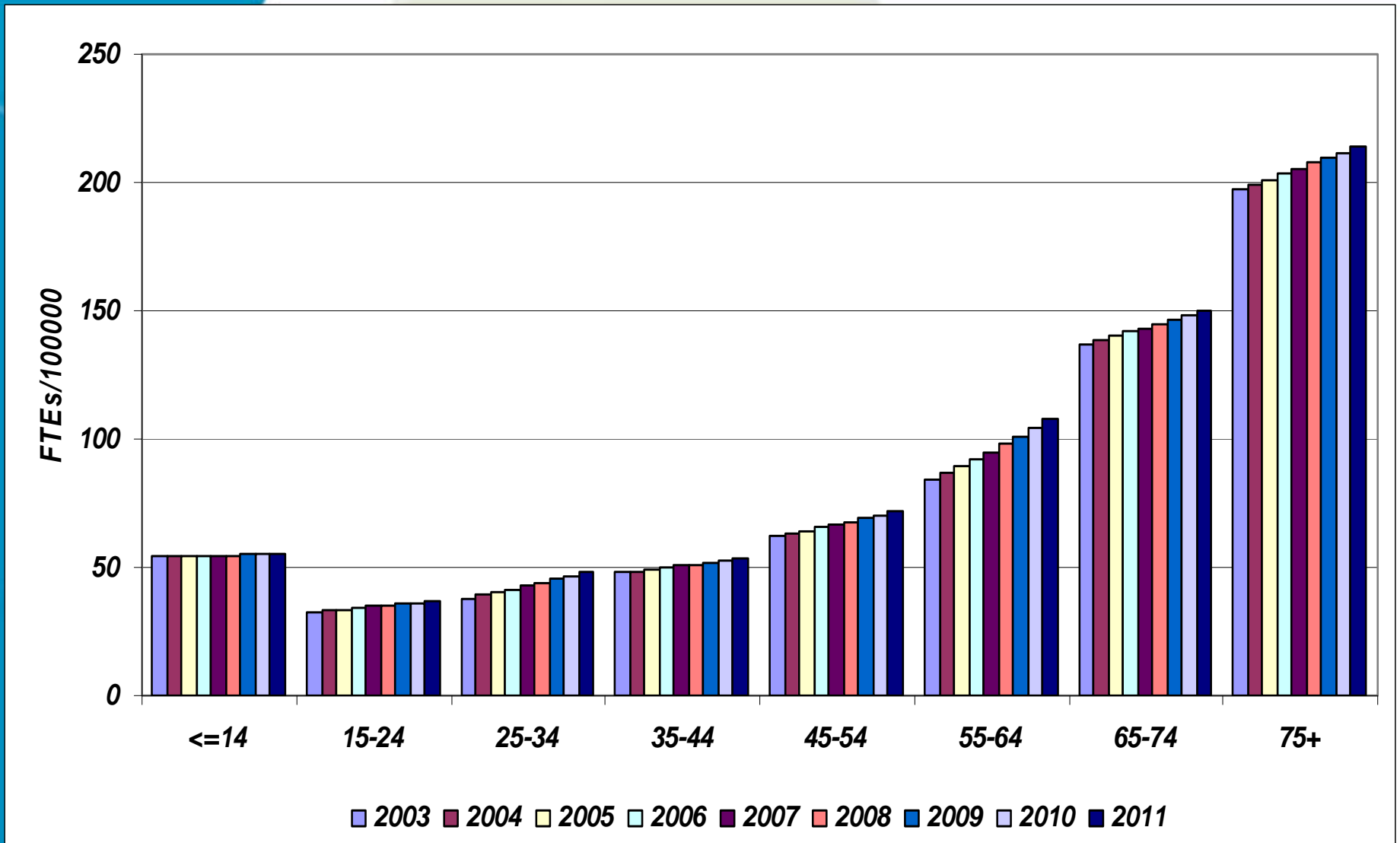
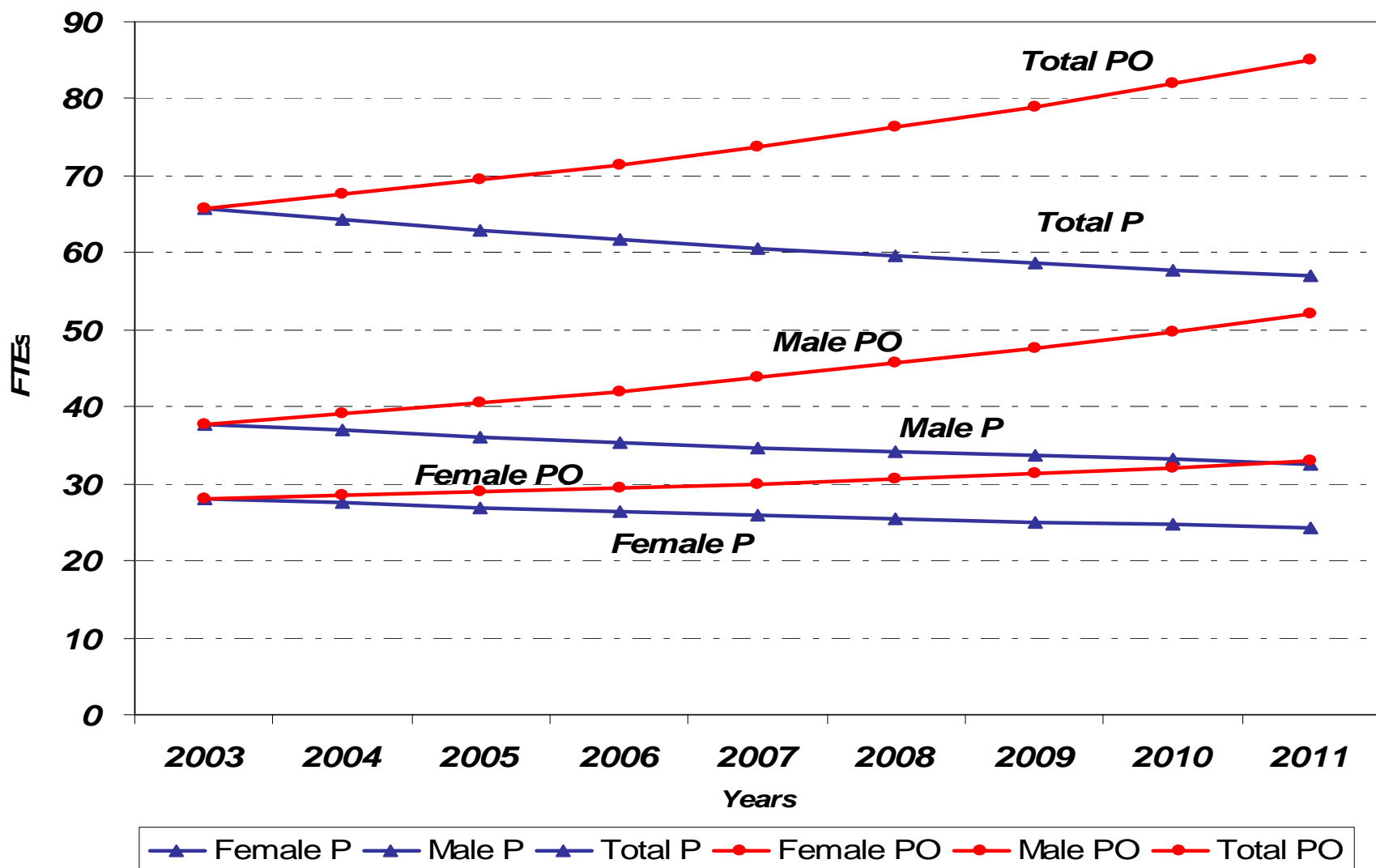


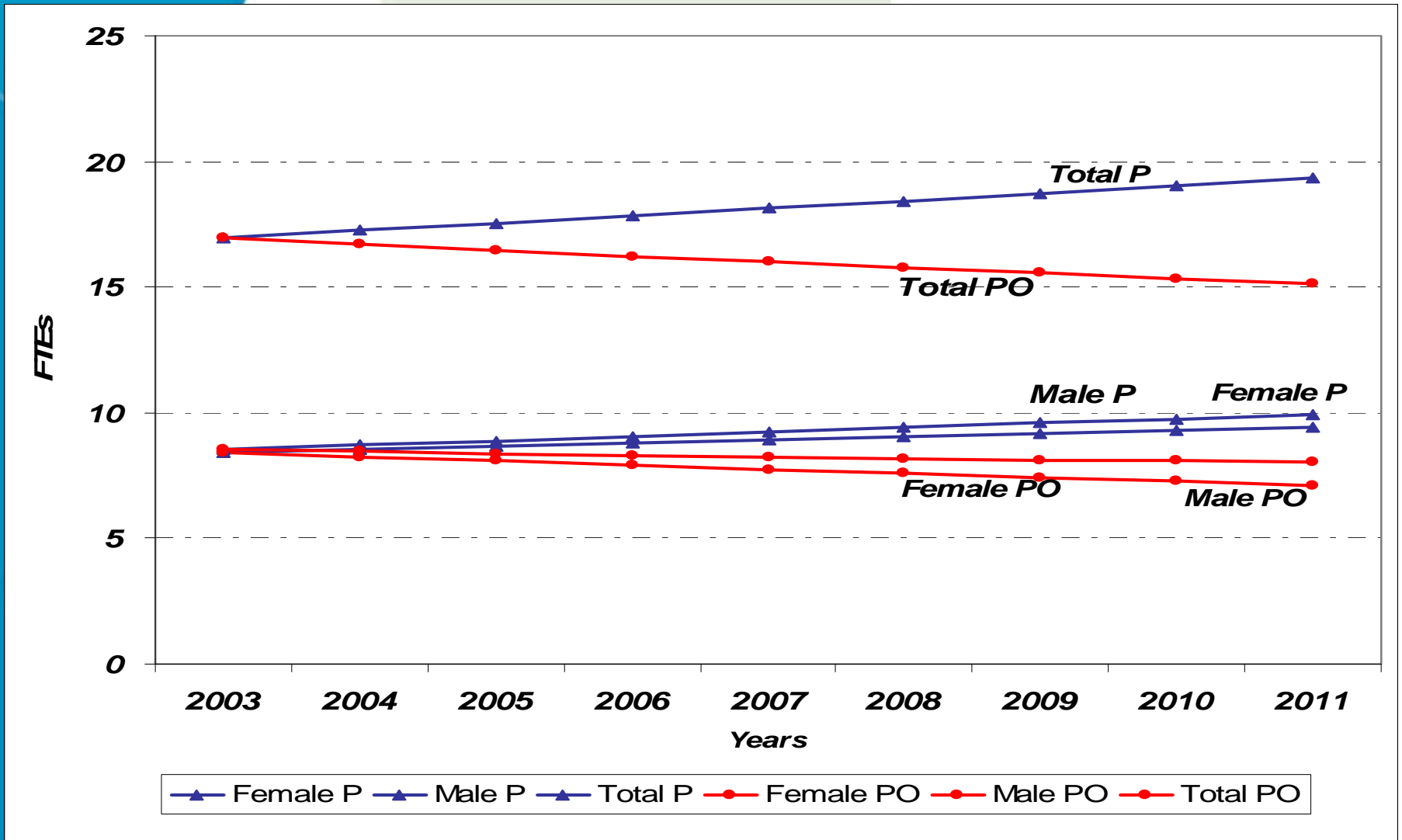
Figure 3b: Projected FPs in terms of FTEs per 100,000 population by age group, Males, 2003/2004 to 2011/2012



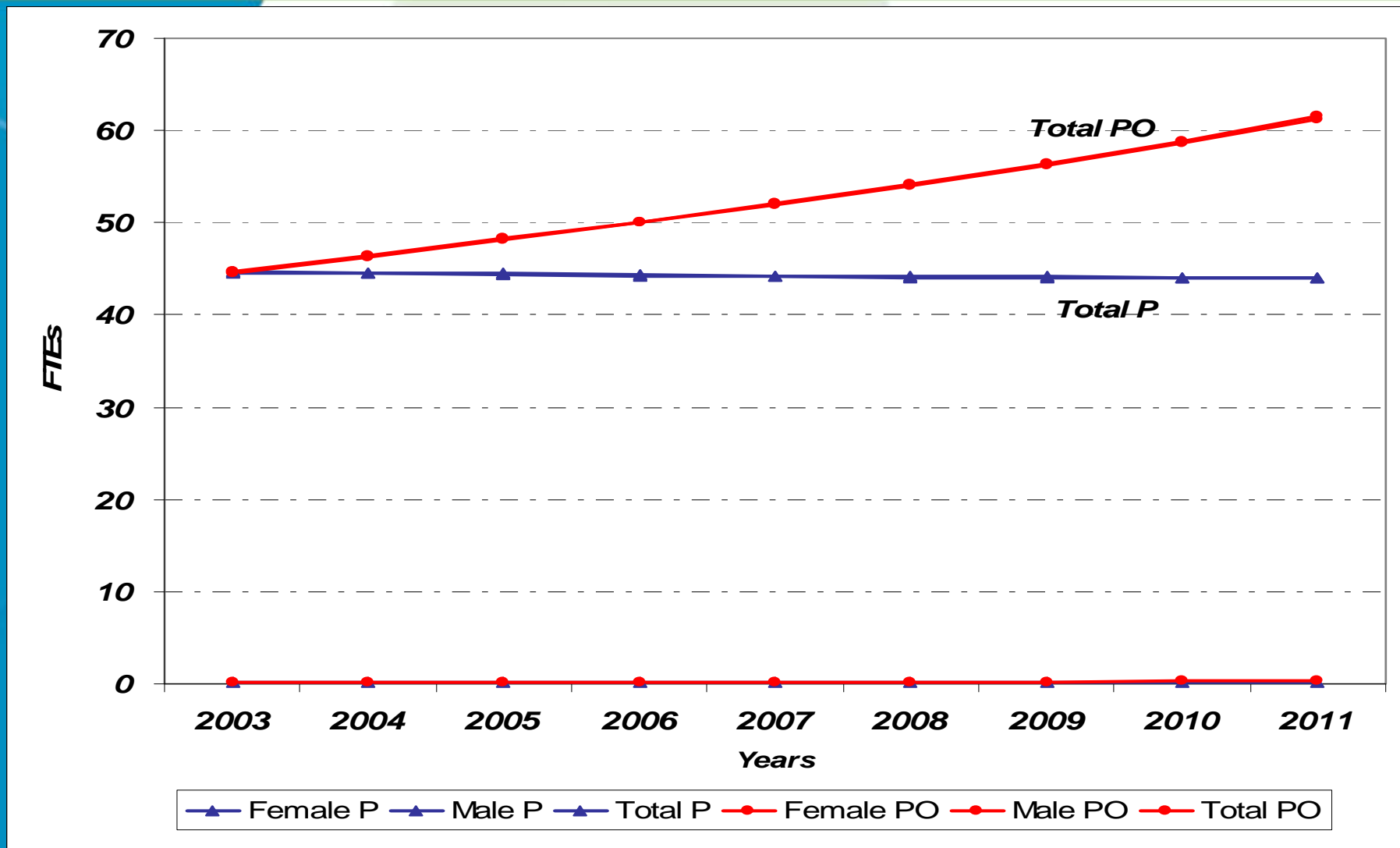
# Figure 4: Projected Paediatrician in terms of FTEs by sex, 2003/2004 to 2011/2012



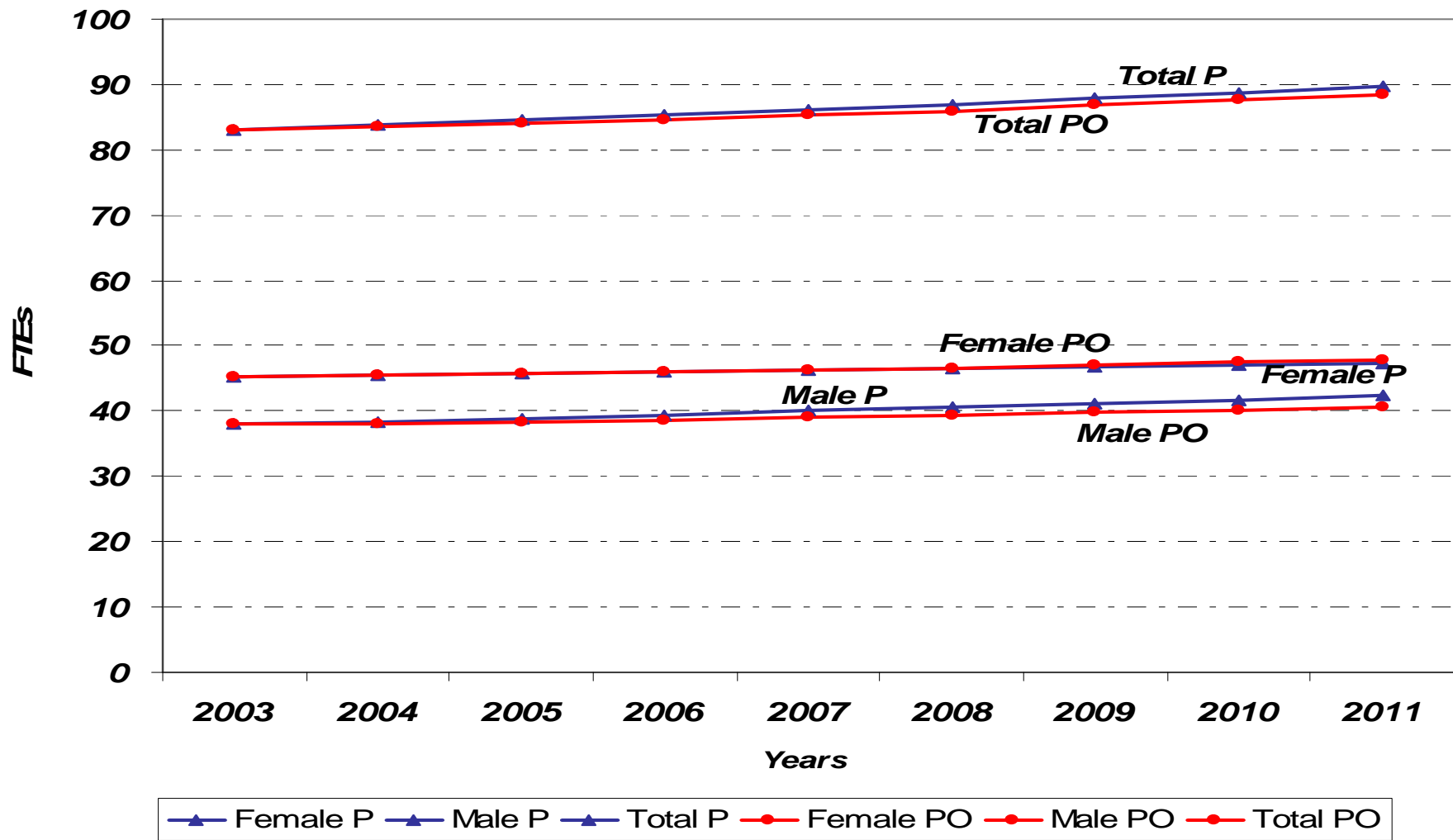
# Figure 5: Projected Internal Medicine Specialist in terms of FTEs by sex, 2003/2004 to 2011/2012



# Figure 6: Projected OBGYN in terms of FTEs sex, 2003/2004 to 2011/2012



# Figure 7: Projected Anaesthesiologist in terms of FTEs sex, 2003/2004 to 2011/2012



# Conclusion

- The *enhanced* model presented here incorporates an *other* factor beyond population growth and distribution
  - It is clearly an improvement over the existing utilization-based models as it uses more information
- The resultant effect of the *other* factor can be positive, negative, or zero
- The theoretical framework of the *enhanced* model can be applied to any type of health care providers in any province
- The empirical framework can be applied to any type of physicians in any province

For more information contact:

Kisalaya Basu

Microsimulation Modelling and Data Analysis Division

Applied Research and Analysis Directorate

Strategic Policy Branch

Health Canada

E-mail: [kisalaya\\_basu@hc-sc.gc.ca](mailto:kisalaya_basu@hc-sc.gc.ca)

Phone: 613-946-3164