Health Information Partnership - Eastern Ontario Region
Alliance Information Santé - Région de l'est de l'Ontario

Short Report
May, 2001

A Comparison of Population Estimates and Population Projections for Eastern Ontario

Background on Population Projections and Population Estimates

To investigate existing trends (if any) in population growth, Canada uses the census count, an enumeration of the country's residents at a single point in time (Census Day). National censuses are conducted at 5-year intervals, in years ending in 1 and 6 (e.g. 1991, 1996).

Because some people may be missed on Census Day, Statistics Canada conducts coverage studies after each census to estimate the extent of the net undercoverage. In Ontario, the net undercoverage for the 1996 Census was 2.9%.

Each year on July 1, Statistics Canada produces **post-censal** estimates to approximate the population of a given geographic location (typically at the Census Division level). These estimates are based on the most recent census counts available and are *adjusted for net undercoverage* (the estimated number of people missed on Census Day), as well as any changes that may have occurred in the population between Census Day and July 1 of the year (ie. available data on fertility, mortality and migration are taken into account).

> *Current population estimates available for 1996 to 1999 are post-censal estimates based on 1996 Census data with adjustments for undercoverage,*

Once a new Census is completed, and adjusted population estimates for the Census year have been prepared, the population estimates for past years are re-adjusted and finalized as **inter-censal** estimates.

> *Current population estimates available for 1991 to 1995 are inter-censal estimates based on adjusted census counts from the 1991 and 1996 Census.*

Once computed, population estimates are used in calculating health-related measures such as utilization rates, birth and death rates, and standardized mortality ratios (SMRs).

The most recent Census data (adjusted for net undercoverage) are also used as the base population to compute **population projections** - a forecast of what the population of a given geographic area will be for upcoming years. Population projections are produced using modeling techniques that take into account assumptions about current trends in fertility, mortality and migration. The models consider different growth scenarios (low, medium and high), of which the middle (or reference scenario) is considered to be the most likely outcome and recommended for use.

The modeling method used to generate population projections is referred to as the 'cohort component' method. With this modeling process age-sex population estimates in a base year are 'aged' one year at a time using assumed fertility, mortality, and migration rates. The assumptions are based on an analysis of past trends and expectations of future direction. The validity of the assumptions, over time, affects (to a great extent) the quality of the derived projections. Population projections assist in, for example, the planning and delivery of health services in given areas.

Premise of this Report

Population projections are commonly used to predict future health care needs. But how well do population projections compare with actual population growth? In 1994 population projections based on 1991 postcensal estimates (produced by Statistics Canada for the Ontario Ministry of Finance) were provided to epidemiologists and health planners in Ontario. These data provided projections by age and sex for each census division in Ontario for the years 1992-2021. Current population estimates are available for the years 1992-1999 and can be obtained via the Provincial Health Planning Database (PHPDB). This report compares the projected population numbers for the years 1992-1999 with the estimated population for each of the six Public Health Unit (PHU) areas in Eastern Ontario.

Interpretation of Figures

The figures on the pages that follow compare projected populations (vertical bars) with the population estimates (line) for each age group. A positive difference between the population estimate and the projection indicates an ***underestimate*** (ie the projection was too low). A negative difference (ie. the population estimate is less than the projected population) indicates an ***overestimate.***

Key Findings

1. Eastern Ontario Region

From 1992-1994, the estimated population for Eastern Region was greater than the projected population. From 1995-1999 the opposite trend is observed and the population projections ***overestimate*** the population of Eastern Region (see Figure 1).

Figure 2 shows the gap between the estimated and projected population numbers grew from 0.6% in 1995 (less than 10,000 persons) to over 4% in 1999 (over 66,000 persons).
The difference between projected and estimated population numbers for each age group is shown in Figure 3 for 1992, and 1999. A perfect match between the population projection and estimate would result in a value of 0. The figure shows that the age group specific population projections match the actual estimates quite closely initially (in 1992), but the projections 8 years into the future have overestimated population growth in many age groups.

2. Public Health Unit Level

(a) Eastern Ontario Health Unit
There is an increasing discrepancy between the projected and estimated population numbers from 1993 onward (Figure 4). The population projection model for this PHU area consistently ***overestimated*** the actual population, especially in the 0-4 and 20-34 age group. The model appears to be a good predictor of the population age 50+.

(b) Ottawa-Carleton Regional Health Department
With the exception of 1993, the projections consistently exceeded the estimated population; that is, the model ***overestimated*** the true population estimate for every year following 1993 and these overestimates were more pronounced with time (Figure 5). The projected population of Ottawa-Carleton was 5% (37,600 people) greater than the actual population estimates. The greatest discrepancy between the projections and estimates is seen in the 0-4 and 30-39 age group.

(c) Renfrew County and District Health Unit
This model ***underestimated*** the overall population for all years except 1999 (Figure 6). Specifically, the projections underestimated the number of 0-4, and 30-39 year olds especially for the years 1993-1997, yet slightly overestimated the number of 20-29 year olds.

(d) Leeds, Grenville and Lanark District Health Unit
The population of Leeds, Greville and Lanark was ***underestimated*** by the population projection model, by a small amount, for the years 1992-1996 (Figure 7). This appears, largely, because the population estimates showed a greater number of residents in the 55-69 age group than were projected. For the years 1997-1999, the model *overestimated* the population. The size of this overestimation increases each subsequent year and is pronounced in the age 20-29 group.

(e) Kingston, Frontenac, Lennox & Addington Health Unit
The model provides a good approximation of the true population estimate for 1992 and 1993, but begins to ***overestimate*** the true population, with a growing discrepancy between the projected and actual population, for 1994 to 1999 (Figure 8). In particular, the population estimates show fewer children (age 0-14) and adults (age 25-49) than were projected by the model. By the 1999, the actual population is 5.6% less than had been expected by the population projections.

(f) Hastings and Prince Edward Counties Health Unit
Over the time period considered (1992-1999), the model for this region consistently ***underestimated*** the true population (the projected population is less than the population estimates) (Figure 9). A closer look at the age groups shows that the discrepancy between the projected and estimated population is not consistent across age groups. This region's model seems to ***underestimate*** most age groups. It consistently (and most pronouncedly) underestimated people between the ages of 50 and 69 inclusive. However, the population in the 20-29 age group is lower than was projected by the model from 1995-1999.

Figure 1: **Eastern Ontario Region**

Figure 2: Overall difference between population estimates and projections, by year, Eastern Ontario Region

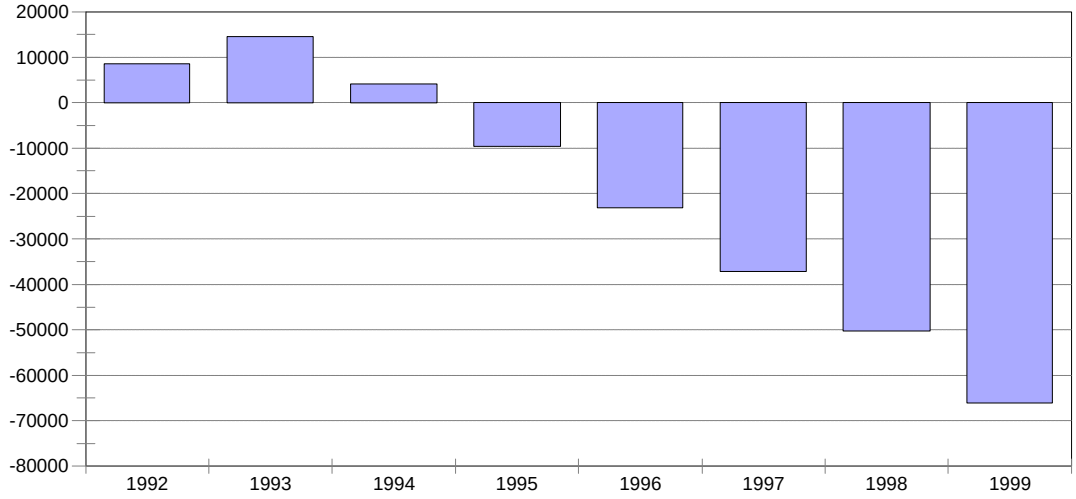
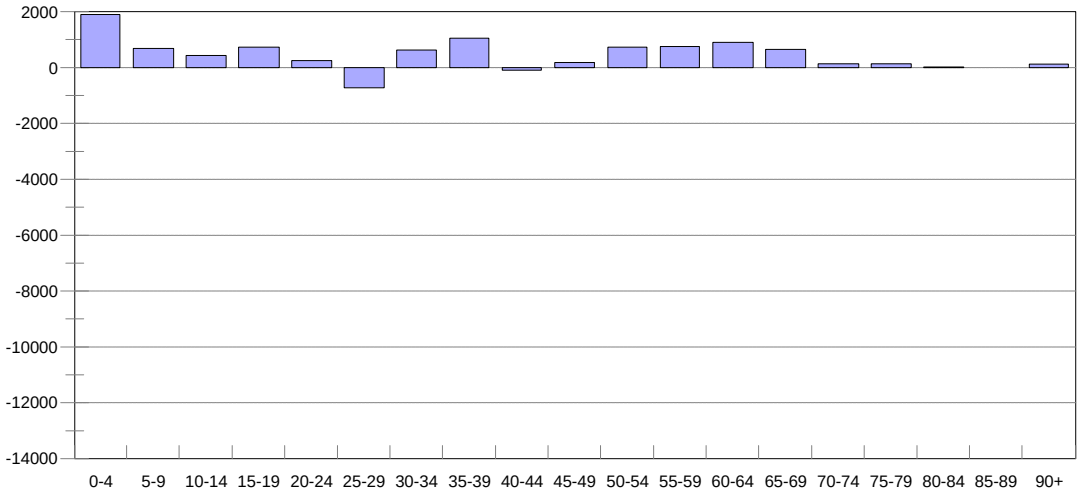


Figure 3: Age specific difference between population estimates and projections, 1992 and 1999, Eastern Ontario Region



1999

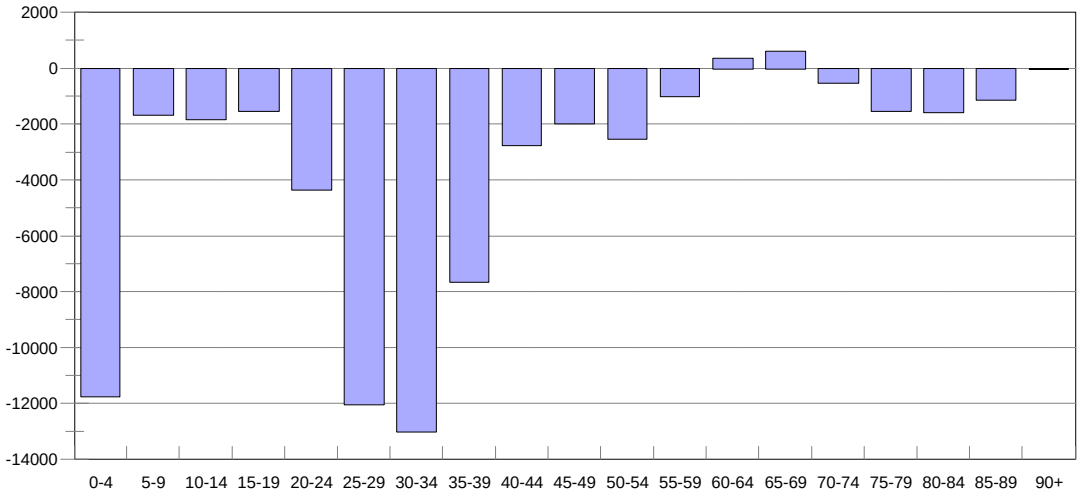


Figure 4: **Eastern Ontario Health Unit**

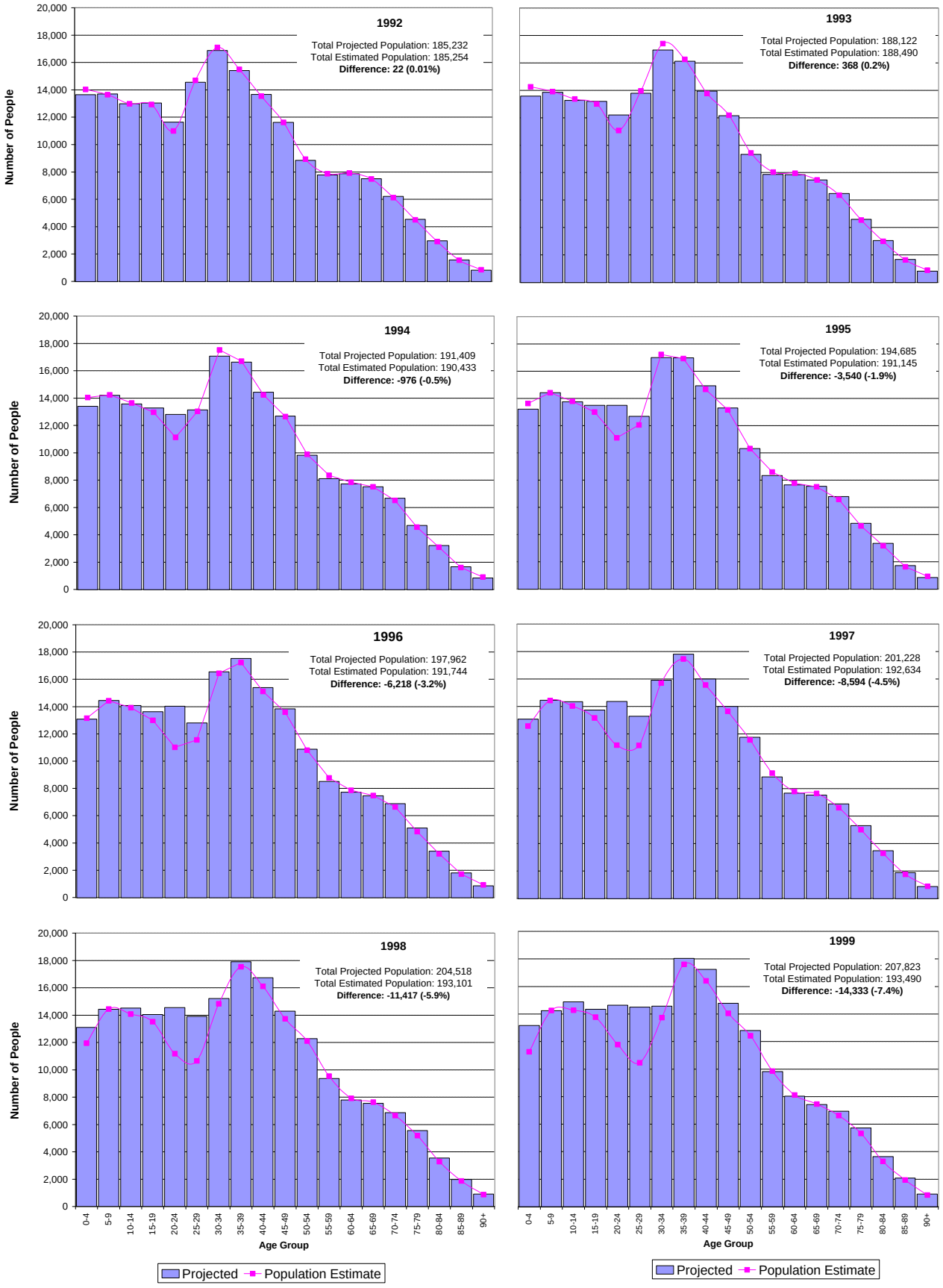


Figure 5:**Ottawa-Carleton Regional Health Department**

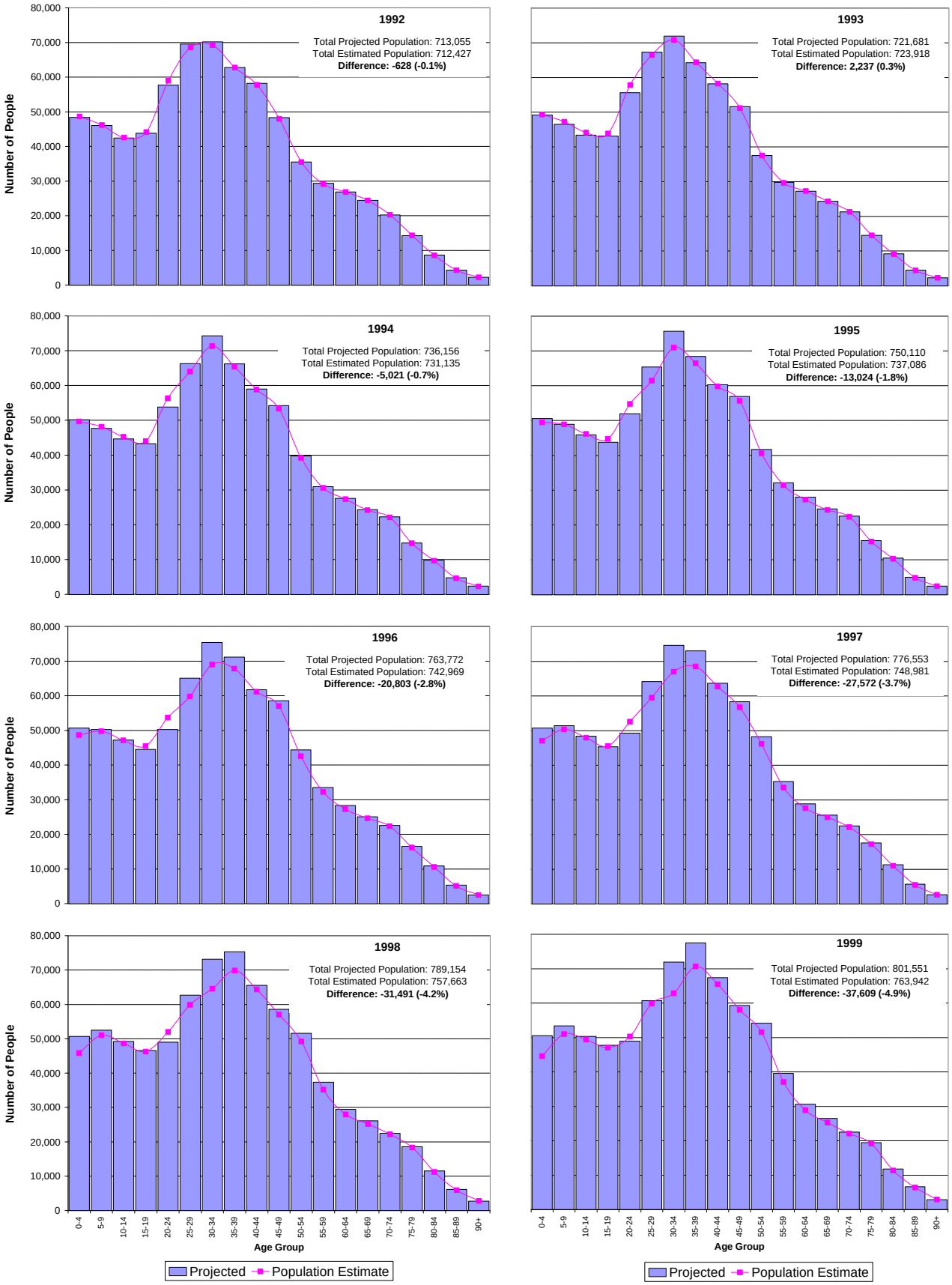


Figure 6:**Renfrew County and District Health Unit**

Figure 7: **Leeds, Grenville and Lanark District Health Unit**

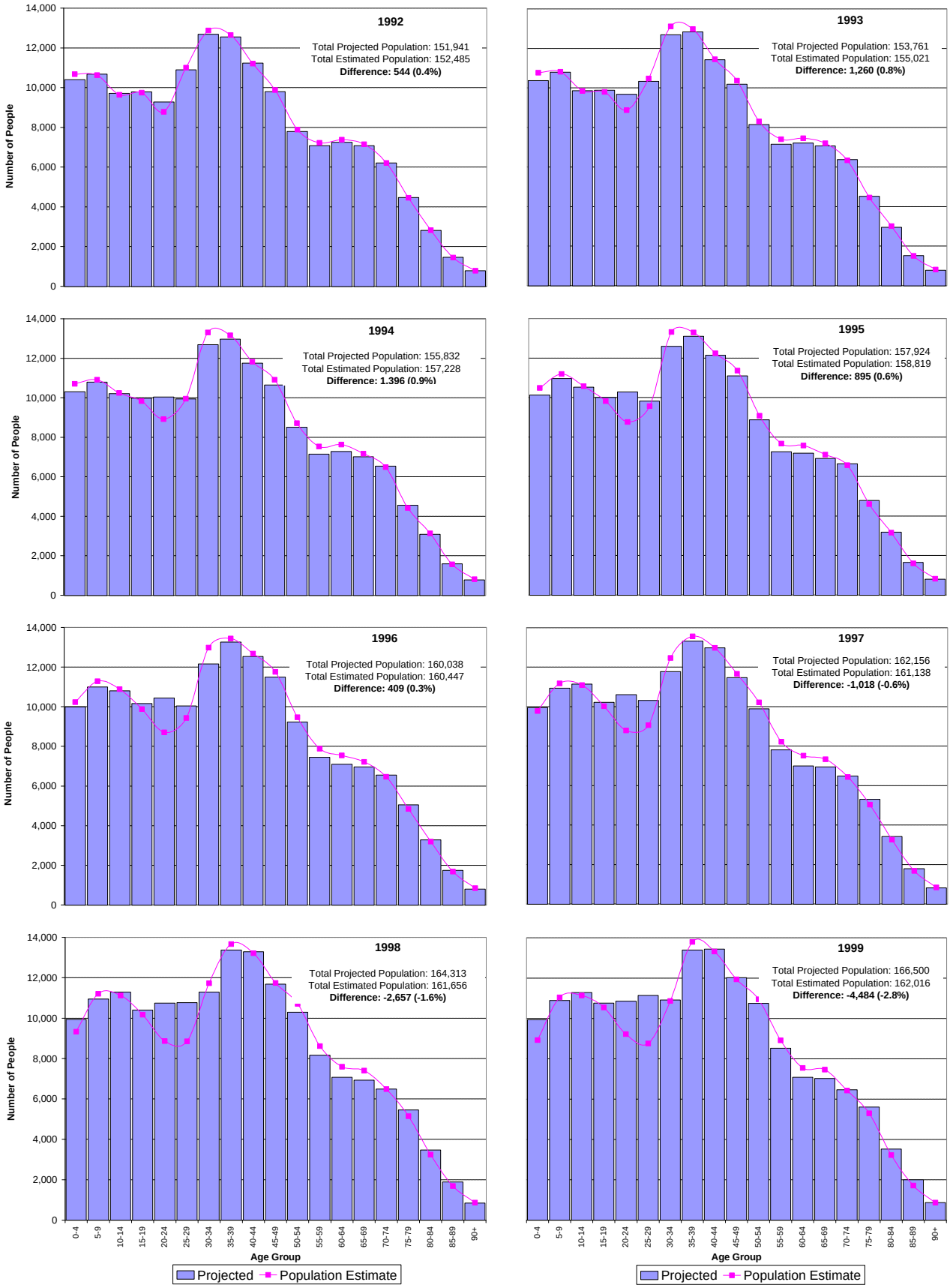


Figure 8: **Kingston, Frotenac, Lennox Addington Health Unit**

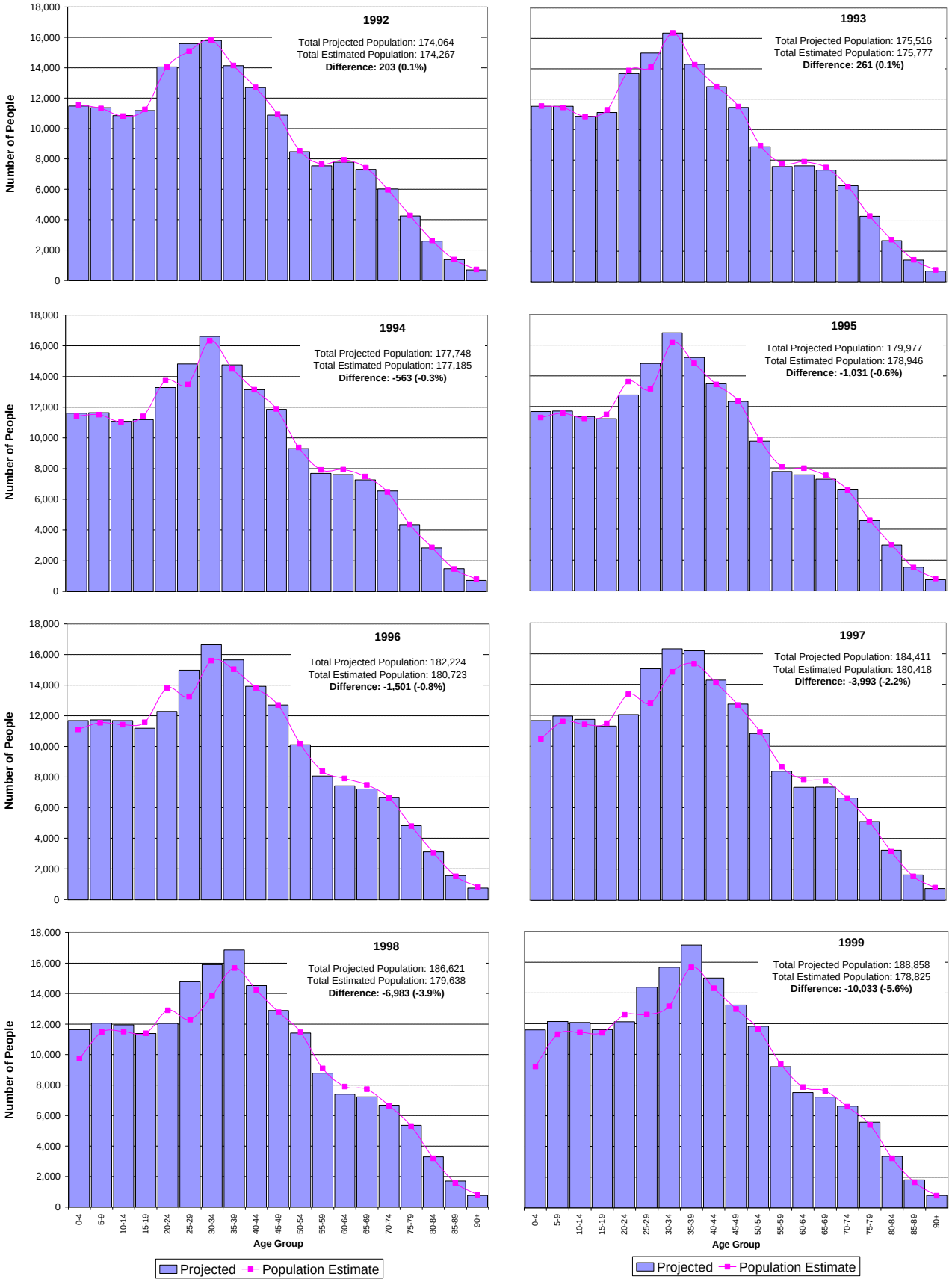
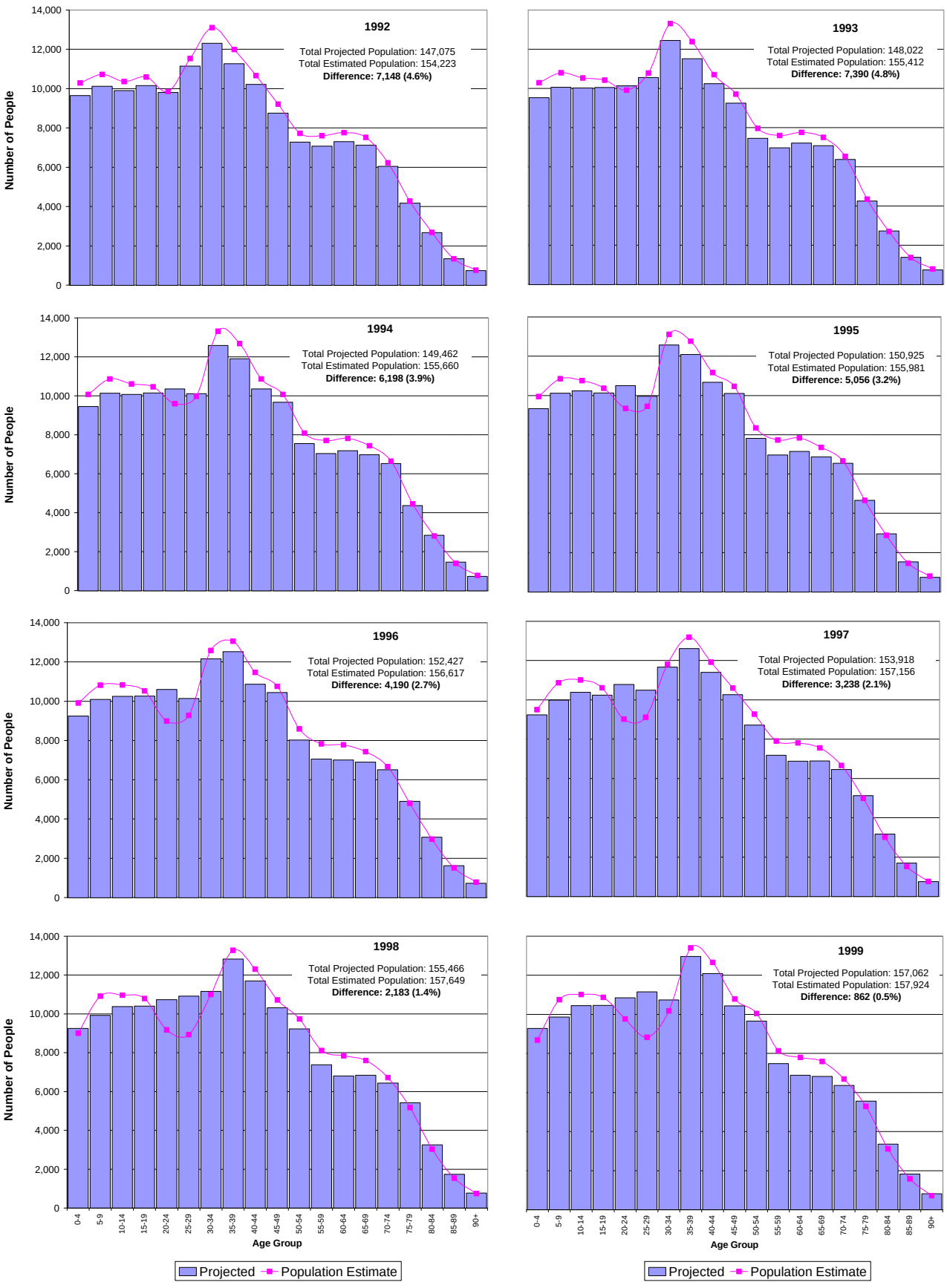


Figure 9: **Hastings and Prince Edward Counties Health Unit**



Discussion

With the exception of Renfrew and Hastings & Prince Edward Counties, the overall discrepancy between population projections and estimates was less than 1% when looking only 3 years into the future (1992, 1993 and 1994). Beyond this time frame, the gap between the projected and estimated population grows each year. By 1999 the actual population Eastern Ontario Region is 4.2% less than had been expected by the projection model. At the PHU level, there was no consistent trend. The projections overestimated the populations of some PHUs for some years, and vice versa.

A more careful examination of age specific projections and estimates reveals that the projections model predicts, quite accurately, the number of persons for some age groups (5-19, 60-90+), but vastly overestimates for other age groups (0-4 and 25-39 year olds) in Eastern Ontario Region.

For the 0-4 age group the overestimation may be due to erroneous assumptions about projected fertility and birth rates. The population projections model had assumed a total fertility rate (TFR) of 1.67 in the reference scenario. However, current analyses of 1997 data by Statistics Canada state that in Ontario the TFR rate has reached an all time low of 1.53. Newly revised population projections use a reference (mid-point) TFR of 1.55.

Unexpected migration patterns may account for the lower population of 25-39 year olds than had been expected. According to the Ministry of Finance, the levels of emigration, especially during 1996-1999, were much higher than expected.

Population projections are based on past and emerging demographic trends, which may not necessarily continue in the same direction. Thus, projections are periodically revised as new data become available. As previously mentioned, the population projections used in this exercise were an earlier set of projections modeled on 1991 Census data. These projections have since been replaced by a new set modeled on more recent data (ie. the 1999 population).

Each of the factors taken into account by population projection models are subject to uncertainty- some more than others. Fertility and mortality are thought to be the more stable components of population projection models (although fertility is less stable than mortality). Other factors such as immigration are easy to predict in the short-term because there are defined national targets for immigration. However, future immigration numbers are subject to changes in policy, and therefore may increase or decrease. Such changes are unpredictable.
Factors such as interprovincial migration are likely to be affected by social and economic conditions. Statistics Canada warns that interprovincial migration is volatile, difficult to forecast, and has a major impact on projected growth at the provincial level. Consequently, they state that provincial projections be viewed with caution.

The same argument may be extended to sub-provincial estimates. Greater variation (ie. greater deviation between projected and actual population growth) is more likely to be seen with smaller levels of geography, simply because small changes in migration, fertility or mortality can have a large effect on the population structure. Thus, using broader groupings of geography, and age groups is recommended.

At the local level, population projections have been used simply to describe demographic trends such as the increasing number and proportion of elderly persons. Any differences between actual and expected population growth are most probably inconsequential. However, projected population growth is also an important consideration in planning health care services, and projections have been used by District Health Councils to estimate future needs for institutional care and community health services. The obvious implication is that a population growth rate that is less than expected would result in an over-allocation of services. Because of the age-specific discrepancies between expected and estimated population numbers, mis-allocations may affect service planning for some areas (i.e., obstetrics, bassinets) more than others.

Overall, our findings suggest that population projections should be used cautiously. It can be problematic to use projections to look at specific age groups, small geographic areas, or to look too far into the future. Furthermore, estimates of future health service needs based on projections should be reviewed and revised as newer population projection data become available.

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