

**Making The Unknown Known:**  
**Sub-Regional And Provincial Population Projections For Turkey**

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**Abstract:**

Projection is an estimation process about the future that is due to some various assumptions in view of the fact that conditions of the past time. TurkStat has used cohort-component method for population projections, since 1994. These projections are assumed for Turkey total as a whole, and don't include regional or provincial estimations. The scope of this study is to make new provincial and regional urban/rural population projections for the centenary of the Republic of Turkey, based on Address Based Population Registration System (ABPRS) 2008 database, with contributions of Turkey Demographic and Health surveys (TDHS-1993, TDHS-1998, TDHS-2003, TDHS-2008), United Nations World Population Prospects, 1990 and 2000 General Population Censuses. This is the first trial-study for provincial based cohort-component population projection with regional and provincial assumptions. This study is also the first one of ABPRS based projections, except the national estimation based projections of TurkStat. According to the results of the study, different demographic patterns will be followed in sub-regions of Turkey. Population ageing will be occurred in western localities. Percentage of urban population will usually rise in some provinces and regions although the decreasing population sizes due to negative net migration or low fertility levels. Turkey's total population will reach a value between approximately 81-83 million until 2023 with decelerating growth rate. It is seen that the population will become dense in cities and high population areas. When the obtained findings in regional and provincial levels are considered, deviation from final phase of demographic transition appears when mainly going to eastern regions from western regions. There are deep differences between the demographic structures of the regions in Turkey, from the western to eastern ones. Western regions are in an advanced level than the average in Turkey; they nearly reach to the end point of the demographic transition process or have reached.

**1. Introduction**

Population censuses have a long history and census taking began at least 5800 years ago in Egypt, Babylonia, China, Palestine and Rome (Halacy, 1980). Other common methods for collecting demographic data are registration systems and sample surveys which differ from a census. Demographic changes over time have always been an important topic for governments, scientists and organizations for planning about the future. Population projection methods that make estimations for past and future by using the data of censuses and surveys of specific dates are used for this issue. Projection is an estimation process about the future that is based on a variety of assumptions in view the conditions of the past. Population projections are applied by some official and non-official institutions in the world. The most comprehensive projections have been presented by The United Nations since 1950, up to now.

In Turkey; after establishment of the Republic, the first general population census was conducted in 1927 and the next one was in 1935. There was a 5 years periodic census until 1990. At that time the census time frame was expanded to 10 years with the 2000 census being the most recent. In 2007, “Address Based Population Registration System” was developed by Ministry of Interior Affairs and Turkish Statistical Institute (TurkStat). A brand-new window on demography is being opened in Turkey.

Population projection methods are separated into various ways. Basic methods are mathematical methods and component methods. The most usual projection method in the world –especially in the EU member countries- is Cohort-Component Method, is based on the components of population change: fertility, mortality and migration. In the assumption process of the projections, the theory of demographic transition is often used as the underlying assumption.

It can be said that the current demographic structure of Turkey is in the last phase of demographic transition process (Canpolat,2008; DIE,1995; Yavuz,2008). The official population projection method in Turkey is cohort-component method which currently used by Turkish Statistical Institute and State Planning Organization, for national-level population projections. TurkStat has used cohort component method for population projections, since 1994. FIVFIV (Shorter, Sendek and Bayoumy 1995) package program is chosen for this application.

The method and program have been applied to the data of population censuses that are periodically executed by TurkStat. Attempts to update the results according to the data of ABPRS have gone on and some general results of that study was released on the TurkStat official Web site ([www.tuik.gov.tr](http://www.tuik.gov.tr)), in April 2009. These results only include assumptions and forecasts for total population of Turkey at national-level, not for any regional or provincial based assumptions. Provincial estimations of TurkStat are made by mathematical methods, not by cohort component method. New population projections are fundamentally needed for Turkey. The scope of this study is to make new provincial and regional population projections for the centenary of the Republic of Turkey by a different software that is named as “Spectrum-DemProj 4” and which is a cohort-component method based software. These projections will be made by using a new database: the most updated (2008) database of ABPRS.

Evaluation of the population projection methods which are used by TurkStat is another purpose of this study. The comparison for evaluation will be discussed especially comparing these methods with in order to apply the software, the data of General Population Censuses or Address Based Population Registration System will be used. This study will be used to examine the forecasts of provincial, regional and total sizes of Turkey population and the main demographic indicators, up to the year of 2023, which is going to be end of the first century of the Republic of Turkey.

## **2. Data**

In our study, the ABPRS is the primary data source for provincial initial year population of 81 provinces, all sub-regions and Turkey as a whole, which is segregated as sex, age groups (5 years) and rural-urban details. On the other hand, 2007–2008 ABPRS Internal Migration data of provinces, regions and Turkey total (zero) in detail of sex and percent distributions of age groups will be used for making migration assumptions as input variables for the software. The data of 1990 and 2000 Censuses will be also used for calculation and estimation of past and future trends of urbanization and urban percent values of all provinces, regions and Turkey total population sizes with the contribution of urban percent values of all of those allocation units from the data of 2007 and 2008 ABPRS. In addition, provincial TFR (total fertility rate) estimations of 2000 Census data will also be used for provincial trend calculation TFR values and estimations for the future trends.

The last four TDHS results (1993, 1998, 2003 and 2008) will be used for calculation and interpretation of regional past trends and projection of these trends to the future for TFR values of the regions and

Turkey total, IMR (Infant Mortality Rate) values of the regions and Turkey total, percent distribution of ASFR (Age-Specific Fertility Rate) values of the regions and Turkey total, birth registration ratios of the regions and Turkey total from TDHS-2008.

UN-World Population Prospects 2008 Revision assumptions and variants for Turkey will be used to calculate and to interpret the regional past trends and forward projection of these trends to the future for TFR and percent distribution of ASFR assumptions and variants for Turkey. Coale-Demeny Life Tables will be used for all population projections.

Spectrum is a Windows-based system. Demproj module will be used in this study, according to its demographic coverage. It is a computer program for making population projections for countries and regions. It requires information on the number of people by age and sex distribution in the base year, future assumptions about the TFR, the age distribution of fertility, life expectancy at birth by sex, the most appropriate model life table, and the magnitude and pattern of migration. The size of the urban and rural populations can be also estimated.

Age correction process will be first used to correct the 0-4 age group population by using the TDHS-2008 regional birth register ratios in NUTS-1 level. Each province is assumed to be having the same registration ratio value of its NUTS-1 region. In this method it is assumed that, population sizes of 0-4 age groups in ABPRS data are numerically lower than the real numbers of the population, which include alive and non-registered infants and children. The difference in the growth in population size will be distributed to the all age groups as the rational weighted values of the all age-groups.

Data for TFR trends has been acquired from the last four TDHS databases (TDHS-1993, TDHS-1998, TDHS-2003, TDHS-2008) for 5 regions level from HIPS and provincial values from 2000 General Population Census for every provinces. Every projection units have 8 alternative TFR trends. The most appropriate and plausible ones will be chosen. All projections will be instituted on only one scenario.

Data for percent distribution of ASFR values has been acquired from TDHS-2008 regional data for initial percentages, and UN-WPP values for posterior values.

Annual migration sizes and percent age-sex distributions were calculated from 2007-2008 ABPRS Internal Migration Statistics. ABPRS provides fresh and updated data; it gives annual information about migration and is also a de-jure based system. So the migration statistics from 2000-General Population Census (GPC) will not be used. The most important assumption of this study is the internal migration rate. Also this is the most difficult field of demographic statistics to estimate. There are no adequate internal migration data in Turkey. So, it has to been assumed these values would stay constant.

Provincial and regional trends for the urbanization were calculated from 1990-GPC, 2000-GPC, 2007-ABPRS and 2008-ABPRS.

Coale-Demeny Life Tables will be used for selection. CD-East will be used for East region; CD-West will be used for all of the other 4 regions and the provinces that are included by. Infant mortality rates (IMR) and life expectancy ("e0") values due to IMR values will be calculated at the regional level and be standard for the provinces of the regions due to the TDHS results. Four levels of population projections will be made in:

- *National level:* Projections for Turkey as a whole, with several different fertility and mortality assumptions. There will be 3 models for Turkey projections: *National projection of Turkey with its own fertility and mortality trends*, *National projection of Turkey with "medium variant" fertility trend of UN-WPP*, *National projection of Turkey with the fertility and mortality trends from the official TurkStat projections*.

- *Regional level (5 demographic regions):* Separate projections for 5 demographic regions of Turkey, which were used for previous TDH surveys.

- *Regional level (12 NUTS-1 level regions):* Separate projections for 12 NUTS 1 level statistical regions of Turkey.
- *Provincial level (81 Provinces of Turkey):* Separate projections for all of the provinces of Turkey.

There will not be any NUTS-2 based population projections, through the absence of any representative and statistically reliable demographic data for neither the current period, nor the past.

### 3. Analysis and Results

Under this title, there will be brief comments on all projection results and their demographic expressions. The basic approach and principle for these controls and comparisons is: “*Regional outputs involve less methodological error than the provincial ones.*” The regions that are mentioned in the principle are especially the five demographic regions, which have more reliable and representative demographic data from the past. The reliability of projections is due to the reliability of demographic data. This rule is parallel to the perspectives for projections. The outputs are only an answer to “*what would happen if...*” question. This study is only an answer that is chosen from the pool of the uncountable answers about forecasting the future.

**Table 1.** Annual results of population size values of the projections and TurkStat projection.

	2008	2009	2010	2011	2012	2013	2014	2015
<b>Total of 81 Provinces</b>	71,517,098	72,347,245	73,163,273	73,965,945	74,754,295	75,528,684	76,288,481	77,033,282
<b>Total of 12 NUTS-1 Regions</b>	71,517,107	72,286,442	73,041,943	73,783,648	74,511,121	75,223,950	75,922,794	76,606,812
<b>Total of 5 Regions</b>	71,517,096	72,291,466	73,049,905	73,792,939	74,520,023	75,231,296	75,929,778	76,611,059
<b>Model 1- Turkey- Spectrum (Own Trends)</b>	71,517,099	72,323,752	73,113,531	73,880,832	74,625,726	75,348,076	76,053,082	76,734,450
<b>Model 2- Turkey- Spectrum (UN-Medium TFR)</b>	71,517,099	72,341,606	73,155,253	73,964,461	74,769,368	75,563,876	76,353,222	77,131,130
<b>Model3- Turkey- Spectrum (TurkStat TFR and <math>e_0</math>)</b>	71,517,099	72,317,780	73,104,296	73,883,040	74,654,108	75,411,323	76,159,977	76,893,373
<b>Turkey- FIVFIV (TurkStat)*</b>	71,477,000	72,297,000	73,093,000	73,890,000	74,671,000	75,444,000	76,219,000	76,980,000
	2016	2017	2018	2019	2020	2021	2022	2023
<b>Total of 81 Provinces</b>	77,761,418	78,471,220	79,162,034	79,832,507	80,481,729	81,109,124	81,713,227	82,293,649
<b>Total of 12 NUTS-1 Regions</b>	77,273,953	77,922,788	78,551,096	79,158,935	79,744,981	80,308,675	80,849,674	81,366,283
<b>Total of 5 Regions</b>	77,274,330	77,918,396	78,542,162	79,145,808	79,727,114	80,285,859	80,821,450	81,333,241

<b>Model 1- Turkey- Spectrum (Own Trends)</b>	77,390,997	78,022,005	78,632,151	79,214,624	79,768,730	80,293,962	80,795,902	81,267,965
<b>Model 2- Turkey- Spectrum (UN- Medium TFR)</b>	77,902,474	78,660,487	79,409,852	80,149,849	80,873,748	81,587,173	82,283,586	82,968,603
<b>Model3- Turkey- Spectrum (TurkStat TFR and <math>e_0</math>)</b>	77,616,551	78,322,293	79,015,457	79,694,982	80,354,049	80,998,101	81,620,500	82,226,693
<b>Turkey- FIVFIV (TurkStat)*</b>	77,731,000	78,471,000	79,195,000	79,912,000	80,614,000	81,307,000	81,977,000	82,639,000

\*: ABPRS-2008 projections, TurkStat (“End of the year” values).

The results in the table give some important considerations of projections. All projections have positive population growth until 2023. This is a conspicuous point that means the long path of Turkey to the end of the third phase in the demographic transition process has not been finished and will not be finished until 2023. Annual differences between the population sizes of all projections are declining each other. Population growth rate will decline in Turkey, according to the projections of Turkey as a whole.

The most striking picture in this view is the insignificant variation between the 2023 values of population sizes which are estimated by the provincial totals and the original *Model-3* projection. The difference is approximately 67000. There is a growing difference between the two trends until 2017, and the difference decreases after 2017. It is a result of the decreasing growth of the province totals. Similar cases can be seen between the regional totals and the *Model-1* projection.

It is clearly seen that, all projections have given results which have plausible differences between each other. Consequently; all projections and regional totals implicate that, Turkey will have positive decreasing population growth rates until 2023.

Population growth of Turkey will decelerate and a decline of the growth rate will be observed according to the all national population projections alternatives other. The population size of Turkey will exceed 80 million and will be near 81-83 million in 2023, if the demographic components behave according to the assumptions that were designed for these model projections.

Mortality and fertility levels were assumed to be decreasing for all of the three models, conveniently with the baselines of third stage of the demographic transition. In the previous chapters, demographic transition was defined in detail for the World and for Turkey. Turkey is in the third phase of demographic transition process (Canpolat 2008; DiE 1995; Yavuz 2008).

According to the national projections, TFR values will decrease and mortality conditions will improve. Life expectancy and urbanization will rise. Mean age of childbearing will be higher. In spite of the very low mortality levels, especially for the infant and child mortality, the annual numbers of deaths will not be low. It is a sign of the ageing of the population. Mortality rates will be fall despite the rising numbers of deaths.

According to the all projections, net migration sizes and their age/sex distributions assumptions affect the results greatly, when the outputs of the study are observed in detail. However fertility and mortality are the main demographic effects that changes the population sizes with migration, these are more predictable than migration. The wellbeing levels and developmental indicators vary by region in Turkey, and it seems they will continue to be unlike according to the outputs. Demographic issues of any region are different from the other ones.

A very different problem, which is not imperceptible in eastern regions, will be occurring in the western regions due to the projection results: Ageing of population. This issue is not in the main research subjects of this study. But the outputs drive the discussions on this demographic workspace. It can be seen that there will be a big problem regarding an ageing population in most of the provinces of Turkey, except the Eastern ones. Percents of age of 65 and over are increasing greatly, until 2023 in those provinces. Ageing may be occurring as the result of lower TFR values, increasing life expectancies and rising of living standards in the regions that are near to the end of their demographic transition process or the regions that have low fertility levels and very high out-migration levels. Age/sex structure of the migration is an important factor in this part of the discussion<sup>^</sup>.

Urbanization is another important case. Urban percent values and population sizes of urban areas are growing almost everywhere. This is also valid for the communities that lose population sizes. In spite of the decrease in total population size, urban population usually grows up.

There are deep differences between the demographic structures of the regions in Turkey, from the western to eastern ones. Western regions and provinces are near to the end of third stage of demographic transition upon their fertility and mortality levels. Population sizes of the western areas will usually increase with the considerable positive in-migration sizes. These positive in-migration levels will be sourced from the less developed and smaller provinces and the eastern provinces, especially from the rural areas everywhere.

The population growth will slow down in Turkey in the near future. In the near future, Turkey will be a more urbanized country. Agglomerations will begin in the urban areas and the regions, especially in the ones that have high population density. All national, regional and provincial projections indicate that.

#### **4. Preliminary Conclusion**

This study was made in order to produce population projections intended for review of demographic structure in national, provincial and regional level until the centenary of the Republic of Turkey and to compare all obtained results with results of most current ABPRS-based population projections produced by TurkStat. Linear trends were calculated with mathematical way in order not to disrupt default standards and not to add comment. Since linear trends are not useful in terms of demographic in normal conditions, projection range was not kept too long.

Migration is the most important, complex and the most unpredictable foot of demographic studies in Turkey. Fertility and mortality are partially more predictable than migration. Demographic registration systems may straighten this issue. ABPRS is hoped to provide consistent data about internal migration. There are so many blank areas and absence of sufficient data for projections. Registration systems have not been improved enough, yet. Even though, the projection results of this study are not too far away from the official projections of TurkStat.

It was a hard process of collecting the necessary information from different sources and huddling them together with standard and faultless format. There were some blank areas for projecting present information to the future and forecasting versatility of future. The only and single mission of this thesis is filling in the blanks; that is all.

When resulting findings were gotten together, Turkey's total population until 2023 will reach a value between approximately 81-83 million with decelerating growth rate and increasing population size at a gradually decreasing rate. Fertility and mortality levels will fall in all sub-regions and life expectancy at birth will increase. It is seen that the population will become dense in cities and high population areas, rural population will be significantly reduced and declines in fertility and mortality levels will continue.

When the output of the study is considered, population appears to be rising across the country mostly by slowing down; it reveals that the last stage of demographic transition process is at a point near the end. When total population size is concerned, this case is also similar to the period which is the third phase of the logistic curve and at which the population growth is gradually slowing down and nearly stops. However regional differences continue in this regard.

When the obtained findings in regional and provincial levels are considered, deviation from final phase of demographic transition appears when mainly going to eastern regions from western regions. There are deep differences between the demographic structures of the regions in Turkey, from the western to eastern ones. Western regions are in an advanced level than the average in Turkey; they nearly reach to the end point of the demographic transition process or have reached. Fertility and mortality levels in these settlements decreased considerably. Population growth rate is still in the positive direction in general; accordingly this is resulted from the size of internal migration taken from other regions, especially from the rural areas of everywhere. The wellbeing levels and developmental indicators are regionally unlike in Turkey, and it seems it will continue to be unlike. Differences between the regions are also clearly seen when examined birth registration ratios even at the phase of assumptions.

When TFR values examined in NUTS-1 level, it can be said that TFR values of more than half of the 12 regions are fewer than “2.10” replacement level. This verifies prospective findings of this study which were obtained and interpretations that were made on it. The results of study present parallelism with scientific studies that has been done before.

Now, rapid population growth in Turkey got behind; there is no probability of re-acceleration of population growth and it can be certainly said that annual population growth rate will continue to decline hereafter (TÜSİAD 1999:56). Republic of Turkey's population growth rate will reach very low levels toward next century; it can reach nil in the process of time and maybe it can even reach negative values. In other words, the dream of “Turkey of 100 million population size” will be probably never realized (TÜSİAD 1999: 58).

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