Appendix 3

# Prevalence of TIA-Related Hospital Discharge Over Time: Emerging Trends in Ontario

Muhammad M. Mamdani
Jack V. Tu,
Institute for Clinical Evaluative Sciences
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# TIA-related Hospital Discharge: Emerging Trends in Ontario

## INTRODUCTION

As a recent study has demonstrated, a null effect of the burden of stroke may arise over time since the gain achieved from decreasing incidence rates may be counterbalanced by population aging[1]. A similar effect may be expected for transient ischaemic attacks (TIAs), although the impact of changes in the healthcare system, for example reductions in hospital beds, may preclude any definitive conclusions. The objective of this study was to estimate future burden of TIAs with respect to hospitalization taking into consideration both trends in stroke incidence and the effects of the aging population.

## METHODS

We used a cross-sectional series to examine the prevalence of TIA-related hospital discharge in Ontario for each calendar year from 1989 through 1998. The Canadian Institute for Health Information (CIHI) Discharge Abstract Database was used as the primary data source. TIAs were defined as a primary diagnosis of ICD-9 code 435. Initial TIA-related hospitalizations resulting from a complication of in-hospital care or transfers from other acute care hospitals were excluded from analysis. To account for age the data was analyzed according to the following age groups: 0-34, 35-44, 45-54, 55-64, 65-74, and 75 + years. In calculating age-specific rates, census data from Statistics Canada was used. Weighted least squares regression was used to project age-specific estimates using age-specific population as weights until the year 2010. The projected age-

specific rates were then multiplied by the projected age-specific populations to arrive at projected age-specific hospital discharges. These estimates were then added together for each calendar year to arrive at projected TIA-related hospital discharges for the population in the respective years. The variance of the mean was calculated at each point, which was used to derive 95% confidence intervals around each projection.

## RESULTS

The expected demographic shifts in Ontario with respect to age over time are presented in Figure 1. The age-specific annual discharge rates over time are presented in Figure 2. All age groups except for the 0-34 year group showed statistically significant downward trends in hospital discharge rates over time (i.e. 35-44: $\beta$=-0.15, p=0.03; 45-54: $\beta$=-0.713, p<0.01; 55-64: $\beta$=-0.86, p<0.01; 65-74: $\beta$=-7.72, p<0.01; 75+: -28.11, p<0.01). The 0-34 year age group displayed a non-significant downward trend over time ($\beta$=-0.02, p=0.31). Overall, the number of TIA-related hospital discharges is expected to decrease over time (Figure 3) when these decreasing trends and the aging population are taken into consideration. The 15-year increase in the number of TIA-related discharges is expected to increase from 4,056 in 1995 to approximately 1,831 in the year 2010 (i.e. a 55% decrease).

## COMMENTS

The results of this analysis indicate that the detrimental effects of demographic shifts in age with respect to TIA-related hospitalization may be overcome by the encouraging age-specific trends in hospital discharge rates over time. The net result

appears to be a decline in the number stroke-related hospital discharges over time. These findings should be interpreted with caution, however, given that TIAs are typically not hospitalized and decreasing trends over time may represent downsizing of the hospital system in Ontario over time, making less necessary hospitalizations less common. It is perhaps this phenomenon that accounts for the observed findings.

Several issues must be considered when interpreting the results of this analysis. Linear regression was used to project estimates of age-related hospital discharge rates. Floor effects may not be accounted for in our analysis and this may overestimate the beneficial age-specific rates of decrease over time, since the analysis assumes a continuation of favorable trends, thus underestimating the overall effect of aging. Indeed, some of the 95% confidence intervals for the age-specific hospitalization rates drop below 0, which is impossible. However, it must also be recognized that the model projections were greater than the actual number of discharges observed in calendar years 1997 and 1998. During these years, drops in the number of stroke-related hospital discharges were observed, despite an increasing and aging population. All estimates were also based on the accuracy of census projections from Statistics Canada and assumed reasonably accurate projection of demographic issues such as immigration and aging.

The projected estimates are also subject to a stable environment without significant changes in stroke prevention. The results are thus not generalizable in the presence of new stroke prevention discoveries.

The results of this analysis should be interpreted with the above considerations in mind.

## REFERENCES

1. Thorvaldsen P, Davidsen M, Bronnum-Hansen H, et al. Stable stroke occurrence despite incidence reduction in an aging population: stroke trends in the Danish Monitoring Trends and Determinants in Cardiovascular Disease (MONICA) population. *Stroke.* 1999;30:2529-34.

Figure 1. Past and projected age-related shifts in population.

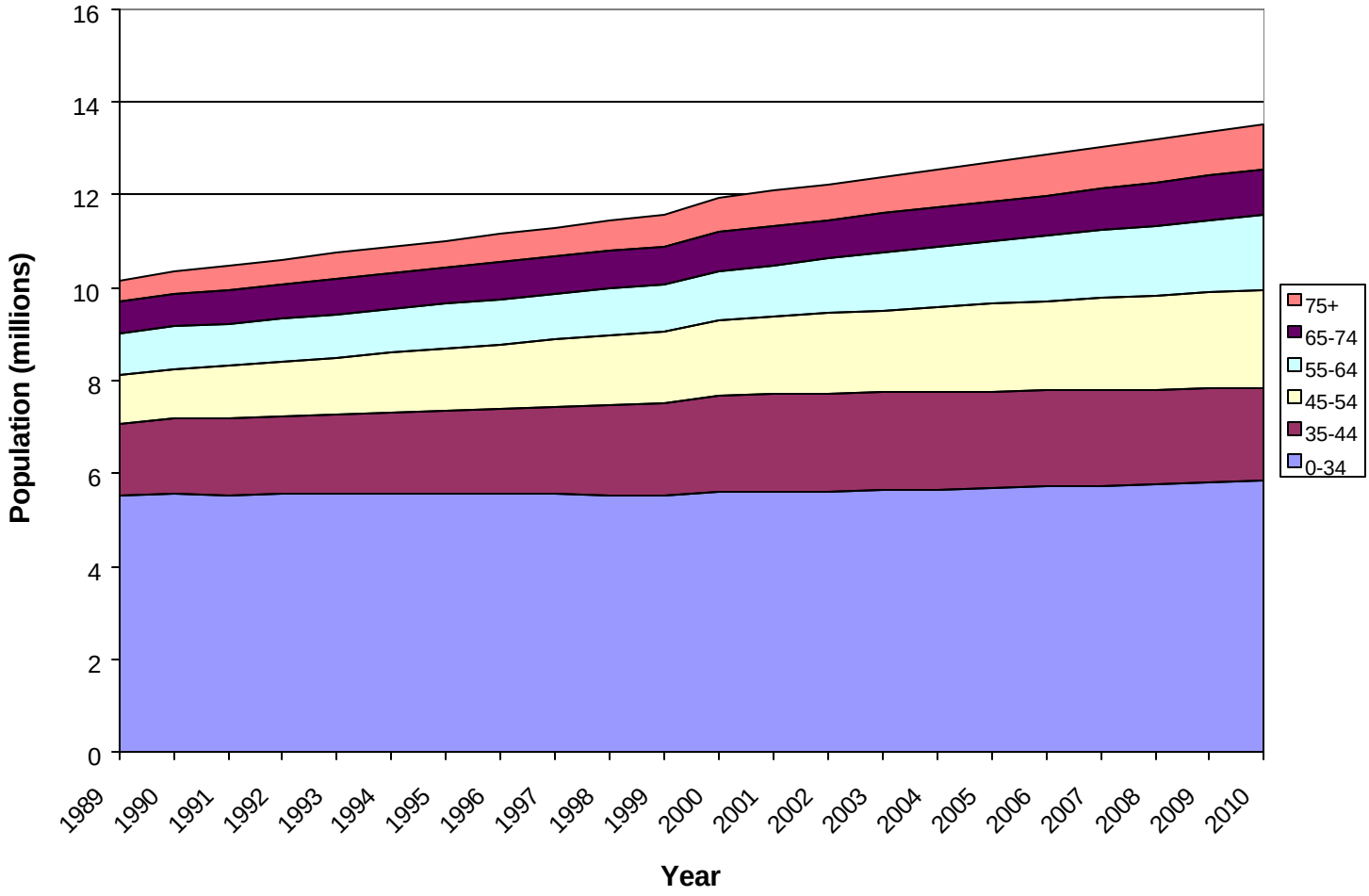
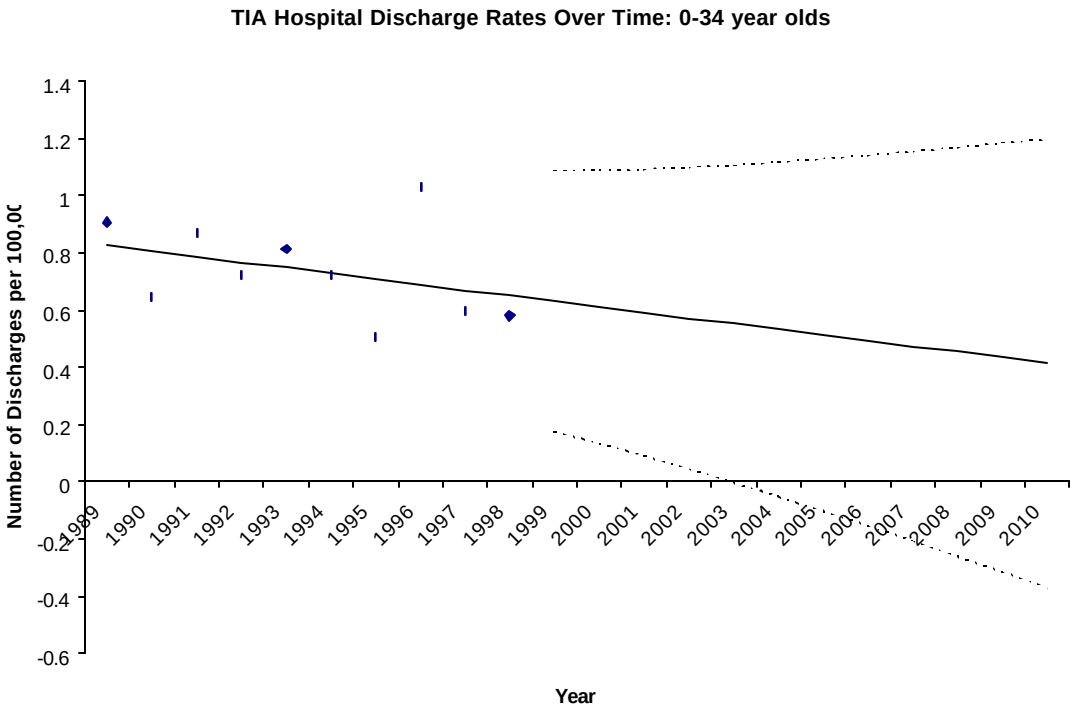
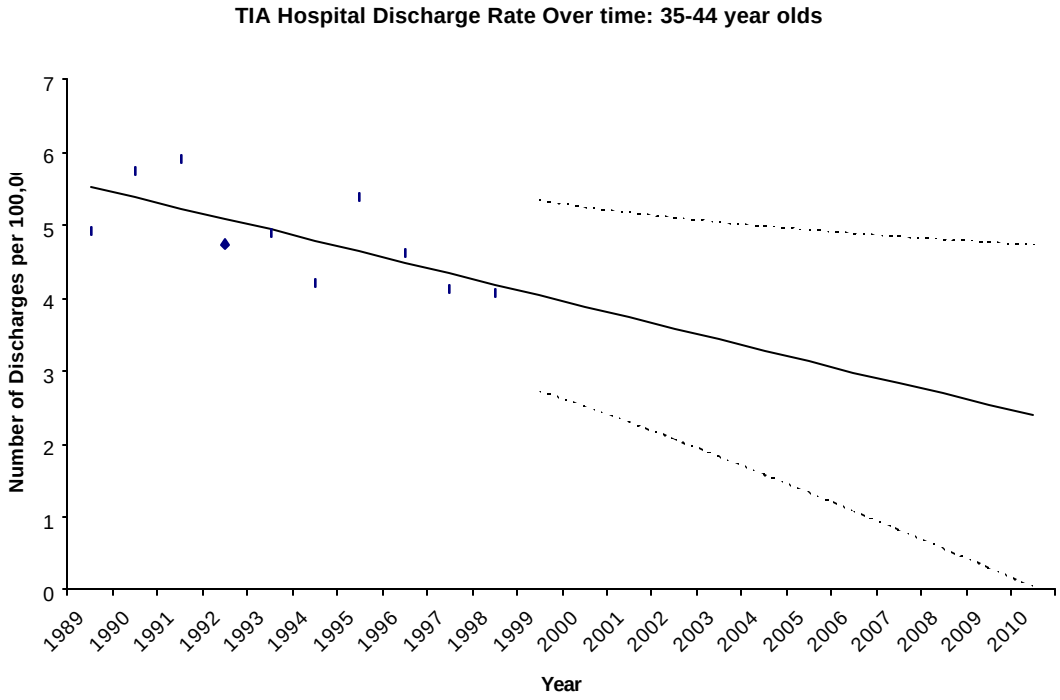
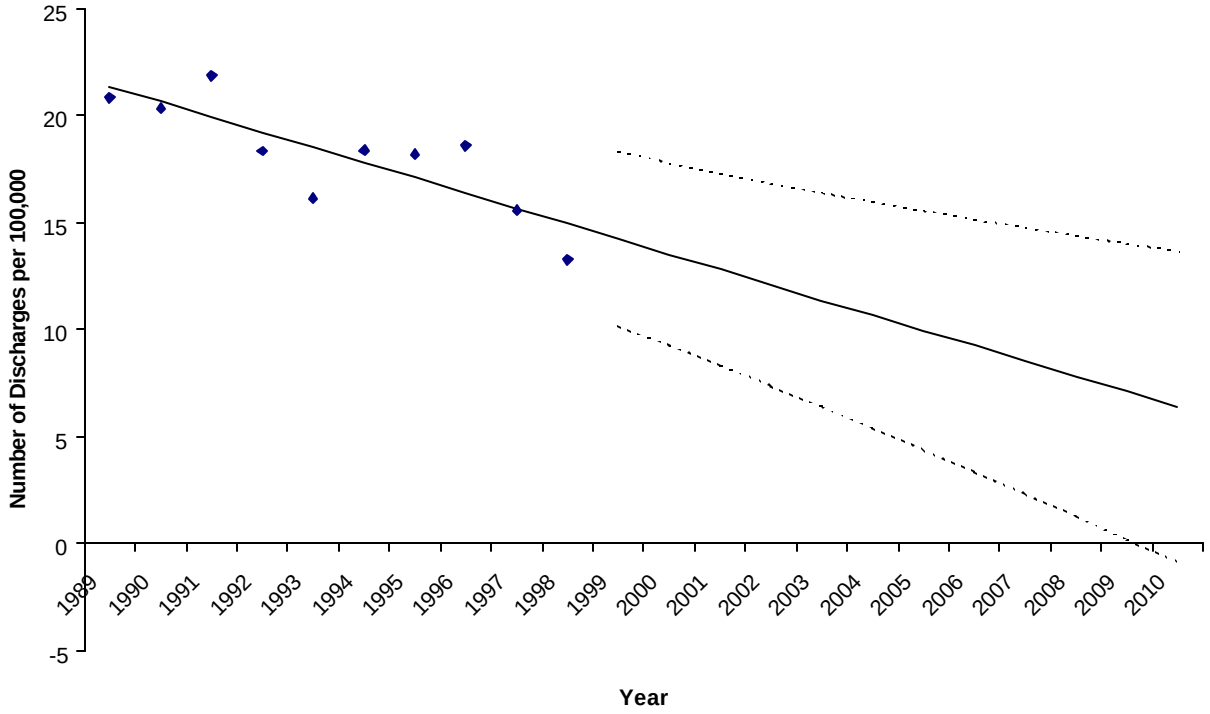


Figure 2. Age-Specific TIA Hospital Discharge Rates Over Time.

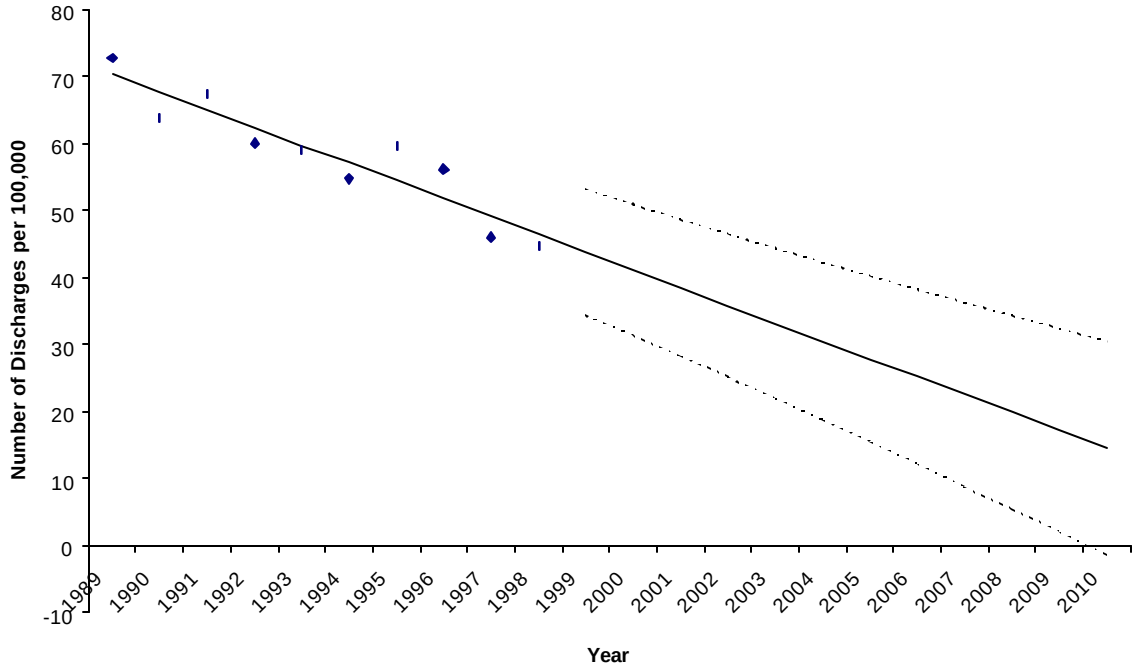


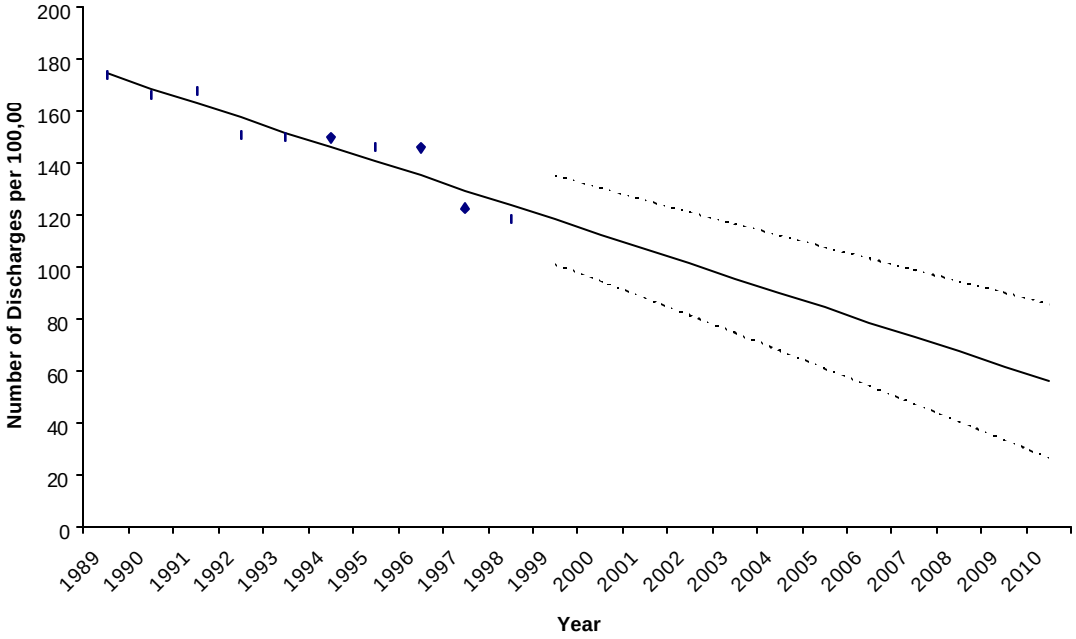
**TIA Hospital Discharge Rate Over Time: 45-54 year olds**




**TIA Hospital Discharge Rate Over Time: 55-64 year olds**



**TIA Hoapital Discharge Rate Over Time: 65-74 year olds**




**TIA Hospital Discharge Rate Over Time: 75 + year olds**

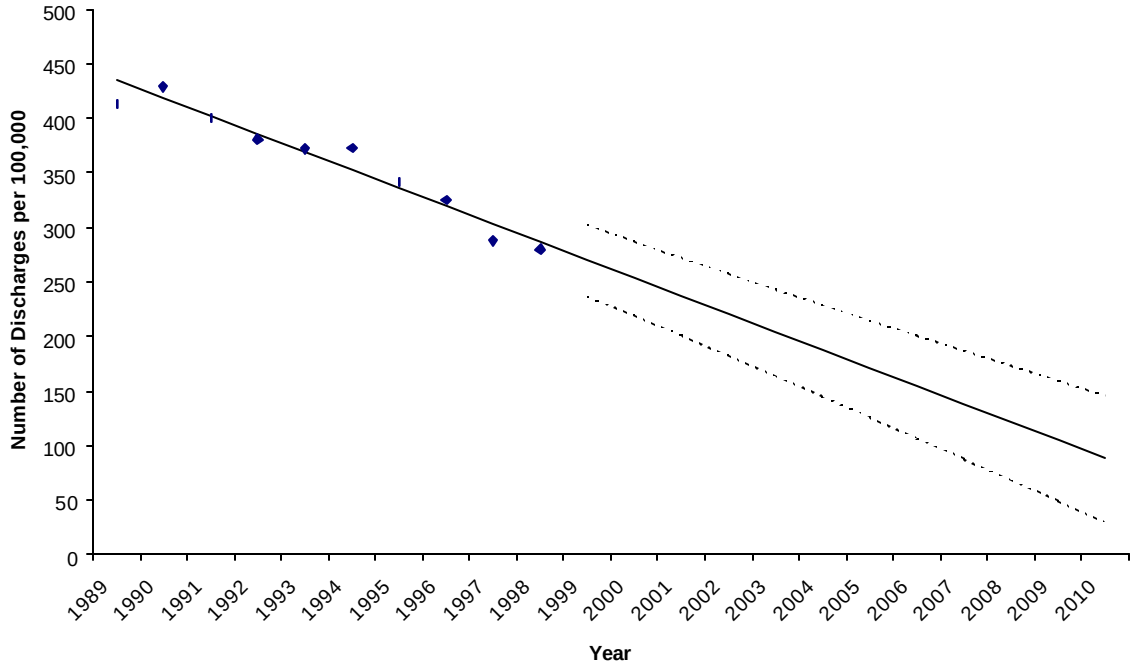
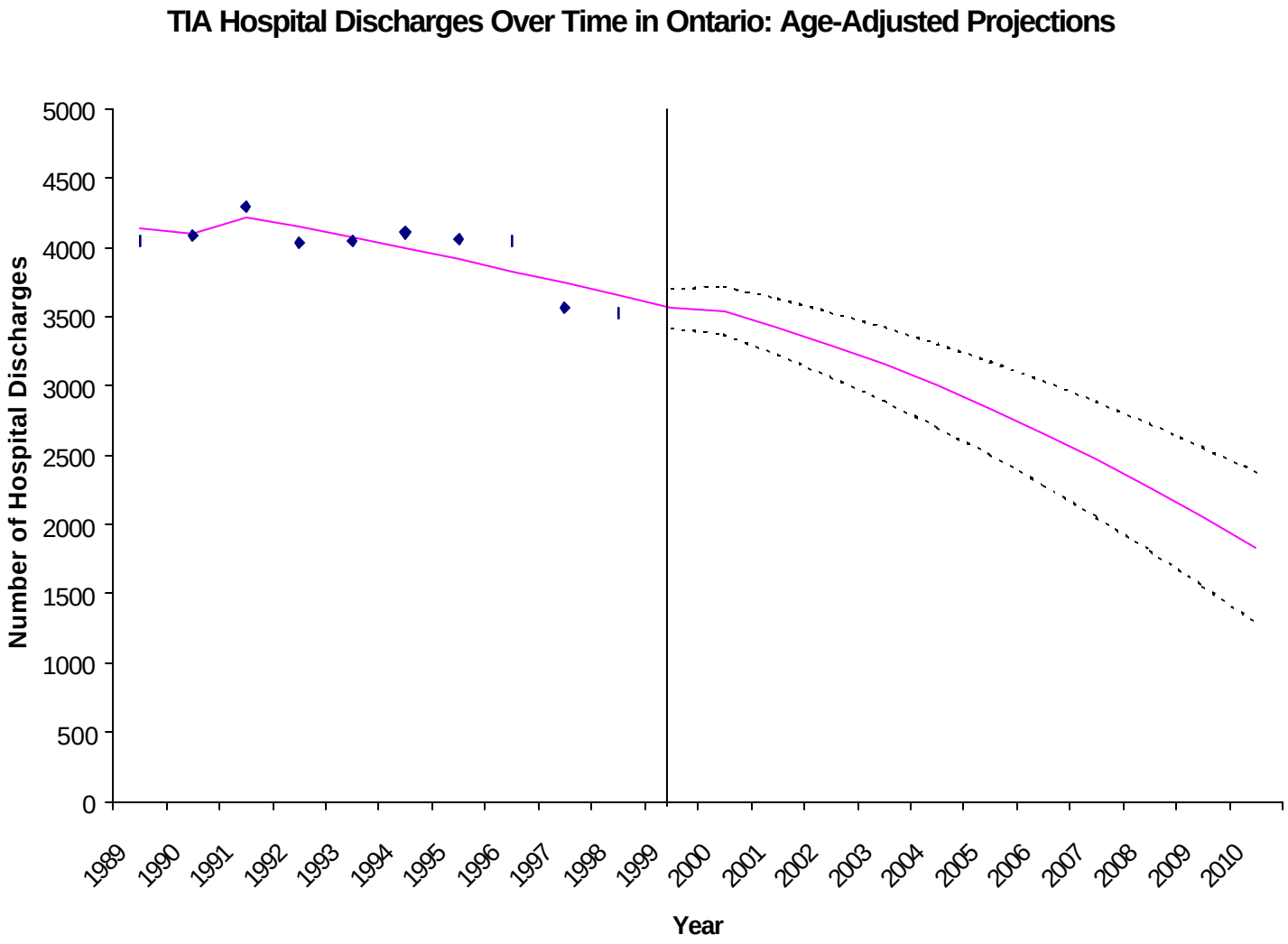


Figure 3. Actual and Projected Annual Estimates for Annual Age-Adjusted TIA-Related Hospital Discharges



Actual and Projected Numbers of TIAs:

| Year | Actual Discharges | Projected Discharges | UCI | LCI |
|---|---|---|---|---|
| 1989 | 4045 | 4131.731392 | | |
| 1990 | 4086 | 4099.952535 | | |
| 1991 | 4292 | 4209.753198 | | |
| 1992 | 4032 | 4147.495331 | | |
| 1993 | 4045 | 4072.514831 | | |
| 1994 | 4104 | 3987.518868 | | |
| 1995 | 4056 | 3909.949582 | | |
| 1996 | 4044 | 3829.155246 | | |
| 1997 | 3561 | 3747.744456 | | |
| 1998 | 3529 | 3658.184382 | | |
| 1999 | | 3556.41126 | 3698.604 | 3414.218 |
| 2000 | | 3543.311664 | 3716.722 | 3369.901 |
| 2001 | | 3425.090921 | 3627.732 | 3222.45 |
| 2002 | | 3296.485967 | 3530.304 | 3062.667 |
| 2003 | | 3155.389451 | 3422.244 | 2888.535 |
| 2004 | | 3000.61881 | 3302.007 | 2699.23 |
| 2005 | | 2835.645896 | 3173.656 | 2497.636 |
| 2006 | | 2658.206852 | 3034.431 | 2281.983 |
| 2007 | | 2467.612288 | 2883.281 | 2051.943 |
| 2008 | | 2266.564514 | 2723.201 | 1809.928 |
| 2009 | | 2053.584248 | 2552.564 | 1554.604 |
| 2010 | | 1831.191946 | 2375.349 | 1287.034 |