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Subnational population projections for Turkey, 2013-2023

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WORK SESSION ON DEMOGRAPHIC PROJECTIONS
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SUBNATIONAL POPULATION PROJECTIONS FOR TURKEY, 2013-2023

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ABSTRACT:

Turkey consists of 81 provinces among which there are considerable differences regarding demographic indicators. The scope of this study is to view the population figures of Turkey by the new provincial population projections for the centenary of the Republic of Turkey (2023), based on the updated Address Based Population Registration System (ABPRS) database, besides to the 2013-2075 population projections for Turkey. This is the first official study for provincial based cohort-component population projections. The end of the year values of ABPRS (Address Based Population Registration System) 2012 results were used as base population. Births and deaths are compiled from Central Civil Registration System ("MERNIS"-CCRS). Internal migration assumptions were produced from ABPRS. An average of recent migration patterns of provinces were taken as inputs. Institutional population living in barracks was separated from the rest of the population and the age structure of this population was regarded not be changed throughout the projection period. According to the results of the study, population of Turkey will be about 84 million in 2023 with decelerating growth rate. Population of 60 provinces will increase and population of 21 provinces will decrease in 2023. The order of the most populous four provinces will not change. The population of İstanbul will be 16.6 million in 2023, the population of Ankara will increase to 5.9 million, the population of İzmir will be 4.4 million, and the population of Bursa will be 3.1 million. The proportion of elderly population in the population of Turkey will increase to 10.2% in 2023. The population of Turkey will continue ageing. Elderly population was 5.7 million in 2012 with a proportion of 7.5%. This population will reach to 8.6 million people with a proportion of 10.2% in 2023. The population will become dense in cities and high population areas. 15-64 population will increase almost in everywhere. But its pattern has direct relationship with the internal migration. The eastern regions will feed the western and more urbanized ones by migrants.

1. INTRODUCTION

Population censuses have a long history and census taking began at least 5800 years ago (Halacy, 1980). Registration systems and sample surveys are the alternative methods for collecting demographic data.

Demographic changes over time have always been an important topic for planning about the future. Population projections are methods that make estimations for past and future by using the data of censuses and surveys, and are applied by relevant official and non-official institutions. The most comprehensive projections have been presented by The United Nations since 1950, up to now. But nowadays, regional projections are a lot more needed by governments and institutions.

After establishment of the Republic of Turkey, the first population census was conducted in 1927 and the next one was in 1935, and 5 years periodic censuses were conducted until 1990, and then the census time period expanded to 10 years. 2000 General Population Census is the last and the most recent one.

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"Address Based Population Registration System" (ABPRS) was developed in 2007, by Ministry of Interior Affairs and Turkish Statistical Institute (TurkStat). A brand-new window on demography is being opened in Turkey (Karakaya, 2009).

2. SCOPE OF THE STUDY

Population projections are very important for future policy-making. Determination of current population trends and predicting future population structure according to these trends provide making healthier policies. It should not be ignored that population projections are not a forecast but an application that shows the progress of the population in case of current population trends continue or reflecting the trends of other countries which lived similar processes previously after an analysis. Projection is only an answer that is chosen from the pool of the uncountable answers about forecasting the future.

The official population projection method in Turkey is cohort-component method which is 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 used for those applications.

The method and program have been applied to the data of population censuses and ABPRS results that were executed by TurkStat. The previous projection study of Turkstat based on the data of ABPRS 2008 results have gone on and some general results of that study was released on the TurkStat official Web site (www.tuik.gov.tr). The results only include assumptions and forecasts for total population of Turkey at national-level. Provincial estimations of TurkStat had been made by mathematical methods, not by cohort component method.

Unestimated changes in population may cause differentiation from the real population size. Population projections are revised due to new demographic trends, when various radical changes are determined. New population projections were fundamentally needed for Turkey. Some different alternative regional projections have been made for academic studies. ABPRS was begun to be used first, but there was absence of adequate administrative data sources for assumptions. So Karakaya (2009) made a trial-study for provinces, by ABPRS 2008 based population and made different sources for assumptions, such as Demographic and Health Survey. Administrative registers were not used directly and criticized as not being improved enough, yet. A process was followed up for collecting the necessary information from different sources and huddling them together. It was advised to make more reliable projections by using updated ABPRS results after 2008 and the results of the updated assumptions in the near future as a decision (Karakaya, 2009).

But nowadays, administrative data sources have been improved dramatically, and considered as strong data sources by academic world. The scope of this study is to make new official based provincial population projections for the Republic of Turkey by cohort-component method.

Population projections of TurkStat, which was last produced according to the results of 2008 ABPRS and 2008 Turkey Demographic and Health Survey, are renewed due to improvements on the birth and death data obtained from registration systems, formation of a serial of migration statistics from ABPRS and to meet the national and international needs. The study for the population projections were carried out by a working group including the participants from related university and institutions. A working group has been constructed by representatives from TurkStat, Ministry of Development and Hacettepe Universitiy Institute of Population Studies.

The main aim was to produce national and regional population projections by using the current data sources and new software, named as PADIS-Int.

Regional projections have been produced in 81 provinces (NUTS-3)[1] detail. In this respect, the study is performed as the first of such an official studies:

- Separate projection of Turkey total population (2013-2075),
- Seperate projections for each provinces (2013-2023).

In Turkey, sub-regional population projections by cohort component method were produced officially for the first time, by this study. These projections were made for 81 provinces for the period 2013-2023. The reason for the choice of the projection period was that 2023 is the centenary of the Republic of Turkey.

3. DATA SOURCES

The reliability of every projection depends on the reliability of its input data and assumptions. This is the perspective for projections.

In these projections data from administrative sources, which are administrative registers and registration systems were widely used. The main difference from previous projections was use of administrative data as inputs. As the basic data sources, ABPRS and Central Civil Registration System (CCRS) registers were used.

Recently, the quality and coverage of demographic data from administrative sources have improved extensively. Since 2007 population of Turkey is announced to the public by Turkish Statistical Institute annually and regularly from ABPRS. The base population used in the projections was taken from 2012 figures. Besides, births are compiled from CCRS. Birth data is available in the system since 2001. Deaths are also obtained from CCRS since 2009, but in addition to the information from this system data collected by death certificates are also used.

Data regarding internal migration was produced from ABPRS. An average of recent migration patterns for the last 4 years (period between 2008 and 2009, 2009 and 2010, 2010 and 2011, 2011 and 2012) of provinces were taken as inputs.

The scope is the same with the population covered by ABPRS. In ABPRS, whole of Turkish Republic citizens and foreign nationals living within the boundaries of the country (de-jure) have been covered. Both institutional and non-institutional population was also covered. Pattern of institutional population was also taken into consideration at the projection process.

4. METHODOLOGY

Cohort-component method was used in the projections. All calculation processes were done according to the requirements of the method. This method projects the effects of many demographic indicators on age-sex structure of the population. Cohort-component method bases on lifelong monitoring of the cohorts that are at the same age, by fertility, mortality and migration components. The cohorts are annual birth cohorts (age-cohorts). The components are births, deaths and migration.

Assumptions
Current results of 2012 ABPRS which was set up according to the Population Registration Law numbered 5490, was used for projections.

[1] Detailed information for classification of NUTS Regions: http://tuikapp.tuik.gov.tr/DIESS/SiniflamaSurumDetayAction.do?surumId=164&turId=7&turAdi=%205.%20Geographical%20Classifications (Last visited on: 03rd October 2013)

Turkey consists of 81 provinces among which there are considerable differences regarding demographic indicators. All provinces were examined by their fertility, mortality and migration patterns. Inputs were prepared for the projections.

In 2012 ABPRS, which was taken as the base population, age correction was needed to be done due to late registrations of births. This correction has been done in accordance with annual "birth registration ratios" (based on year of registry) and is based on cohorts.

United Nations World Population Prospects - 2010 Revision and 2000 General Population Census were used for fertility and mortality assumption trends at national and subnational level.

During the projection designing process, it has been assumed that there are slight decreases in fertility rate and declining tendency in infant mortality rate (IMR). In this respect, detailed literature study was carried out and historical developments of the world countries were investigated.

Life tables were developed by using IMR values which were derived from administrative registers, via MATCH module of MORTPAK Demography Applications software. By this way, e0 (life expectancy) values were obtained. These values were analyzed by sex aggregation and also literature review was made. Life expectancy trends of different countries and assumptions for Turkey were evaluated by the data source of UN- World Population Prospects.

In order to calculate mortality rates, "Coale Demeny-West" Model Life Tables (Coale and Demeny, 1983) was used as the optimal model for Turkey's mortality structure.

For international migration, 2010, 2011 and 2012 ABPRS results were used and annual net migration by sex, age and province was estimated by residual method.

For internal migration, register movements derived from ABPRS were used. An assumption was produced by calculating the mean of the trends of annual register movements and age-sex patterns.

Trends of fertility rates and historical data sources were analyzed and future attitudes were assumed by demographic approaches.

Data regarding internal migration was produced from ABPRS. An average of recent migration patterns of provinces were taken as inputs. Annual migration sizes and percent age-sex distributions were calculated from 2008-2009, 2009-2010, 2010-2011 and 2011-2012 ABPRS Internal Migration Statistics. ABPRS is a de-jure based system and provides updated data. It gives annual information about migration. Internal migration assumptions are the most important and difficult phase of this study. The values have been assumed to stay constant until 2023.

Institutional population living in barracks was separated from the rest of the population and the age structure of this population was regarded not be changed throughout the projection period.

Reference periods of all demographic indicators that were used are taken into consideration, end-of-the-year values for 2012 were calculated after determining the trends. So, all factors that affect the projection were combined at the same time cross-section.

Firstly, "Scenario 1" designed as the basic projection for Turkey and outputs were obtained up to the year 2075. The assumptions and trends of basic scenario till 2023 were used for provincial projections. The assumptions for provincial projections were developed by using the mathematical relationships between the indicator of the provinces and Turkey in total.

Projections of Turkey and all provinces were produced separately and final figures were obtained by calibrating the provincial values to Turkey total population.

Software
At the design and production stages of projections, "PADIS-Int" software was used. PADIS-Int is a population projection package program that was produced by China Population Information and Research Center.

It was equipped for personal computers and makes population projections based on cohort-component method. Its infrastructure is based on single-age calculations and all assumption processes are presented by graphs.

5. FINDINGS

This study was carried out in 2013 and published by as a news release on 14th February 2013 on Web site of TurkStat.[1] Population projections were made on the basis of the results of 2012 ABPRS and produced for both Turkey in total and 81 provinces. Besides, projections were made by single ages until the year 2075 for Turkey. In addition, needful population projections at provincial level were produced officially and announced to the public with this news release for the first time in Turkey. Changes in the population of all the provinces between 2013 and 2023 were projected by analyzing the trends of the demographic events. On the other hand, alternative population projections (different scenarios) reflecting different fertility variants were also made. The details of the study can be seen in the tables of this news release.

Population growth rate will decline until 2023 in Turkey according to the projections of Turkey total. Net migration sizes and their age/sex distributions assumptions affect the projection results greatly, when the outputs of the study are observed in detail. Fertility and mortality are more predictable than migration.

The results indicate that the population of Turkey will be about 84 million in 2023. Population of 60 provinces will increase and population of 21 provinces will decrease in 2023 compared to 2012 ABPRS results.

The population will increase slowly to the year 2050, and it will reach to its highest value with almost 93.5 millions. After 2050, the population will start to decline, and it is expected to be 89 millions in 2075.

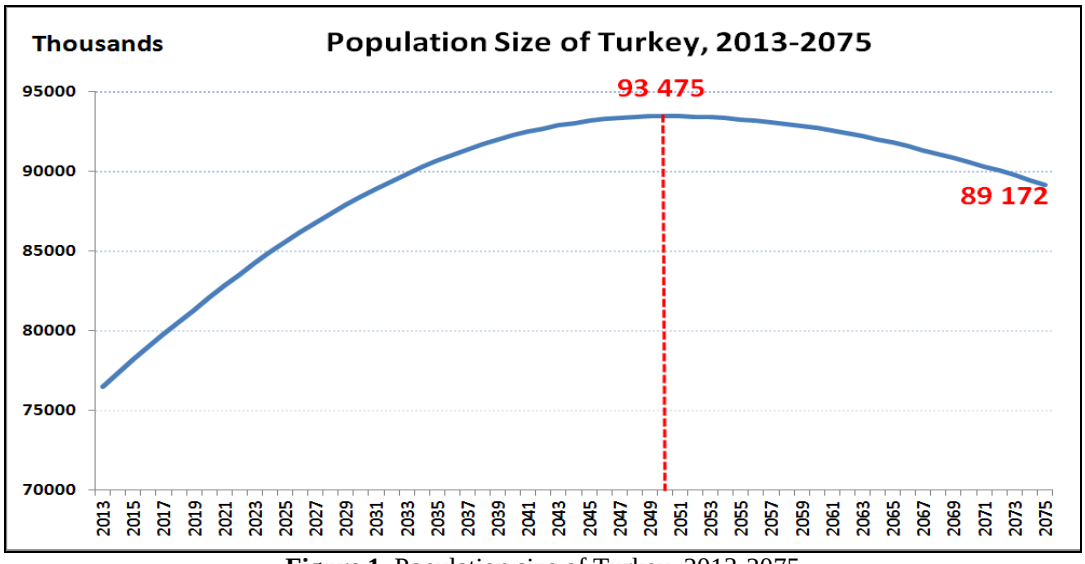

Figure 1. Population size of Turkey, 2013-2075

[1] http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=15844 (Last accession date: 30 th September 2013)

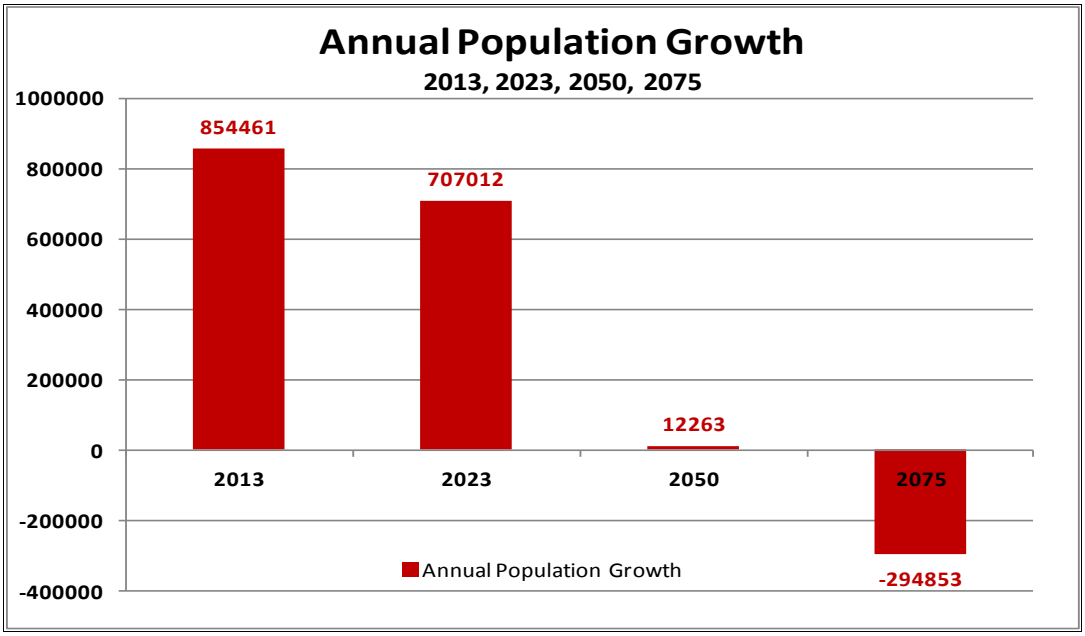

Figure 2. Annual growth rate of Turkey, 2013-2075

While the median age of the population of Turkey was 30.1 in 2012, it will increase to 34 in 2023. The median age of the male population was 29.5 in 2012, will increase to 33.3 in 2023. The median age of the female population was 30.6 in 2012 and will be 34.6 in 2023.

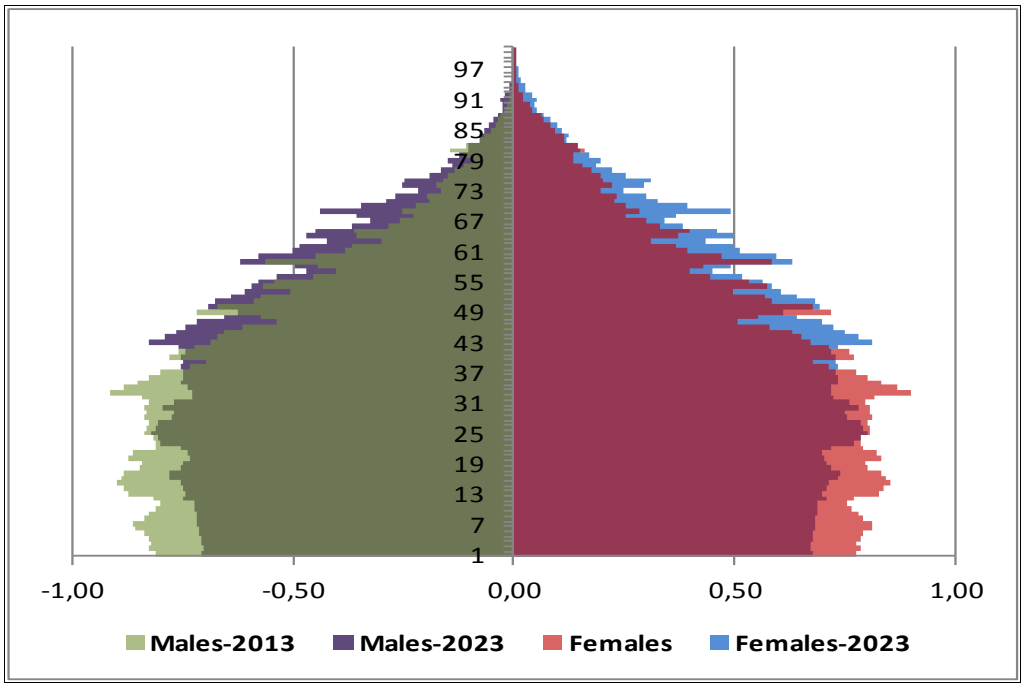

Figure 3. Population pyramids of Turkey, 2013-2023

Table 1. Median age by sex for Turkey, 2012-2023

	Total	Males	Females
2012	30.1	29.5	30.6
2023	34.0	33.3	34.6
2050	42.9	41.8	44.0
2075	47.4	46.0	48.7

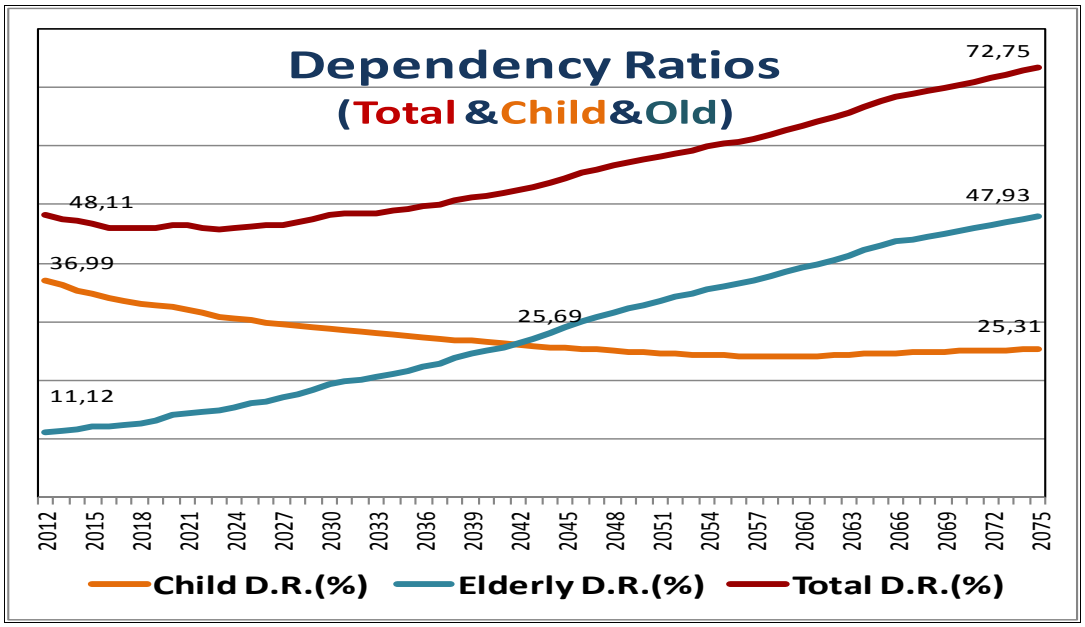

Figure 4. Dependency ratios for Turkey, 2013-2075

Demographic issues of any province are different from one to another. The order of the most populous four provinces will not change. The population of İstanbul will be 16.6 million in 2023, the population of Ankara will increase to 5.9 million, the population of İzmir will be 4.4 million, and the population of Bursa will be 3.1 million.

Table 2. Most populous 10 provinces in 2012 and 2023

	2012			2023	
1	İstanbul	13 855	1	İstanbul	16 569
2	Ankara	4 966	2	Ankara	5 927
3	İzmir	4 005	3	İzmır	4 405
4	Bursa	2 688	4	Bursa	3 073
5	Adana	2 126	**5**	**Antalya**	**2 626**
6	Antalya	2 093	**6**	**Şanlıurfa**	**2 339**
7	Konya	2 052	7	Adana	2 287
8	Gaziantep	1 800	8	Gaziantep	2 257
9	Şanlıurfa	1 762	9	Konya	2 175
10	Mersin	1 683	**10**	**Kocaeli**	**1 984**

Table 3. Least populous 10 provinces in 2012 and 2023

	2012			2023	
72	Sinop	201	**72**	**Çankırı**	**206**
73	Iğdır	190	73	Iğdır	204
74	Bartın	188	**74**	**Sinop**	**192**
75	Çankırı	184	**75**	**Bartın**	**189**
76	Artvin	167	76	Artvin	162
77	Gümüşhane	135	77	Gümüşhane	140
78	Kilis	124	78	Kilis	130
79	Ardahan	107	79	Ardahan	90
80	Tunceli	86	80	Tunceli	79
81	Bayburt	76	81	Bayburt	73

Table 4. The highest and the lowest provincial growth rates between 2012 and 2023

		‰			‰
1	Şanlıurfa	25.8	77	Yozgat	-35.7
2	Tekirdağ	21.0	78	Ardahan	-15.5
3	Antalya	20.7	79	Çorum	-13.1
4	Gaziantep	20.6	80	Zonguldak	-10.6
5	Şırnak	20.3	81	Tunceli	-8.2

Elderly population, which is the population at 65 years of age and over was 5.7 million in 2012 with a proportion of 7.5%. The population of Turkey will continue ageing. This population will reach to 8.6 million people with a proportion of 10.2% in 2023.

Sinop will stil have the highest median age in 2023. Çorum will follow Sinop (44.4), which will have the highest median age, with a median age of 42.9 in 2023. While the median age was lowest in Şırnak (18.5) in 2012, it will be lowest in Şanlıurfa in 2023 with a median age of 20.8.

Table 5. First five provinces that have the highest median age, 2012-2023

	2012			2023	
1	Sinop	37.5	1	Sinop	44.4
2	Çanakkale	37.2	2	Çorum	42.9
3	Balıkesir	37.2	3	Giresun	42.8
4	Kastamonu	37.2	4	Kastamonu	42.4
5	Edirne	37.1	5	Zonguldak	42.2

Table 6. First five provinces that have the lowest median age, 2012-2023

	2012			2023	
1	Şırnak	18.5	1	Şanlıurfa	20.8
2	Şanlıurfa	18.9	2	Şırnak	21.7
3	Ağrı	19.5	3	Ağrı	22.5
4	Siirt	19.5	4	Muş	22.9
5	Muş	19.6	5	Siirt	22.9

Şanlıurfa will have the highest proportion of child population in 2023 with 38.6%. Şırnak had the highest proportion of child population (population at 0-14 age group) in 2012 with 42%. Şanlıurfa was the second with 41.5% after Şırnak. In 2023, Şanlıurfa will have the highest proportion of child population, and Ağrı will follow Şanlıurfa with 35.2%.

Table 7. 5 provinces that have the highest values of percentage of elderly (65 + population), 2012-2023

	2012 (%)			2023 (%)	
1	Sinop	16.3	1	Sinop	21.4
2	Kastamonu	15.5	2	Kastamonu	20.4
3	Çankırı	14.2	3	Giresun	19.6
4	Giresun	13.9	4	Artvin	18.9
5	Artvin	13.9	5	Yozgat	18.8

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. Ageing will 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. Population structure will be directly affected by the structure of the migrants. The eastern regions and rural areas will feed the western and more urbanized ones by young and dynamic migrants, by the higher fertility rates.

Recently, there are differences between the demographic structures of the provinces in Turkey, from the western to eastern ones. Western provinces and provinces are near to the end of third stage of demographic transition according to their fertility and mortality levels. Population sizes of the western areas will usually increase because of the positive in-migration sizes from east. Population will become dense in cities and high population areas.

6. CONCLUSION AND EVALUATION

The current demographic structure of Turkey is in the last phase of demographic transition process (Canpolat,2008; DİE,1995; Yavuz,2008; Karakaya, 2009).

The population figures of these projections differ from the older ones, about being produced as end-of-the-year values, targeting to be comparable with the results of Address Based Population Registration System.

When resulting findings were gotten together, Turkey’s total population until 2023 will reach a value between approximately 84 million with decelerating growth rate. Fertility and mortality levels will decrease and life expectancy at birth will increase. Population will become dense in cities and high population areas. However, regional differences continue in this regard.

Western regions are in an advanced level than the average in Turkey; by demographic transition. Fertility and mortality levels in these settlements decreased. 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.

TFR values of many provinces are less than “2.1” replacement level. This verifies prospective findings of this study which were obtained and interpretations that were made on it. These results 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; Karakaya, 2009). 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; Karakaya, 2009).

6.a) Encountered Problems and Solutions

The most important assumption of this study is about the internal migration, because of the absence of adequate internal migration data in Turkey. It has been assumed to be constant.

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.

6.b) Future Plans

Our plans are:

- Improving the estimations by new demographic data,
- Making household projections,
- Making probabilistic projections.

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