CONTENTS

LIST OF ABBREVIATIONS

CBR	Crude birth rate
CDR	Crude death rate
CIS	Commonwealth of Independent States
IMR	Infant mortality rate
KG	Kindergarten
KZT	Kazakh tenge
LLP	Limited liability partnership
MES	Ministry of education and science
MOH	Ministry of health
NKR	North Kazakhstan region
OECD	Organization for economic co-operation and development
PE	Pre-school education
PO	Pre-school organization
PPE Classes	Pre-primary classes
PPE Groups	Pre-primary groups
RK	Republic of Kazakhstan
TFR	Total fertility rate
The USSR	The Union of Soviet Socialist Republics
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	The United States
WHO	World Health Organization

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Chapter 1

Introduction

The problem of population development in Kazakhstan is one of the most discussed issues in policy discourse especially since independence. Taking into account the increase in fertility rates, especially in the 2000s with the socio-economic growth of the country the problem of pre-school education, the capacity and availability of pre-school organizations also gained attention. Therefore, the present chapter is devoted to describe the relevance of the theme of present thesis, its aims and objectives. Additionally the chapter provides with basic terminology regarding the system of pre-school education in Kazakhstan and general terms used in the thesis. The chapter also contains description on the structure of the thesis.

1.1 A problem definition

Since Kazakhstan gained its independence and sovereignty in the early 1990's, the demographic pathway with regards to population development as a whole and increase of fertility rates in particular stands the amongst the most topical issues on the national agenda. One of the "wise" platforms to solve these issues is the forecast of pre-school education as a component of "an accurate guessing of what the needs of "children seats" will be in the future". On the one hand, the relationship between pre-school education and fertility rates is not so obvious but when digging deeper a sustainable connection between expectations and possibilities which allow people to better organize and maintain their reproductive "potential" can be found. Just as in physics the heavier an agent, the stronger its gravitational force; there are some places in Kazakhstan that have higher gravity in the context of demographic processes.

Thus, we believe that the forecast of pre-school education which has greater subtleties and complexities (due to many factors which will be discussed later) than seems from first glance would be reliable and accurate if one starts looking upon Astana, which is a powerhouse of Kazakhstan today, as the example.

As mentioned earlier; gaining independence due to the collapse of the Soviet Union caused in turn optimization of pre-school organizations' network in pre-school education. More than 80 % of pre-school institutions were closed at that period (Ungarova 2007). The transition to the market relations significantly changed the possibility of financing these institutions and many enterprises refused to support them because of the intensified budget limitations and growing orientation towards profitability. As a result, today the growth of private pre-school institutions is too small to meet demands and it is, first of all, connected with the low efficiency and difficult process of juridical registration of pre-school organizations and, particularly, with the problems of getting license for their activity.

The low coverage of children by pre-school education (due to insufficient pre-school education institutions) initially lays the foundation of inequality elements and contradicts with the basic principles of the State education policy aimed at accessibility of education for the citizens of the country. As a consequence of insufficient governmental financing, the cost of child maintenance increased and became the reason of unavailability of kindergarten service for separate groups of people.

The development of population dynamics in Astana is of particular interest. In 1997 Astana became the capital of the Republic of Kazakhstan. Since that date the city has been going through an "urban boom". A constant flow of population into Astana leads to a high pace of the city population's growth. So, from 1989 to 2007 the population size of Astana increased 2.2 times (from 276,003 people to 602,684) (Department of the statistics of Astana city 2008).

The capital status credits Astana with additional 'gravity force' for internal migrants and for labor migrants from other countries as well, including foreign investors, businessmen of different levels and tourists. The concentration of a large quantity of young population (15–29) in the city favors the increase of its size, as well as increase of crude birthrate. It should be noted that since 2005 Astana became the second city of Kazakhstan by the population size. Astana ranked the fifth place in 1999. At the beginning of 2003, the population of Astana exceeded 500 thousand people, though the draft of the general plan of the capital city construction read that the city would reach the half million level only in 2010 and all government projects were connected with this population size forecast (Gali 2006).

Whereas during the early years of capital transfer (1997–2000) rural communities were brought to the urban agglomeration, there is no significant growth of rural people expected in the near future at the expense of new village accession. Nowadays there is no the settlements closely located around Astana, nevertheless, in comparison with 1997 there is an increase of 2.7 times in urban area which was achieved by means of establishing new and unpopulated agricultural areas.

The dynamics of birth rate is retraced in the region; in this way, if the crude birth rate in Astana in 2002 was 11.2, then in 2003 it increased to 12.7 and in 2004 it reached the level of 15.4 accordingly. As for 2005 it rated 16.7, and 17.8 births per 100 women in 2006. For instance, if there were 5,585 children born in Astana in 2002, then in 2006 this number almost doubled up to 10,026 children (Zabirova 2008). This statistical information specifies the presence of women which is typical for a countryside but not for an urban areas and it is defined by the high pace of countryside-urban migration in the Republic.

The fact of a "delayed" or so-called "postponed" childbearing due to the system crisis during the nineties, where the whole population of the Republic had been in stagnation, should not be left out. In other words, the reasons for the present high coefficient of birthrate are those children that were not born during the transitional period in Kazakhstan.

Another definition of the given phenomenon is the appearance and stabilization of the middle class in urban areas. Socio-economic opportunities of this social stratum as well as social and cultural values in this group are highlighted here. However, the most important here is the transition of the women who were born in the 80s into the childbearing age. They prevail in the adult population pyramid of Astana representing the female majority. Thus, in the statistic data given today, positive dynamics of growth of childbearing population (at the expense of migration) and the increase of birthrate (at the expense of accepted programs for family support), that in turn increases the quantity of potential consumers of pre-school institutions services, can be distinguished.

The system of pre-school education is unable to satisfy growing demands and increase the in-take of pre-school institutions – kindergartens, which means the decrease of the relative possibilities of pre-school education system. As a response to the annually growing demands in pre-school the government started a program called the “Balapan” (Ministry of education and science of the RK 2009). This is the largest budget-sponsored program in the current Kazakh educational sphere. The program is created to implement the Message of the President of the Republic of Kazakhstan "A new decade - a new economic boom - new opportunities of Kazakhstan" (Poslanie Prezidenta Respubliki Kazahstan 2010) and in accordance with the Strategic Plan of Development of the Republic of Kazakhstan up to 2020, approved by the Decree of the President of the Republic of Kazakhstan as of February 1, 2010 № 922 (Strategicheskii plan razvitiya Respubliki Kazahstan do 2020 goda 2010). For its implementation from 2010 – to 2014 is planned to be allocated 216,3 billion KZT or 1481,5 million US dollars (Sostoyanie doshkol’nogo vospitaniya i obucheniya Respubliki Kazahstan v 2010 godu 2011).

The network of pre-school institutions extends due to the return of kindergartens’ buildings previously given to other departments, as well as privatized and used for other purposes. The procedure for the establishment of private kindergartens and mini-centers has been simplified. As a result, the coverage of pre-school organizations (POs) significantly increased. The network of such institutions has increased by 230 kindergartens and 979 mini-centers. A working group is following all the details of the "Balapan” program implementation (Tuimebaev 2010). If the positive development can be seen in this sphere, why should one forecast the needs in pre-school education today? It is a reasonable question for accountants and finance clerks but, with no doubt, it has the same importance for administrative staff, management and demographers.

Nowadays the need for pre-school education is obvious but the following question is more important – what would happen within next 10-20 years? Will the need grow with subsequent growth of the offer of pre-school education system or will it begin to decline with the passage of time? These considerations are key to making a forecast.

In 5–6 years from the publishing of this thesis, women born in the 90s will be at childbearing age. It is known that there were twice less children born in the 90s than in the 80s. Accordingly, it is logical to expect the decrease of women childbearing (those born in the 90s) and this, in turn, would mean that they would not cover the high pace in absolute terms which exists today. The main conclusion as the consequence is the expectation of a dramatic reduction of the number of pre-school children. Therefore, the expensive program accepted by the government is oriented to the future. So, the reasonable question arises – are the investments made in the right direction? A grand total of 1481,5 million US dollars looks serious and responsible and all this can be considered as CAPEX (Capital expenditures) in the construction of pre-school organizations (kindergartens) field. Construction of kindergartens is a long-term prospect; facilities are not constructed for a couple of decades of use; they are expected to bear at least 60-70 years under the existing conditions in the country. This means that such huge financial investments must be thoroughly analyzed and all possible risks should be elaborated so that in future these facilities would work to full capacity (covering existing demand) or constructed in the way that implies modernization of the other facilities of social maintenance (secondary schools, retirement homes).

Concern as to whether these investments become a basis for future development is rooted in the assumption that it is necessary for the modernization of the country as a whole. This assertion remains a "hot topic" well disputed in political and theoretical spheres as well as in wider society.

This Master thesis is focused on the analysis of current and projection of upcoming trends in Astana pre-school supply and demand in order to contribute information upon which to base wider discussion - thus it is necessary to conduct a forecast of future demographic changes in Astana. The aim, objectives and structure of the Master thesis will be presented in the following part.

1.2 Research aim and objectives

This thesis aimed at investigation into future population development, particularly future number of children on the base of forecasted future pre-school education needs. The aim of this thesis is broad and narrow at the same time. In the narrow sense, the research goal is to provide analysis of the future pre-school needs in Astana until 2030 using the forecast for interested audience, and at the same time the broader goal is to present the picture of how the trends are developing and how they will be affected in the future. Implementation of such "two-sided" goal involves the following objectives:

- Glimpse upon the "general picture" of pre-school education needs in Astana on the base of existing available data and literature.
- Forecast of projection model parameters.
- Compare forecasted pre-school education needs with forecast of real pre-school education supply.
- Present main results and provide recommendations for the further activities.

1.3 Structure of the thesis

This Master thesis consists of 9 chapters including introductory part and conclusion. In the first chapter the problem definition, research aim, objectives and related research questions of the topic are introduced. Basic description to the terminology dealing with theoretical part is given. The second chapter is focused on literature review, available data and their quality. As this is a highly-specific topic in population forecast, an attempt to represent relevant literature sources and authors was made. There are dozens of sources tagging themselves as "experts" in pre-school needs today in Kazakhstan, however, the accuracy of predictions are difficult to ascertain except by time and outcome, the most reasonable approach is to base cautious confidence on source which have been historically borne-out. Materials were carefully categorized by source in order to find "rich veins" of materials. The third chapter is the conceptual framework of study. It starts with a high-level description of the terminology, main theories and research questions and hypotheses connected with the theoretical component. The fourth chapter is divided into two sub-parts; the first devoted to the introduction of the methodology, definitions and practical needs/use of population forecasts, the main focus given to the process of population forecasting and its stages. The second part presents various forecast scenarios and types. The chapter five is covering pre-school education system of Kazakhstan, making comparisons between national and local to Astana levels. The core of the work is represented by the following two chapters. Chapter six is one of the key chapters of

Master thesis; the main focus is on how restructuring of administrative-territorial division influenced the internal changes of population development. Population development is analyzed by components: fertility, mortality and migration, and by their principal results: total population size, and sex and age structure. Forecast results are presented in the chapter 7. Perspectives of pre-school capacities and their use, distribution, basic trends in their use, assumed pre-school loads requirement, current loads and future needs will be considered in the eight chapters. In the conclusion of the thesis the main findings are recapitulated and discussed. Bibliography (reference) completes the thesis.

1.4 Basic terminology

Early childhood care and education - In this thesis, the term 'early childhood care and education' is used to refer to the discipline that concerns the care, development and learning of young children of ages 0 to 8 years.

Early childhood services - In this thesis, the term 'early childhood services' refers to all types of formal, non-formal and informal early childhood care and/or education services catered for children from 0 to 8 years old and/or their parents.

Kazakh tenge – 'Kazakh tenge', 'Tenge', or 'KZT', is the national currency of Kazakhstan.

Mini Pre-school Centre – 'Mini Pre-school Centre' is a type of pre-school service set up in the premises of general secondary schools, Kindergartens, or teacher's home. It is a flexible and less costly service compared to traditional POs (see below), serving children ages 3 to 5 or 6 for shorter hours (e.g. 2 hours) in a mixed-age setting.

Oblast - The term is translated as "region". Kazakhstan consists of 14 'Oblasts' and two Cities (i.e. Astana and Almaty Cities). In this thesis, the names of Oblasts are given as they are called in Kazakhstan. The following is a complete list of Oblasts, expressed in English in brackets: Akmolinskaya (Almola Oblast), Aktyubinskaya (Aktobe Oblast), Almatinskaya (Almaty Oblast), Atyrauskaya (Atyrau Oblast), East Kazakh (East Kazakhstan Oblast), Zhambylskaya (Zhambyl Oblast), West Kazakh (West Kazakhstan Oblast), Karagandinskaya (Karaganda Oblast), Kyzylordinskaya (Kzyl Orda Oblast), Kostanaiskaya (Kostanai Oblast), Mangystauskaya (Mangystau Oblast), Pavlodarskaya (Pavlodar Oblast), North Kazakh (North Kazakhstan Oblast), South Kazakh (South Kazakhstan Oblast).

Pre-primary Class – 'Pre-primary Classes' (PPE Classes) are free of charge and provide 32-week pre-primary education to children of age 5 to 6 who have not benefited from any form of early childhood service before. They are set up in general secondary schools.

Pre-primary Group – 'Pre-primary Groups' (PPE Groups) are another form of free preprimary education set up in Kindergartens. They are attended by 5 to 6 year-olds as part of their continuing participation in the Kindergartens. PPE Groups are senior classes of Kindergartens, offering pre-primary education.

Pre-school education - The term 'pre-school education' is used in Kazakhstan to refer to the first stage of education for children ages 1 to 6 or 7 years. It is also called pre-school education and training. Services providing pre-school education are attentive to children's learning as well as physical and psychological health and protection.

Pre-school Organization – 'Pre-school Organization' (PO) is a generic term used in Kazakhstan to refer to early childhood care and education services catered to children of age 1 to 6 or 7. POs include Nurseries, Kindergartens, Kindergarten-School Complexes, Nursery-Kindergartens, Mini Pre-school Centers and PPE Class (see Table 1 in page 35).

Rayon - The term is translated as "district.

Chapter 2

Literature and data

The present chapter consists of two subchapters. The first subchapter is devoted to the discussion of the literature which mainly deals with legislation in the sphere of pre-school education in Kazakhstan. The second part of the chapter discusses the availability and quality of data that was the base for calculations.

2.1 Overview of literature

Most of the considered source literature may be described as 'of governmental nature', meaning the articles were produced for governmental administrative purposes, for example the outputs of Ministries of education and science and regional departments of education and statistics etc.

As mentioned earlier, present thesis is the solely project where the author tries to forecast the needs of pre-school institutions and to correlate them with the tendencies in fertility rates. The importance of such correlation was noticed by Kaldybayeva (2010) in "Social concerns of pre-school needs in Kazakhstan" where she states that since the 1980s, childbearing occurred more often in the places with well-structured system of health care and educational attainment including pre-school institutions. Thus, in 1991 there were 8,881 pre-school institutions with more than 1,07 mln. pre-school children of 2,3 mln. in total, which meets nearly 46.5 % of the requirement. Years after were traced with regression in the development whereas economy of the country weakened and the number of pre-school institutions dropped almost six times in 1999 (Kaldybayeva 2000). This is also proven by the research article "Education reforms in countries in transition" powered by the Asian Development Bank, which describes how the crisis of the 1990s disintegrated the social safety-net during the transition period. "The state narrowed the range of recipients of lump-sum and social support allowances for children from the end of 1992. In 1999, 13.7 % of families with children between 0 and 17 years of age received child benefit, compared with 84.2 % in 1991. Allowances for single mothers and some benefits for pensioners were abolished in 1997 and 1998" (Asian Development Bank 2004:22).

Another source is "The Status of Pre-school Education in the Republic of Kazakhstan" (UNESCO Cluster Office in Almaty 2004) which is the summary of findings with complete data on pre-school institutions statistics till 2003. This summary presents corresponding development information on the transitional period, however, the second decade brought positive dynamics to the increasing number of pre-school institutions. It is still uncertain why we have to speak about retrospective development of such needs? Popular saying that best meets our attempt to reply is: "To know the future, recognize your past".

The same situation with finding an answer for the question: who is the group of interest for these needs? For this purpose a short explanation on basic demographic structure on typological groups selected will be given in order to better identify mentioned needs.

These processes consist of demographic events that occur to individuals and change their demographic status. Under the demographic structure of the population one should understand the distribution of individuals according to some typological groups selected for various reasons. Quite often the demographic terms "structure'' and "composition" are used interchangeably to describe the population on the basis of sex, marital status, occupation, age, etc. (Sidorov 2005).

As it was mentioned before, the regression period, which was observed in Kazakhstan in the mid of the 90s, was undermined by the fast development in Astana city in the early 2000's with the adoption of new programs aiming to restrict and reinforce pre-school institutions for future needs.

Presented above literature overview clearly proves that there is a lack of literature in the context of pre-school needs in Astana city. This is due to:

- Lack of research of pre-school forecast needs
- Specific field of interest
- Weak methodological basis of forecasting school in Kazakhstan in general

It is also to some extent uncertain how the needs in pre-schools education will be concisely viewed in future. Thus, population forecast based methodology needs to be highlighted, namely population forecast - evidence-based information about future changes in population, reproductive parameters and population structure at the local (regional), national and global levels. Regional population forecast is the most important component of applied social geography and is of key importance for the economy, state and territorial administration (Iontsev, Sagradova 2003). These concepts will be further elaborated in the next chapter.

2.2. Data quality and availability

Demographic information used in the presented thesis was taken from official sources, provided by the Agency of the Republic of Kazakhstan on Statistics. The data on pre-school education are taken from the sources of the Agency on Statistics and the Ministry of Education and Science of the Republic of Kazakhstan, as well as from the local authorities (Department of education and the Akimat of Astana city).

Availability of the data is one of the key-problems of Kazakhstan official statistics. Even though the required data are stored in statistical database, it is "pay-per-view" based. Users often face this problem while collecting the data. This is due to complex and sometimes useless structure of the system itself.

According to the Law of the Republic of Kazakhstan "On State Statistics" the Agency of Kazakhstan on Statistics is the authorized body, forming and implementing public policy in the field of statistics, developing and implementing programs to improve the statistics in the Republic of Kazakhstan. According to the Decree of the President of the Republic of Kazakhstan from June 30, 1998: "On further measures to optimize the government", the Agency of the Republic of Kazakhstan on Statistics is a central executive body that is not part of the Government. The Agency of the Republic of Kazakhstan on Statistics is independent in matters of methodology and methods of statistical records, administers its

territorial divisions, and coordinates the activities of subordinate organizations. Public policy of the Republic of Kazakhstan in the field of statistics is aimed at the creation, operation and improvement of a unified statistical information system based on scientific methodology and international standards and is built on the principles of methodological unity and centralization, i.e. coordination of the authorized body of statistical work of government bodies. In order to implement a uniform policy and methodological unity the authorized agency specifies requirements for the program of statistical surveys for national and departmental statistical surveys and approves them. State statistical observations include the state statistical reporting and specially organized statistical observations. The statistical work plan after preliminary discussions with interested representatives of science and public organizations approved by the Government of the Republic of Kazakhstan (Agency of the Republic of Kazakhstan on Statistics Head order dated 10 July, 2002 No.71). Programs of state statistical observations developed to identify key indicators of socio-economic, demographic and environmental spheres of the republic and its regions. Rules are developed in accordance with the Law of the Republic of Kazakhstan "On State Statistics" and taken in accordance with other regulations.

State statistical observations are comprised of national statistical surveys, organized by the authorized body in accordance with the plan of statistical work, and departmental statistical surveys conducted by other government bodies and major statistical activities. Information on pre-school education in Kazakhstan has also been taken from the web-site http://www.predschool.kz of the National Center for "Pre-school Education", created in partnership with the UNESCO Representation in the Central Asian region.

The National Center for "Pre-school Education" was established in accordance with the decision of the Government of the Republic of Kazakhstan on 29 April 2005 No. 405 "On some issues the Ministry of Education and Science of the Republic of Kazakhstan". According to the State Program of development of education in the Republic of Kazakhstan for 2005-2010, the Centre will develop innovative projects to develop different models of pre-school organizations, examine teaching aids, toys, and play equipment to conduct research on the status and development of pre-school education in Kazakhstan. The Centre will also render methodical support in the implementation of state standards of pre-school education which includes a variety of trainings, preparation and issue recommendations, experimental design for teaching children and parents. In addition, the Center will develop educational standards for 800 pre-school mini-centers, the opening scheduled in 2008-2010. In fact, the Centre should become a cluster for the formation of innovative processes and strategy innovation breakthrough in the field of early childhood education (Respublikanski centr "Doshlkol'noe detstvo" 2005).

Information on the coverage of pre-school children in pre-school education and training, pre-school organizations is provided by the Departments of education of the Akimat. In addition, the study of social organizations and UNESCO reports were used in this Thesis. Reliability and accessibility data can be judged directly as satisfactory even though some of the results based on national data are impugned due to rendered censuses of 1999 and 2009.

Chapter 3

Conceptual framework

This chapter addresses the theoretical framework of diploma thesis and considers the main theories related to the aim of thesis. Particularly, such theories as demographic transition and women's empowerment theory in sociology were applied for the analysis of population development and its future trends. Additionally, the chapter consists of research questions that aimed to achieve the aim of the thesis and related hypotheses.

3.1 Basic theories related to the theme of study

The thesis aimed at investigation into future population development, its age and sex structure affected by the mortality and fertility changes. The explanation of future population forecasting results is always based on set of demographic theories.

One of the most crucial demographic theories is the theory of demographic transition. The concept of demographic transition is a generalization of the sequence of events observed over the past two centuries in the more developed countries (Knodel and van de Walle 1979). While different societies experienced the transition in different ways, in broad outline these societies have gradually shifted from small, slowly growing populations with high mortality and high fertility to large, slowly growing populations with low mortality and low fertility (Knodel and van de Walle 1979). According to demographers during the transition itself, population growth accelerates because the decline in death rates precedes the decline in birth rates. Knodel and Walle (1979) argued that the empirical evidence from all parts of the world overwhelmingly confirms the relevance of the concept of demographic transition to less developed countries. The transition is well advanced in all regions except sub-Saharan Africa, and even here the beginnings of a fertility decline are becoming apparent. In several countries such as China, Taiwan, and Korea, fertility is already at sub-replacement levels. In many other countries in Southeast Asia and Latin America, fertility has fallen to levels seen just a few decades ago in most developed countries. The biggest difference between the transition in most developed countries and less developed countries has been the speed of the mortality decline. In Europe, North America, and Japan, mortality fell slowly for two centuries as food supply stabilized, housing and sanitation improved, and progress in medicine was made. In contrast, mortality in less developed countries fell over the course of just a few decades after

World War II as Western medical and public health technology and practice spread to these regions. One result is that less developed countries' populations are growing much faster than did the populations of most developed countries at a comparable stage of their own transition (Knodel and van de Walle 1979).

The earliest attempts to explain the demographic transition cited industrialization and urbanization as the ultimate driving force (Thompson 1929, Davis 1945, Notestein 1945). According to this "classical" transition theory, economic modernization leads improvements in health and nutrition that decrease mortality. Modernization also drives changes in economic and social conditions that make children costly to raise and reduce the benefits of large families. Eventually, this leads to lower fertility; fertility decline lags mortality decline because cultural norms regarding reproduction are difficult to change while improvements in mortality meet little resistance.

The idea that reduced demand for children drives fertility decline was given in the 1960s with the development of a theory based on changes in determinants of parents' demand for children (Becker 1960, Becker and Lewis 1973, Becker and Barro 1988), which provided a micro-economic model describing choices parents are assumed to make between numbers of children and consumption of material goods at the household level. The model assumes that fertility falls because as societies develop, parents' preferences shift toward higher "quality" children requiring greater investments in education and health, while increases in women's labor force participation and wages increase the opportunity costs of raising children. In addition, some of the economic benefits parents may derive from children, such as household labor, income, and old age security, decline as a result of the development process.

Thus, as the net cost of children rises, demand falls. This framework has been extended and made more flexible by taking into account sociological aspects. Easterlin (1975) added supply factors (environmental and cultural effects on fertility in the absence of regulation) and costs (including the psychic, social, and monetary costs of fertility regulation) in order to focus on demand.

Other explanations have given much more weight to sociological factors over economic ones. For example, Ryder (1983) argued that reproductive decisions are not based strictly on a rational weighting of the consequences of childbearing, but are strongly influenced by cultural and normative contexts. Caldwell (1982) elaborated a theory that identified a shift away from extended family structures toward the child-centered nuclear family as the cause of a reversal in the flow of wealth (money, goods, services, and guarantees against risk) from children to parents typical in pre-transition societies to a flow benefiting children. As children displace parents as beneficiaries of the family, fertility falls. The shift in family structure could be triggered by economic changes, but also by the spread of new ideas.

Other researchers have emphasized the role of cultural over socio-economic factors. Based on analyses of the fertility transition in Western Europe, Lesthaeghe (1983) argued that differences in fertility across societies were largely due to differences in religious beliefs and the degree of secularism, materialism and individuation.

Cleland and Wilson (1987) concluded that ideational change in general, and the spread of new ideas about the feasibility and acceptability of birth control in particular, was a key driver in fertility decline and likely more important than changes in economic conditions. Bongaarts and Watkins (1996) demonstrated that diffusion of ideas and information about limiting fertility is important. They showed that fertility transitions typically start in more developed countries where economic development levels

are relatively high, and then spread to other countries in the region, often before they have achieved the same level of development.

Demographic transition theory has been and continues to be a central focus of demography (van de Kaa 1996). While there are many ideas, each offering important insights, no single, simple theory explains the multi-faceted historical experience with transitions (Robinson 1997, Mason 1997). It is likely more accurate to think of transitions as being driven by combinations of factors rather than single causes, but determining the precise mix of factors likely to be at work in particular circumstances remains an elusive goal (Mason 1997, Hirschman 1994). Although the fact that demographic transition has occurred under so many different conditions and has likely been driven by multiple causes complicates study of the subject, in one sense it can be considered strength where projections are concerned. It implies that transition is probably inevitable, so that the task of projecting future fertility in high fertility countries is to anticipate not so much whether countries will experience this phenomena, but when, how fast, and to what eventual end state.

The other theory related to the fertility changes influencing on future population development that could be employed in this study is women's emancipation (or women empowerment) theory in sociology. Women's status, empowerment, and gender equality have long captured the imagination of demographers interested in explaining whether and why fertility does or does not decline. Demographic research demonstrates that women's empowerment, variously defined, influences a range of demographic processes and reproductive outcomes (MacQuarrie 2008). More empowered women tend to have increased use of contraception, smaller families and larger spacing between children (Pande et al. 2008), although some studies have shown weak or no effects (Morgan, Stash et al. 2002; Mumtaz and Salway 2005). It also affects women's ability to implement intentions to attempt abortion (MacQuarrie 2008) and weakens the strength of son preference and results in longer time to conception (MacQuarrie 2008).

Since the mid-1980s, the term empowerment has become popular in the social science, especially with reference to women. This study attempts to analyze the concept of women's empowerment as a key factor in population changes appeared in Kazakhstan recently. This chapter sets out from the understanding that empowerment is a process by which those who have been denied power received the ability to make strategic life choices. For women, these could be the capacity to choose a marriage partner, a livelihood, or whether or not to have children. For this power to come about, three interrelated dimensions are needed: access to and control of resources; agency (the ability to use these resources to bring about new opportunities) and achievements (the attainment of new social outcomes). Empowerment, therefore, is both a process and an end result. Women's empowerment should be considered as an ability of women to make self-determined choices (Kabeer 1999). The change in the values and beliefs of the individual woman, in the goals that she sets herself, in the life-style she chooses and in the understanding of her existential problems influences her life in general and the number of her children in particular (Kabeer 1999).

In their extensive review of research on women's empowerment, Malhotra et al. (2002) argue that international development research is approaching a consensus about the conceptualization of empowerment. As a starting point for their discussion, Malhotra used a definition of empowerment suggested by Kabeer (1994). Kabeer's simple and illustrative definition of empowerment is "the

expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them" (op.cit.).

Consequently, women's empowerment comes to bear in multiple spheres of life (familial/household, economic, legal, political) (Malhotra and Schuler 2005; Kishor 2000; Malhotra and Mather 1997). The empowerment theory is strongly correlated with the reduction of woman's fertility level (number of children in a household). However, in the majority of literature, and implicit in many models, the household is asserted to be a critical sphere in which empowerment exerts influence on demographic processes and outcomes (Mason 1986).

The theory of population aging is also lying within theoretical framework of study. The theory of population aging is applied as an explanation of mortality trends, mostly longevity. The theory based on the simple phenomena: as fertility rates decline, the proportion of older persons is expected to increase (Gavrilov and Gavrilova 2001). According to Gavrilov and Gavrilova (2001), the search for a general biological theory to explain such questions on ageing and longevity has been made mainly in terms of evolutionary theory of aging. They explain the population aging as a product of natural selection. For example, a mutant gene that kills young children will be strongly selected against (will not be passed to the next generation) while a lethal mutation with effects confined to people over the age of 80 will experience no selection because people with this mutation will have already passed it to their offspring by that age (Gavrilov and Gavrilova 2001).

According to Gavrilov and Gavrilova (2001) the disposable soma theory explains the aging theory, which postulated a special class of gene mutations with the following antagonistic pleiotropic effects: these hypothetical mutations save energy for reproduction (positive effect) by partially disabling molecular proofreading and other accuracy promoting devices in somatic cells (negative effect). The authors argued that it may be selectively advantageous for higher organisms to adopt an energy saving strategy of reduced accuracy in somatic cells to accelerate development and reproduction, but the consequence will be eventual deterioration and death (Gavrilov and Gavrilova 2001).

Thus this chapter set out to discuss the main demographic theories related to the theme of thesis. Basically, all of them applied in order to explain the main population forecasting results during checking of hypotheses and research questions.

3.2 Research questions and related hypothesis

This study addresses the forecast of future pre-school needs in Astana until 2030 using the forecast of future mortality and fertility trends with taking into account migration processes. The study attempts to answer several main questions related to the aim of thesis. Recently the new government program "Balapan" and subsidies aimed at building new child care facilities in Astana city were implemented. However, these programs do not take into account the future population changes, the impact of mortality, fertility and migration processes on the population size and structure in general and the size of child population in particular. Hence, the practical value of this thesis is closely related to the measuring of effectiveness of implemented expensive programs that are aimed at increase in number of pre-school education institutions. The rejection of detailed analysis of future population trends, mostly changes in the

number of child population, on the first stages of program management leads to the disappointments over high costs and low effectiveness of these programs.

Consequently, the first and main question that must be answered in this thesis is related to the investigation of future pre-school needs: do the pre-school needs will be on the same level in the future as nowadays?

The dependency of number, age and sex structure of population on several demographic factors affecting on characters of changes in the time dimension is obvious. The next question is aimed at analysis of factors, which are influential on the changes of future population size and structure. The other question to be answered in this thesis is how the fertility level will change during the projection period? Does the fertility intensities in Astana will stay on the same level or it will decrease dramatically?

Nowadays in the demographic literature (Basu 2001, Bongaarts 2002), the idea of global fertility decline caused by massive changes of fertility behavior among women at reproductive age is discussed. This intuition has been strengthened by the empirical finding in recent years. This finding is that the process of fertility decline is much better explained by theories of diffusion (which are essentially theories of copycat behavior) than by theories built around structural factors that affect the costs and benefits of childbearing (Basu 2001). The great range of conditions under which fertility has begun to fall all over the developing world, and the most potent correlates of such decline – education, exposure to the mass media, exposure to the ideologies (rather than the material trappings) of modernization – strongly suggests that the urge to control fertility and to have fewer children than one's parents comes largely from wanting to do what others do (Basu 2001).

Accordingly, it is obvious that nowadays the whole world has embarked on a process of fertility decline, however, it does not follow from this that the whole world is headed to exactly the same eventual fertility levels or that all societies will reach eventual low fertility by the same means (Basu 2001). This idea reflects to the next question: will the fertility decline in Astana the same as it was observed in other developed and developing countries? Will this decline reach the replacement level as it was observed in developed countries?

These questions strongly associated with the theory of global fertility convergence, which means that all countries eventually will experience the same level of fertility. The idea of global fertility convergence discussed in the wide range of demographic literature (Bulatao et all 2001, Wilson 2000, Strulik and Vollmer 2010). However, other demographers (Basu 2001) argued that there is sufficient variation even within the countries currently in "post-transition" stage. In country after country in the industrialized world, fertility declines have plummeted well below the replacement level and thrown much planning based on past population projections out of gear.

Population projectors of the past have by now received plenty of criticism for treating replacement level fertility as some kind of sacrosanct end point in the fertility transition. By now, it is well accepted that the magical total fertility rate (TFR) of around 2.1 is little more than a convenient analytical device (Dorius 2008). With this recognition, population projections of recent times have been boldly assuming eventual fertility levels that would laugh at the forecasters of population doom of the last century. Having discarded the logic of replacement level fertility as a plausible end point in the fertility transition for the developed world, it naturally followed that there was nothing sacrosanct about this end point for the developing world either. The skepticism about global convergence is supported by the still significant

differences in fertility in the developed world. Even if all these countries now have below replacement fertility levels, they nevertheless exhibit a range of sub-replacement fertility levels (Bongaarts, 2001).

Skepticism about the prospects of global convergence is also supported by the wide range of measures on the proximate determinants of fertility in the developed world. Variations in marriage, contraceptive use, abortion are pervasive enough to suggest, even if faintly, that the eventual similarity of fertility levels might be something of a coincidence. Basu (2001) came to the conclusion that the plausible ways in which future fertility in South Asia might not drop to levels as low as many parts of the developed world experienced. This caused by the differences observed between developed and developing countries: all groups do not required to marry at exactly the same age, use the same kind of contraception, and want and bear exactly the same number of children.

Accordingly the question related to the processes that affecting on the future population structure considers recent fertility trends. The thesis aimed at giving an answer to the question: how the fertility trends, based on the current situation will be changed at micro and macro levels. According to aforementioned demographic publications the fertility level is decreasing all over the world. This trend caused by health care facilities improvement, women empowerment, changing attitudes towards family, children, and conjugal relationships (Bongaarts 2001, Basu 2001). The first hypothesis formulated to be tested in this thesis related to the assumption that in the nearest future the fertility level in Astana city as well as in Kazakhstan will be reduced. The reduction of fertility rates in Astana will be more dramatic compared to the overall national level.

Among demographers there is powerful opinion on the mortality changes all over the world (Murphy and Topel 2005). Majority of the empirical evidence on this question measures the cross-country relationship between health improvements and mortality decline. McKeown, for example, examined a wide range of factors in his efforts to account for the decline of mortality, he attached the greatest importance to the improvement of nutrition, changes in the virulence of infectious organisms, improvements in personal and domestic hygiene, medical intervention and, perhaps most importantly, the beneficial effects of the sanitary revolution.

There is another question on how the effect of additional conditions and factors related to the improvements in nutrition, medical care and facilities influenced on the mortality decline in Astana? Do these factors lead to the increase of longevity and decrease of child mortality? How the mortality intensities will change the number and structure of future population? In accordance with this argument, we explore the hypothesis that longevity improvements started during the last decades caused the changes in number and structure of population in Astana. Exogenous improvements in adult mortality during the period of independency of the Republic of Kazakhstan will increase the longevity and decrease the mortality among men and women. As a consequence, the process of aging of population will dramatically change the size and structure of future population.

An analysis of future pre-school education needs is based on comparative analysis of trends in regional level (Astana city) with sufficient level of homogeneity and at national level (Republic of Kazakhstan) characterized by its heterogeneity. Accordingly the hypothesis highlighting the assumption that Astana city experienced different mortality and fertility trends, compared to the trends at national level (on the whole territory of the Republic of Kazakhstan), was formulated.

Migration intensities play crucial role in the future population developments. As such, the hypothesis that the in-migration flows to Astana from the other regions of the Republic of Kazakhstan will dramatically change the future population structure compared to the current population of the capital city and consequently will increase the future population size in Astana must be highlighted.

Finally, the major hypothesis in this study is based on the aforementioned assumptions and considering the following statement: the future pre-school education needs will decrease as a consequence of gradually changes in fertility and mortality trends.

Chapter 4

4. Methodological framework

This chapter attempts to describe some aspects of the current state of the art in the field of population forecasting under the aegis of general population methodology and its applicability in the case of Astana pre-school needs.

4.1 General forecasting methodology

Before discussing the "conceptual basis" of the master thesis a population forecast definition will be given. Most of the users often interchange "forecast" and "projections" (O'Neill et al., 2001), due to lack of methodological experience; such misunderstanding must be eliminated. O'Neill et al. (2001) in their work warned us from such incompetency. The distinction between projections and forecasts, therefore are important because of:

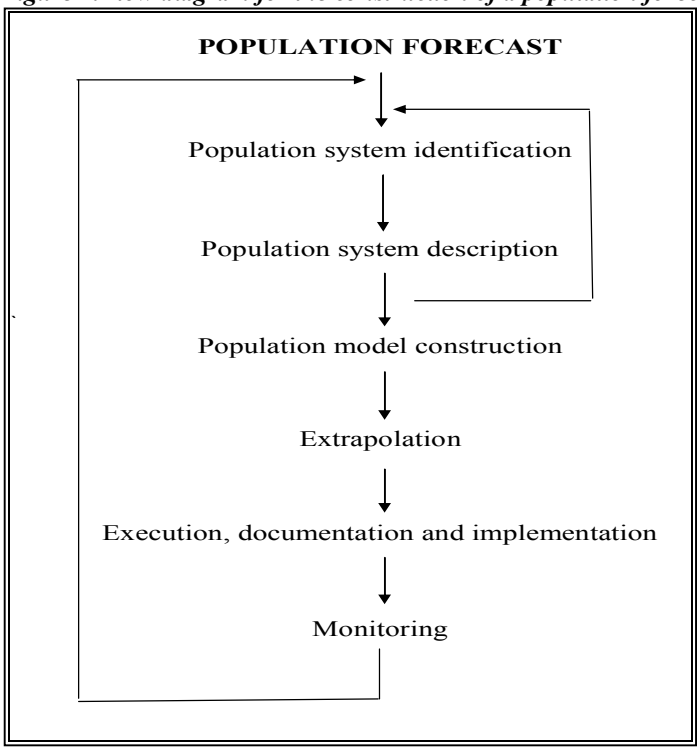
1) Analysts often mix up the terms and use projections instead of forecast.
2) Forecasts are mislabeled as projections.
3) Analysts prepare projections that they know will be accepted as forecasts without evaluating the assumptions implicit in their analytic results.

Thus, projection is the calculation of future conditions that would exist as a result of adopting a set of underlying assumptions. There is the definition of projection formulated by the IUSSP Multilingual Dictionary: "projection is calculation which show the future development of a population when certain assumptions are made about the future course of population change, usually with respect to fertility, mortality and migration" (Multilingual Demographic Dictionary 1982:21).

Forecast is "a projection in which the assumptions are considered to yield a realistic picture of the probable future development of a population" (International Union for the Scientific Study of Population 1958). Consequently, forecasting is a guess of the most likely future (Keilman 1990). From the aforementioned definition it follows that the projection is conditional development of future trends based on development of consequences of the assumptions that are made, while a forecast is particularly unconditional and based on current scientific knowledge.

From a technical standpoint, the demographic outlook appears usually in the form of a so-called projection of the population, i.e. calculating the size and age-sex structure, built on the basis of data on changes in demographic characteristics (population, demographic patterns, fertility, mortality, migration) in the past, as well as the accepted hypotheses regarding their dynamics in the future. Such calculations are usually done in several different ways, setting the boundary of the most probable change of the population. Projections do not constitute a scientific problem, a purely mechanical problem; a routine response is facilitated by the use of modern computer programs. For better understanding a model of (Keilman and Cruijsen 1992) was used which is describes the main stages of population forecast in an easy way.

Figure 1.Flow diagram for the construction of a population forecast



Source: Keilman 1992, p.7

The first stage is the identification of a population system, i.e. define the population categories (system elements) and the relevant demographic events (relations of the system elements). Nonetheless, the number and type of population categories can be restricted by available data, as well as detailed classifications may cause small cell-counts, which may lead to random fluctuations within the projection.

The second stage of producing a population forecast is associated with the description of a population system. At this stage the forecasters estimate historical behavior and categories of the population identified. As long as this behavior is not understood properly, there may be a revision of the identification stage. There are several basic tools which help to implement this procedure as demographic measurement concepts, time series methods, curve-fitting techniques and multivariate models.

The third stage is the model construction, which shows a one-to-one correspondence with the population system identified in the first stage.

The fourth stage is the extrapolation of the model parameter values, which is the most crucial one. After all, proper assumptions about the demographic future are more important for the success of a

forecast than a sophisticated model. Assumption-making process should base on a systematic approach, and this may be facilitated by distinguishing several levels at which these assumptions could be formulated.

The fifth stage is the execution, documentation and implementation. Execution of the calculations, the assumptions and results are recorded on tables, figures and they are published. The implementation of the produced forecasts become easier when the forecaster and the user belong to the same organization and, otherwise, a situation becomes more complicated if a general-purpose forecast is produced without much knowledge of its users or in competition with other forecasts.

The final sixth stage of the production of a forecast is monitoring. Monitoring consists of a comparison between predicted and observed behavior of the population system and an assessment of the deviations and their impact in the years to come.

4.2 Population forecasting methodology

In general, multi-variant projections, like any other, are imperative. Usually forecast is based on three main scenarios such as: Medium variant – the most likely future trajectory based on appropriate assumptions, low variant - is the lower limit of the assumptions and high – taking maximum possible values of future trajectory (Lutz et al 1998). These most common variants outline the dynamics of demographic indicators for a given period.

The condition for the accuracy of prediction is correct, scientifically sound assumptions about the trends in the reproductive and migratory behavior of the population for which data are available through specially organized sociological and demographic studies. Just the nomination and verification of hypotheses about these trends represents an extremely interesting scientific challenge which is also the touchstone, which verified the orientation researchers and their theoretical achievements.

Socio-demographic security of the country is a particularly important task of decision-making under uncertainty, risk region, or municipality, an alternative strategy, a method of moving average, exponential smoothing method. In other words, the development of special software in the early 90s opened a great possibility to operate with statistical packages and to provide an accurate and to some extent certain models of projections.

In the past, the approaches in forecasting the population were mathematical in nature. Application of the mathematical methods suggests that, based on available empirical data on the population selected for a mathematical expression, its future options can be predicted. The use of mathematical methods has several disadvantages. First, they allow predicting only the general population, not the changes in its composition, for example, the distribution by age, sex, and race. Second, if there is a lot of factual data (points, built on their basis), the mathematical expression, as a rule, does not pass through each of them, in particular, and through the latest. This reduces the reliability of the predictions of forecast values. Third, the mathematical approach assumes that social and economic factors that determine the dynamics of the population in the past, remain unchanged in the future as well (Spiegelman 1968).

A variety of mathematical functions in order to make predictions can be applied. Most often, however, linear, exponential and logistic functions are used. One of the easiest ways to predict is based on

the assumption that the average absolute magnitude of the increase (decrease) in population, calculated for the period of time, continues in the future.

In other words, in this case the projection of the linear function is applied:

$$P_t=P_0+_{\Delta}*t$$

where: P_0 and P_t - population, at times 0 and t, respectively, Δ - absolute average annual growth (decline), t-time in years.

In reality, a linear function for the population projections is almost never used because the assumption of constant absolute annual increments may be relatively true only for very short periods of time (no more than 5 years) (Medkov 2008).

Somewhat more realistic is the assumption of a constant annual rate of increase (decrease) in population, especially under the assumption of constant levels of fertility and mortality and permanent migration balance. In this case the prediction of exponential function is used:

$$P_r=P_0*en$$

where: r - the average annual rate of increase (decrease), t - time in years, e - base of natural logarithms.

For short periods (no more than 15 years) using the two functions - linear and exponential - gives similar results. However, if there is a decrease in population, it is preferable to use an exponential function, as it ensures that the population does not become negative.

In addition to linear and exponential functions, other mathematical functions can be used in forecasting. In principle, this can be any function. But it is an empirical question, and there is no general mathematical law of population dynamics (Grazhdannikov 1974). The function is selected, based on the type of empirical curve, and the hypothesis is based on the relationship of the population over time as the independent variable. Changes in population can be considered either as a function of time only, or as a function of time and population. In the first case, it will be the class of hypotheses on the dependence of changes in population size from time to time (Medkov 2008).

If it is assumed that the change in population in an infinitely small interval of time is a function of population, they receive a different class of hypotheses and mathematical relationships, respectively. One is the exponential function with a non-zero permanent member, or an increase (decrease) in population in a geometric progression.

The forecasting techniques, using various mathematical functions, can be used only for short periods of time for which the assumption of constant nature of the relationship between time and population size remains more or less plausible (Medkov 2008). While in periods of rapid economic and social changes, changes are radical within the entire social structure, the application of these methods is less reliable. As it was correctly mentioned by Spiegelman in his work, the weakness of forecasting techniques based on the application of mathematical functions is that the trends derived from past dynamics, in silence shall be extended without change in the future. In this regard it is more reasonable to use demographic projection component method (Spiegelman 1968).

Considering the above-mentioned complications, the method which takes into consideration various parameters of population change should be introduced; this model is called a cohort-component method.

4.2.1 Cohort-component approach and model

The cohort-component model is the method of components that offers greater opportunities for demographic forecast. In contrast to the extrapolation and mathematical analysis, it allows obtaining not only the general population, but also its distribution by sex and age. The method of components was developed by the American demographer P.K. Whelpton (Bogue 1980).

The standard features of the method of population projections (the method of components, or method of advancing age) are based on the use of demographic balance equation:

$$P_1 = P_0 + B - D + M_i + M_o$$

where P_0 and P_1 - population at the beginning and end of period (years) B - the number of births for the period; D - the number of deaths for the period; M_I - migration inflow for the period; M_o - migration outflow for the period. Here B, D, M_I, M_O and called the components of population change for the period (year) (Medkov 2008). The data on the number of individual age-sex groups are moved each year to the next age and the number of zero-age group is determined based on the forecast of the annual number of births, infant mortality and age-specific net migration.

The method of components is "tracking" the movement of individual cohorts over time in accordance with prescribed (forecast) parameters of fertility, mortality and migration. If these parameters are fixed at some initial time t_o, then it remained unchanged throughout the period Δ_t , then this uniquely determines the size and structure of the population at time $t_o + \Delta_t$ (Smirnova 2004).

Beginning at time t_o, the population of each age decreases in accordance with the forecasted age-specific probabilities of death. Of the initial population of each age subtracted number of deaths and the survivors are a year older. Predicted age-specific fertility rates are used to determine the number of births for each year of the forecast period. People are also beginning to feel the risk of death in accordance with the accepted levels. The method also takes into account age-specific components of the intensity of migration (arrival and departure).

In practice, the population forecast is based on the age-specific data for each sex separately (on an age-specific basis). Fertility is expressed in its age-specific ratios. Power is expressed in age-specific mortality probabilities to survive to the next age (as age-specific survival parameters) separately for men and women. Migration is generally measured in terms of expected annual net migration, classified by sex and age. A modern trend is the desire to clarify the migration by providing, where possible, the inflow and outflow.

The procedure is repeated for each year of the forecast period. This also defines the population of each age and sex, total population, total fertility rates, mortality, and factors in common and natural growth. At the same projections can be made for first-year age intervals and for different age (complete age structure, i.e. 1-year interval) or age-groups (5-year-olds or 10-year-olds). Forecasts are usually done separately for male and female population. The total population obtained by simple summation of age structure of female and male populations (Medkov 2008). Moreover, all forecast parameters of fertility, mortality and migration can vary for each year of age or interval of the forecast period.

Calculations are made in terms of the forecasting cycle, each of which is usually equal to 1 year or 5 years. Starting with the census or other source data, a demographer consistently uses data on fertility, mortality and migration during one cycle of forecasting, then summing the results to get an estimate of the population on the date marks the end of the cycle. The population at the end of the cycle, calculated with

the help of this operation, in turn, becomes the starting point for the next cycle. The cycle is repeated prediction to get an estimate of the population for the next date in the future. This is repeated until it reaches the date for which the forecasts are made. A special feature of this procedure is that the forecaster can use for each forecast cycle, the different values of fertility, mortality and migration. As long as each cycle selected sets of values of each component, the computational process is simply a substitution of the values obtained in the equation of the demographic balance. From the above it follows that the validity (validity) and utility (utility) prognosis depends on the accuracy of the initial assessment of the population and the accuracy of forecasting the future parameters of fertility, mortality and migration (Bogue 1993).

Prerequisite for application of the method of components is the preliminary development of forecasts of fertility, mortality and migration. However, if by itself the use of this method is a purely technical problem, the prediction of the dynamics of demographic processes requires a lot of the analytical work, knowledge of laws of change in fertility, mortality, migration, and their relationship to socio-economic factors. It can be said that such a prediction in something akin to the art (Medkov 2008).

Currently, the relevant computer packages are widely used for decision-making. In particular, such packages developed by the UN as DemProj and Spectrum are launched (Medkov 2008), which allows almost instantly to realize the computational procedure of forecasting population size and structure by the method of components. The U.S. Census Bureau has developed a computer program RUP (Arriaga 1994), which implements a method of components and allows both to predict the dynamics of urban and rural populations.

It must be highlighted that a computational procedure is the least complicated and least interesting part of the demographic projections. The meaning of the forecast is not in this kind of calculations, but in forecasting trends in fertility, mortality and migration. In this case, of course, the first step in forecasting should be to evaluate the accuracy and reliability of data on population size and structure of the base year, because if this information is incorrect, every prediction is meaningless (Medkov 2008)

4.2.2 Fertility methods

For fertility - the most complex and interesting in the creative stage to predict fertility by total or age-specific fertility rates. It is at this stage are crucial theoretical concepts of demographic forecasters, understanding of the nature of the changes that occur with fertility, and the forces causing them (Medkov 2008).

Nowadays, various methods are applied to predict the total fertility rate, ranging from a simple extrapolation of trends into the future, to attempt the development and application of mathematical models that take into account the interrelationship of fertility and socio-economic factors determining it.

Last, it would probably be the ideal solution to the problem of forecasting fertility. In this case, the forecasted values of socio-economic factors would serve as the input projection parameters, the output of which would be obtained and the values of the total age-specific fertility rates. Unfortunately, the task of creating such mathematical models has not been solved so far due to its incredible complexity and the need to use the enormous information and computing resources. One possible approach to solving such problems is the application of the method of multiple regressions. The essence of this approach is that based on long-term data on the values of fertility and a number of socio-economic indicators (such as per capita income, the share of female employment, per capita income among women, the marriage rate, the

prevalence of contraceptive use, etc) built a multiple regression equation relating the value of fertility to the levels of these factors (Isserman 1985). Most forecasts of fertility, however, are performed using the more accessible and less costly methods.

The simplest method is the extrapolation of trends in total fertility rate in the future with the help of a mathematical function, for example, the same logistic curve. This feature is often used to predict fertility in developing countries where there is transition from high fertility to low. The grounds for the application of the logistic function in this case are long-term statistical time series fertility characterizing its decline in those countries where it has already reached low levels. This decline from a high to low is best described by the logistic curve (Medkov 2008). Having determined the trend of total fertility rate, it can be said that it is renewed in the future. Then, using standard tables of fertility, its age-specific coefficients corresponding to forecast total fertility are calculated, thereby setting the input parameters for prediction of population size and structure by using the components method (advancing age). The method of extrapolation is typically used to predict fertility in countries with high levels of age-specific fertility rates.

Another method for forecasting age-specific fertility rates is a reference method, implemented mainly by comparison with the more “advanced” population. From a technical point of view, this method for predicting fertility is similar to that predicting mortality. The only thing that needs to be mentioned is that comparing the projected population is not so much with the levels of age-specific or total fertility rate “advanced” people, but rather with the prevalence and characteristics of the practice of contraception and abortion.

In modern conditions special statistical surveys and opinion polls whose purpose is to identify reproductive intentions and orientation of the population play an increasingly important role in predicting fertility data (Medkov 2008).

It should be mentioned that the developments of the past are now almost impossible to be considered without a thorough study of the demographic specifics of people behavior in the region (survey lines, dispositions and plant reproductive health, marriage, self-preservation, sexuality, contraception, nutritional, lactation behavior). Socio-psychological approaches increasingly impact the results of demographic studies in specific regions of Kazakhstan, whereas the traditional methods of population statistics recede into the background before the onslaught of the micro sociology family.

At the present time various methods are applied to predict the total fertility rate, ranging from a simple extrapolation of trends into the future, to the development and application of mathematical models that take into account the interrelationship of fertility and socio-economic factors determining it (Gorelyi and Kovalenko 2009).

4.2.3 Mortality methods

As for mortality, the methodology of the mortality projection is the most developed. The main methodological techniques predicting mortality may occur in two ways.The first one assumes that the first predicted total mortality, measured in terms of life expectancy at birth, and then are evaluated by age mortality levels for each adopted in the prediction of the value of average life expectancy newborn (Coale, Demeny, Vaughan, 1983).Second, by contrast, involves the reverse order of predicting the total

and age mortality levels: the first is defined by age-based indicators, and then, on this basis, the predictive value of the average life expectancy of a newborn is calculated.

The first stage consists of two sub-stages: getting life expectancy and determination of the trend values between the base year and the year for which the calculation is done.

The second stage is a largely technical exercise to be solved by well-known mathematical methods of interpolation of the dynamic series. The determination of future mortality levels (the value of life expectancy, or age values of mortality) is more creative and is a real scientific challenge that requires a special study. To determine the predictive values of life expectancy, or age values of mortality, the following methods are used often: extrapolation, the method of "law" of mortality; referential prediction, or forecasting by analogy (in three varieties - (1) compared with standard tables of mortality; (2) comparison with more "advanced" population and (3) compared with the "optimal" life table, calculated for the "ideal" conditions), forecast based on analysis of the dynamics and prediction of the causes of mortality (Bestuzhev-Lada 1999).

The choice of the method depends on the purpose of forecasting, availability and reliability of demographic information, and also, importantly, the value resources available to the demographic forecaster. The simplest method is the extrapolation. If one knows the value of this indicator for the past years, the relatively short period of time, future trends can be determined by extrapolation methods, using certain mathematical functions. For example, in case of predicting the life expectancy logistic curve is usually used, as it approximates the dynamics of this indicator well.

The prediction of the age levels of mortality (e.g., ${}_nq_x$ – probability of dying at the age interval (x + n) years) with the help of various techniques determine a correction factor, which shows the dependence of the option selected from time to time, and multiplied by a base value of the projected figure to obtain its value at a chosen date. The calculated projected values of mortality and average life expectancy are normally used for advancing ages.

The second method of forecasting mortality by age is based on a so-called "Law of mortality", i.e. a mathematical function that describes the changes in mortality depending on age (Bestuzhev-Lada 1999). Although the history of the "law of mortality" amounts to almost three centuries, it is better known as the Heligman-Pollard model. Its present form, proposed by the authors in 1980, describes the changes in mortality, represented by the probability of dying at age x years of life tables to supplement it to 1, i.e., the probability to survive until the next age x + 1 year ($q_x/1-q_x$) age (Heligman, Pollard, 1980).

A prediction using the "law of mortality" is to define its parameters, their subsequent extrapolation to the depth of the forecast horizon and forecast values of the parameters of the substitution of "the law of death" in its formula for age-specific variables to mortality levels and as a result - life expectancy. The calculated projected values of mortality and life expectancy, as in the previous case, is used for advancing ages.

The method of predicting mortality based on the use of "law" has a number of limitations, which create difficulties for its practical use. In particular, the reference method for predicting or forecasting by analogy: the first variant is the comparison with model life table can be considered as a special case, both the method of "law of mortality" and the method of comparison with the more "advanced" population. Technology for forecasting in this case is to select the most suitable system of model life tables. Next, the parameters of the selected system for a number of periods in the past (usually the average life

expectancy), and then extrapolate them to obtain predictive values. The next step is to use the chosen system model life tables, calculated by age, mortality rates, which are then used for advancing ages.

4.2.4 Migration methods

Migration model construction is based on model age-sex patterns of net migration, which are constructed by combining age profiles of gross immigration and emigration based on model schedules of gross migration developed by Castro and Rogers (1983). Castro and Rogers analyzed data on migrants by age in a number of countries and found similarities in those age profiles.

Migration data is less reliable for the analytical results, especially in case of emigration. Low reliability of migration volume data, low forecast ability of migration and significantly stable empirical relative sex and age patterns of immigration and emigration led to adoption of the assumption on constancy of sex and age specific net emigration rates, net migration and the relative structure of immigrants. The underestimation of migrants does not necessarily mean less representative relative structures of the principal migration streams. It is possible to analyze and to some extent judge stability of sex and age structures of migrants. In our model the migration components were incorporated into the projection model in two different ways:

- Immigration was incorporated in the terms of the absolute numbers of immigrants by sex and age, and emigration detailed one-year intensities of emigration separately for males and females.
- The volumes of immigration in particular calendar years were determined by corresponding volumes of emigration and net migration. This approach is generally understood as the most rational way of incorporation of migration into the classical cohort-component projection methods; in the official population forecasting practice direct incorporation of net migration divided by sex and age is used. However, this does not provide a chance to adopt future migration estimates to changing size and sex and age structure of the forecasted population.

To conclude, it should be said that even though most of the projection parameters are complex and some models are sophisticated, they are not done purposefully. Most of those models attempt to count most probable parameters and occurrences to eliminate and decrease uncertainty of the model itself. Add here the issue with published methodological literature on specific selected age groups by educational attainment, in our case pre-school needs of Astana. The following chapters will present the capacity of available methods for the needs in forecasting.

Chapter 5

Trends of pre-school education developments

The current chapter considers the development of pre-school education on the national level and on the level of Astana. The chapter shows the development of education system since independence and improvements occurred in the 2000s due to the general socio-economic development of the country. The structure of early childhood care and education in Kazakhstan is discussed. The development of the pre-school education in Astana is considered since 1997, when the capital was changed from Almaty to Akmola (Astana).

5.1 The national level

Basic pre-school educational establishments in Kazakhstan are shown in Table 1. The Ministry of Education and Science (MES) is the primary government agency responsible for providing formal early childhood education in the country.

Meanwhile, there is the rise of the private sector of Pre-school education. They are formal (i.e. nursery full and part-time, child care centers for children of 1–3 years old and pre-school classes for children of 1–6 years old in nursery kindergarten, school) or informal (e.g., nurse, and nursing). The MES monitors their activities, but does not finance them (UNESCO 2005).

Analysis of natality in Kazakhstan over the past 20 years shows decrease of fertility in 1990 -1999 and its increase in 2000-2008 on an average of 13 thousand people, which resulted in a subsequent increase in the order of pre-school organizations to 5–7 % per year (the Ministry of education and science of the RK 2009).

Before its independence, Kazakhstan had the best system of pre-school education in Central Asia, which covered approximately 70 % of children under 7 years old. The basic structural unit of the system of pre-school education was a pre-school organization, which in the form of playgrounds were created in the republic since 1917. From 1993 to 1998 the number of kindergartens in Kazakhstan fell down from 8,578 to 1,558. In the 1997–1998 school year, pre-schools were attended by only 0.1% of children under one year of age, 7.7 % - up to two years, 11.6 % - up to three, 14 % - up to four, 15.3 % - up to five, 8.9 % - up to six years (Kaldybaeva 2000).

Table 1. The structure of early childhood care and education in Kazakhstan

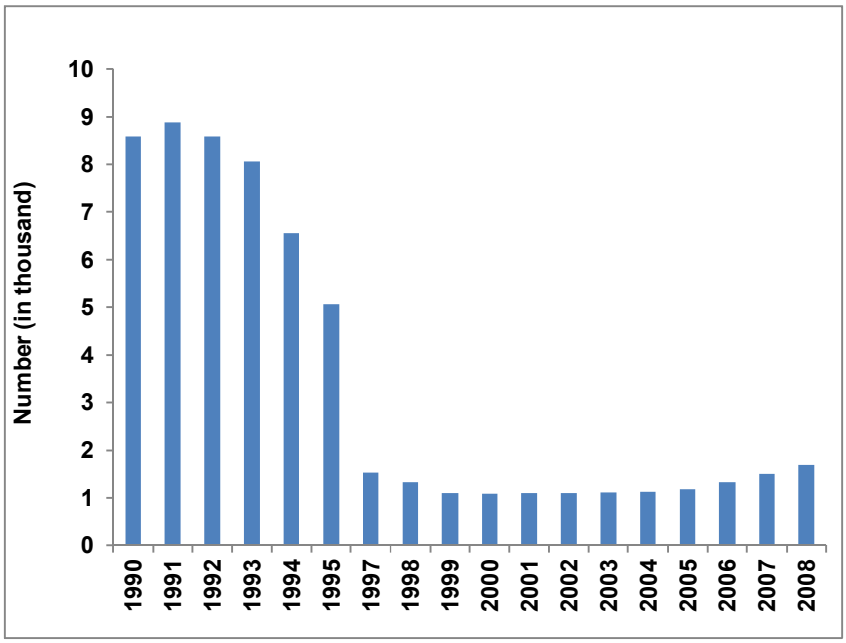
Pre-school network			
Pre-school Organizations (POs) Under MES and Oblast education departments			Orphanages Under MOH and Oblast health departments
Nursery 1-3 years	Kindergarten (KG) 3-6 years	Pre-primary Education 5-6 years	
Nursery 1-3 (10 hours per day)	KG 3-6 (10 hours per day) Nursery-KG 1-6 (10 hours per day) KG-School Complex 1-10 (10 hours per day) Mini Pre-school Centers (Mini KG, Home KG are forms of Mini Pre-school Centers) 3-6 (6 hours per day) • Shorter hours (2 hours per day) and flexible • Can be mixed age group • Setting can be in KG, secondary school, home (e.g., teacher's apartment) Kinderdorf (children's village, serving young children in orphanages) 4-7 (24 hours per day)	PPE Classes in secondary school 5/6 (4 hours per day; attendance for one year) PPE Groups in KG 5-6 (10 hours per day; attendance for one year)	Early Childhood Orphanages 0-3 (24 hours per day)

Source: UNESCO / OECD policy review of early childhood care and education. - UNESCO, Paris, May 2005. 19-20

In 1991 there were 8,743 kindergartens, more than half (4,868) of which were privatized. During the "optimization" the kindergarten buildings were abandoned. Some of them were destructed. In general, until the year 2000 the number of kindergartens in the country had fallen to 1,144 (UNESCO 2005) (Figure 2).

Since 2000s, the republic once again revived the system of pre-school education: a growing number of kindergartens, and creating new types of organizations for children of pre-school age. At the end of 1990's the government was concerned about pre-school education. It accepted the decree "The development strategy of the Republic of Kazakhstan 2030", where the priority is determined by the introduction of pre-primary education rather than destroyed pre-schools. In 1999 a special decree of the Government of the Republic of Kazakhstan "On issues of compulsory pre-school education of children" was released. Under the auspices of the Ministry of Education the concept and the draft program for one to two years has been developed (Vorotnoy 2005). According to Vorotnoy, this partly helped to improve the situation, it increased coverage of six-year-targeted educational work. However, the author shares the position of sociologist Kaldybaeva that a "pre-school is not an alternative to traditional pre-school education, conducted from 2 to 3 years old, but only its final stages, designed for children who had not yet visited kindergarten. Pre-school should not push the issue of developing a full-fledged pre-school" (Kaldybaeva 2000). Such problem as "Pre-school", according to the author, ensures mental development of children, improves their health, prepares the child for to the integration into the "school" social relationship, joining his parents in education and training, etc.

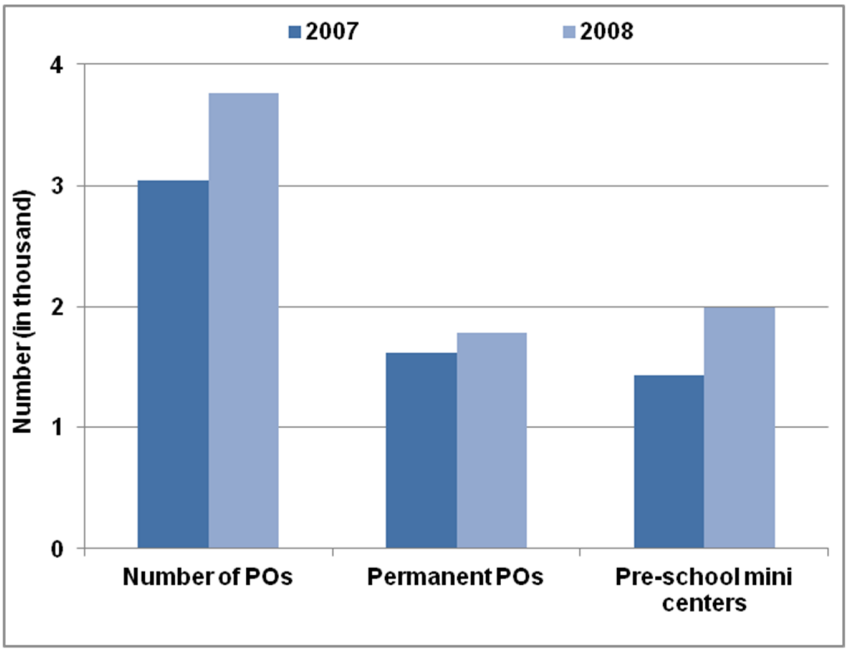
Figure 2. Number of pre-school organizations, Kazakhstan, 1990-2008



Source: The Statistics Agency of RK (www.stat.kz)

The network of pre-school institutions in Kazakhstan since 2002 was increasing year by year, and reached the 2008 value of 3,763 units (Figure 3). 1,773 of them are permanent pre-school organizations, and 1,990 are pre-school mini-centers. For one year the number of pre-school institutions increased up to 719, among them the permanent organization are at the level of 156 pre-schools and pre-school mini-centers are at the level of 563 units, respectively (Natsionalnyi tsentr kachestva obrazovaniya RK 2010).

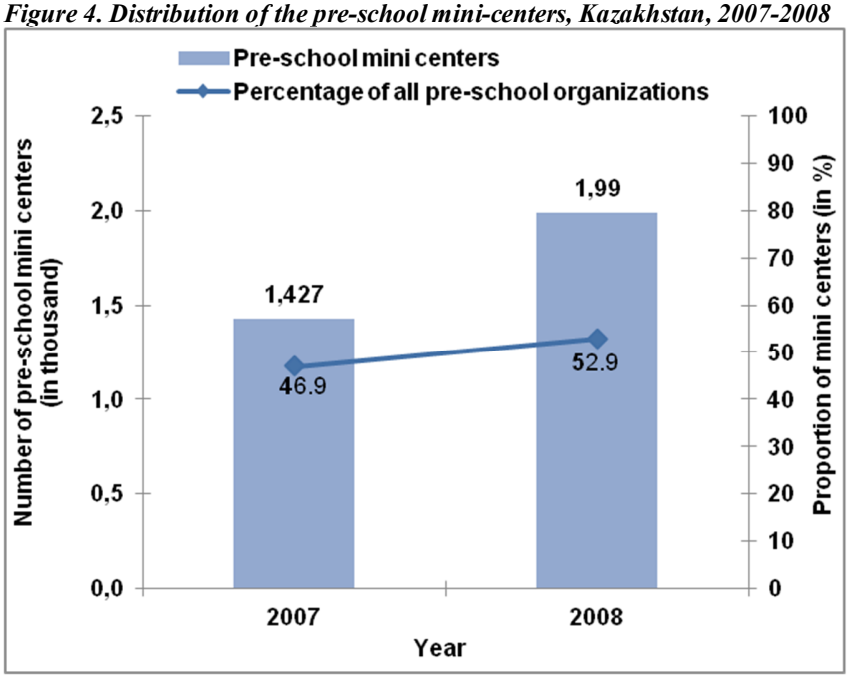
Figure 3. Pre-school organizations, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

Network pre-school mini centers are presented in Figure 4. The share of pre-school mini-centers was growing steadily and by 2008 amounted to 52.9 % of the total number of pre-school education institutions.

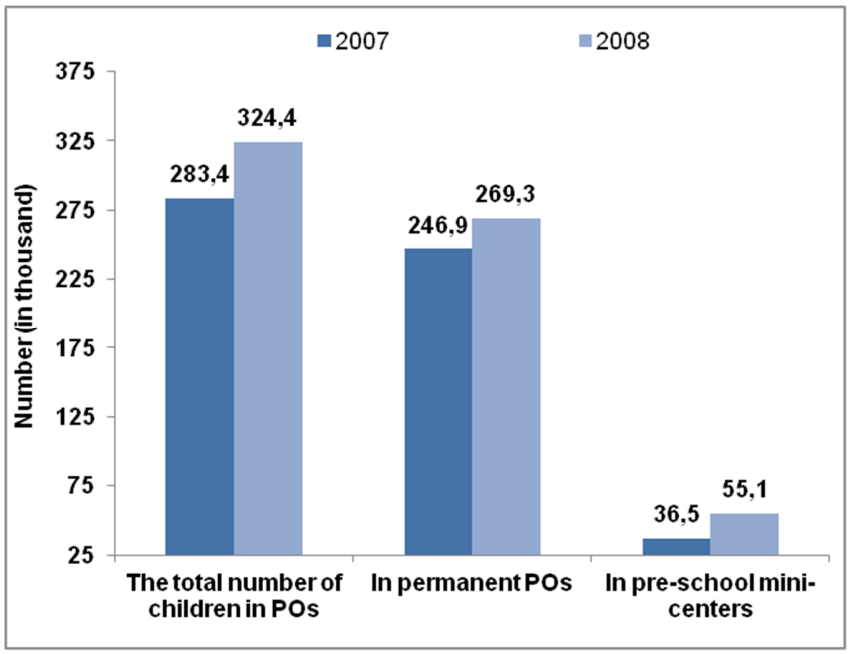
Figure 4. Distribution of the pre-school mini-centers, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

The number of children in pre-school organizations is constantly growing. If in 2007 it was RK 283.4 thousand children, then in 2008 it increased up to 324.4 thousand, including those in permanent pre-school organizations, 269.3 thousand and 55.1 thousand people in pre-school mini-centers (Figure 5).

Figure 5. The number of children in POs, Kazakhstan, 2007-2008

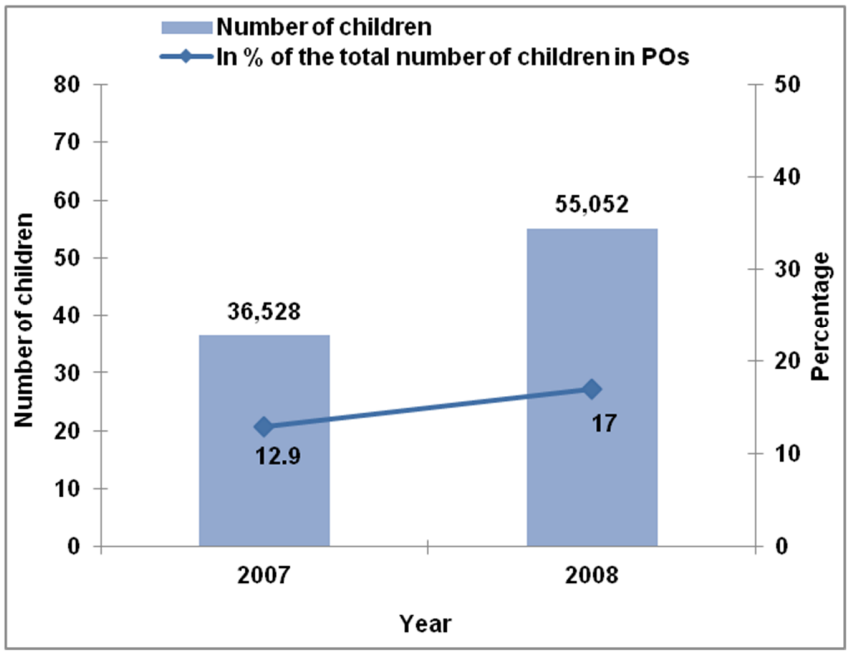


Source: Natsionalnyi tsentr kachestva obrazovaniya RK

During the period from 2007 to 2008 719 pre-school organizations for 40,989 children, including 156 kindergartens for 22,465 seats, were opened. There were 3,763 pre-school organizations in 2008, among them 1,773 kindergartens. The number of children in pre-school education and training is 324,371 (2008) or 35.6 % of the number of all pre-school children. The ratio of children in day care institutions against children in pre-school mini-centers in 2008 was 4.9 to 1, respectively it is evident that most of children are registered in day care institutions. The number of children in pre-school institutions in 2009 in urban areas was 174,972 thousand children, in rural areas 64,926 children.

The increase in the number of children in pre-school mini-centers is shown in Figure 6. Pre-school mini-centers are being established for the full development of children aged 1 to 6 (7) years, and advisory and methodological support their parents in organizing child care and education, and social adaptation of children. The main objectives of pre-school mini-centers are: 1) providing early socialization of children, and 2) the mental, moral, physical, aesthetic, emotional and cognitive development of children based on individual characteristics and capabilities of each child, 3) prevention of educational neglect of children, and 4) the preservation of health children, 5) organization supervision, care, and 6) the timely correction of abnormalities in the development of children, and 7) psychological and pedagogical education of parents.

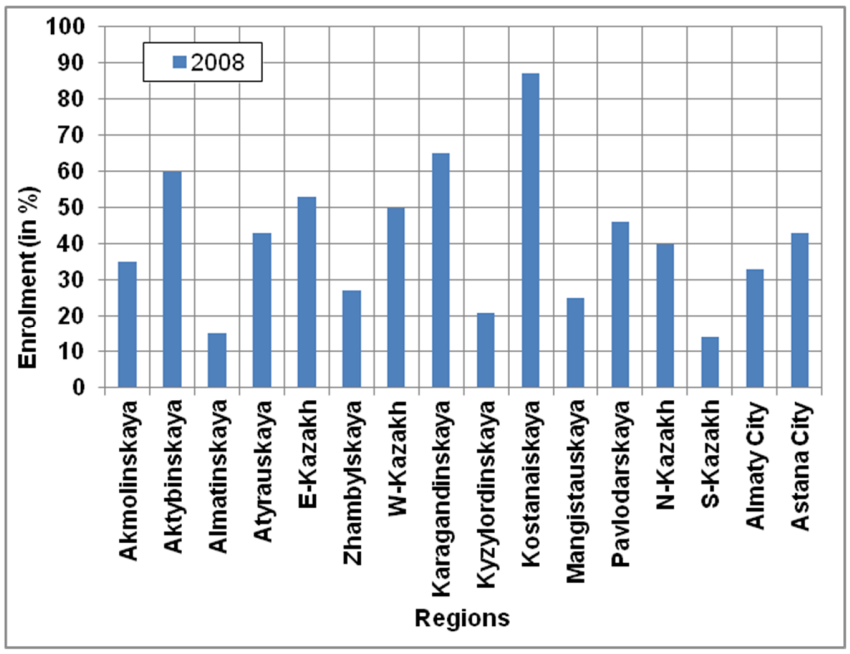
Figure 6. Number of children in pre-school mini-centers, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

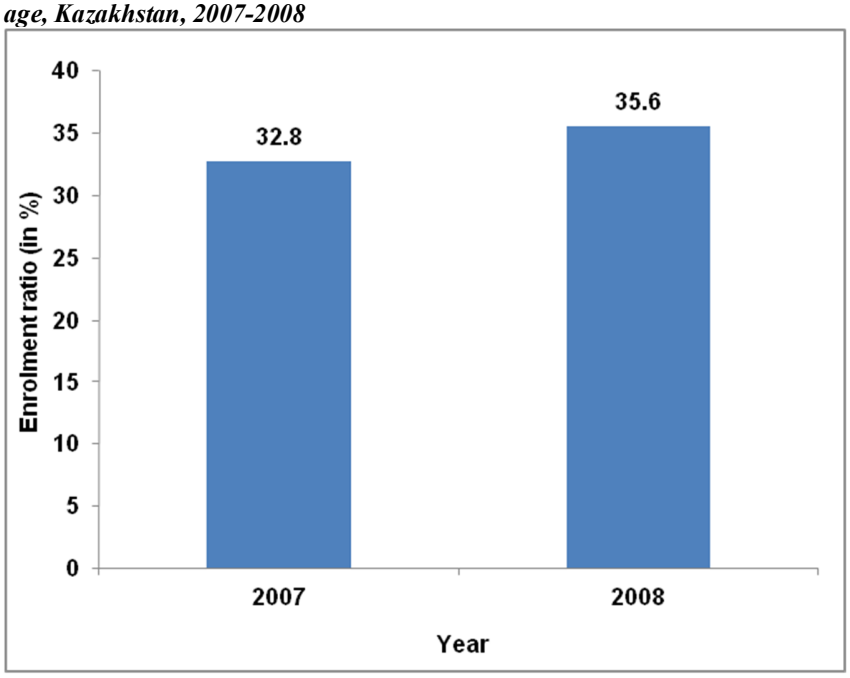
Enrollment rates that characterize early childhood care and education and the percentage of children of pre-school age in Kazakhstan in 2008 amounted to 35.6 %. This is 2.8 % higher than in 2007. The rates for the regions are as follows: Kostanay – 87 %, Karaganda – 65 %, Aktobe – 60 %, the lowest in: North Kazakhstan region – 14 %, Almaty region – 15 % and Kyzylorda – 21 % (in Astana – 40 %) (Figure 7).

Figure 7. Enrollment rates: early childhood care and education, Kazakhstan regions, 2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

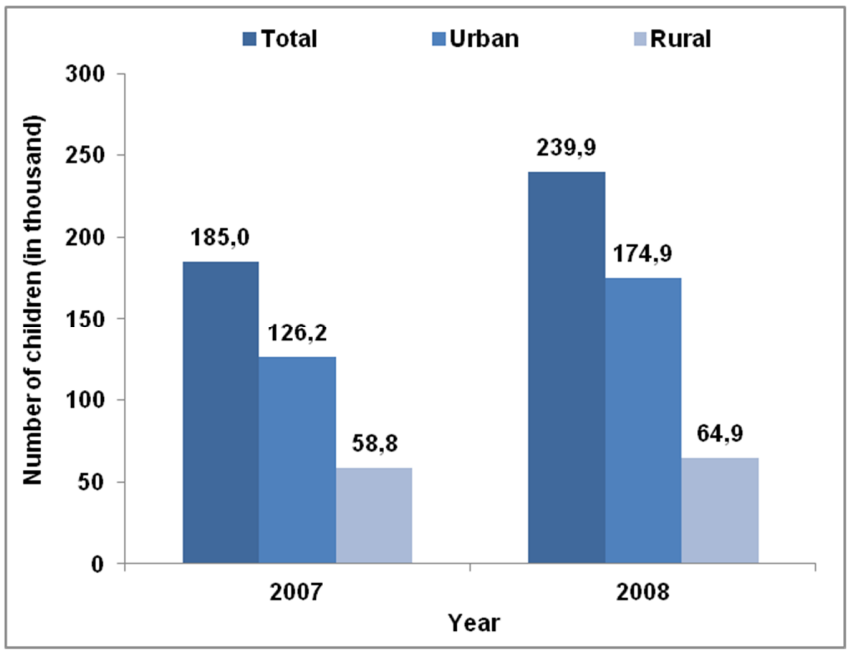
Figure 8. Enrollment ratio in pre-school educational establishments, as a percentage of the children of pre-school age, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

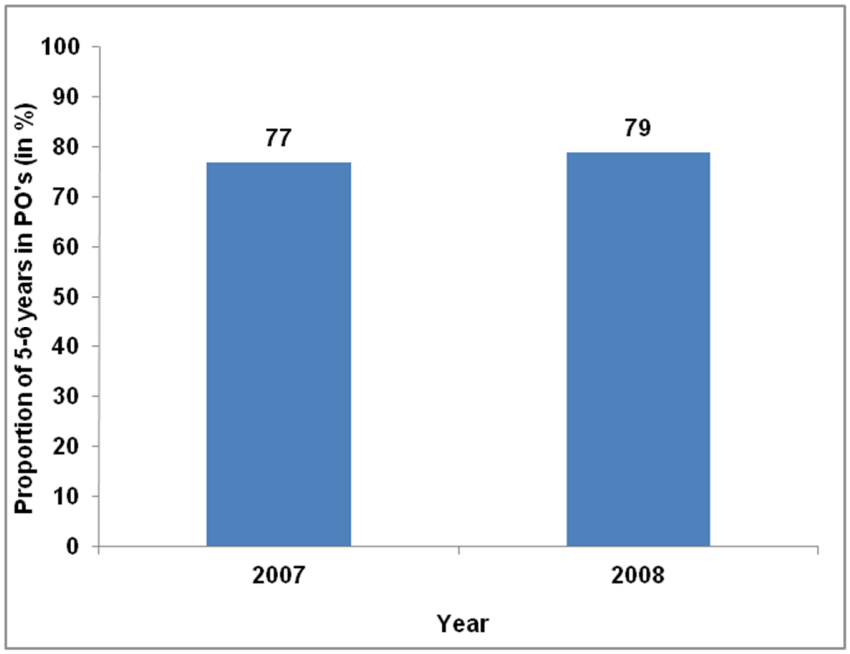
There were 239,858 thousand children, including 147,084 from 3 to 6 years (Respublikanski centr "Doshlkol'oe detstvo" 2009) waiting in the year 2008 to enroll and register with pre-school organizations. In 2008 239,858 applications were registered in kindergartens, including 174,932 in urban areas and 64,926 in rural areas. The number of popular seats is rising from year to year (Figure 9).

Figure 9. The number of children on the waiting list of public kindergartens, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

Figure 10. Enrollment of 5 to 6 year-old children to compulsory pre-school training for the population of typical age, in percentage, Kazakhstan, 2007-2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

Compulsory pre-school education coverage in 2008 constituted 79 % of 5–6 year olds. When it is compared with 2007, it is higher by 2 %. Thus, the enrollment rate has been steadily growing (Figure 10). Pre-school education covers 100 % of children in the Atyrau region. Low coverage rates are observed in Almaty region – 64 % and NKR – 76 % (Natsionalnyi tsentr kachestva obrazovaniya 2009).

Figures provided by the Strategic Plan of the MES show the increase in enrollment of children in 2009: pre-school education to 39.4 %, pre-school training to 86.9 %. Thus, the coverage of pre-school education and upbringing, its content, methodological support, the amount of the state budget do not match today's realities and tendencies of development of the world pre-school education and upbringing. In 2008, as compared with the previous year, there was an decrease in the relative share of the state budget expenditures for almost all levels of education, which is probably associated with a significant decrease in expenditures for "other educational programs" from 4.29 % in 2007 to 4.26 % in 2008. The share of public funding of education is characterized by a certain tendency to decline (Table 2).

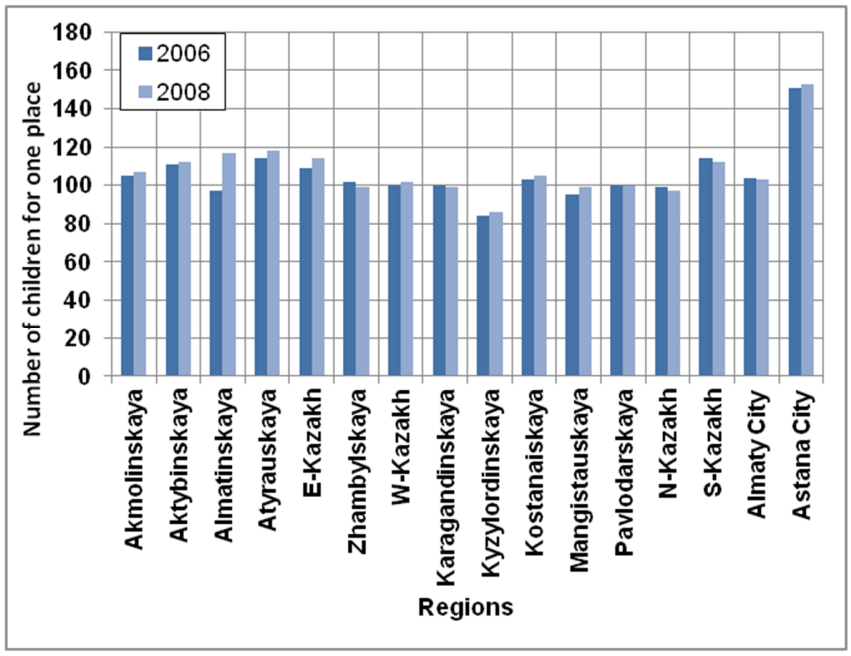
Table 2. The structure of the state budget for pre-school education, million KZT, 2005-2008

Year	The total budget for pre-school education (thous. KZT)	The share in the budget for total education (%)
2005	9,589	3.60 %
2006	12,937	3.90 %
2007	20,646	4.29 %
2008	27,288	4.26 %

Source: Natsionalnyi tsentr kachestva obrazovaniya RK

The analysis of the statistical data on the number of children per 100 places planned in pre-school organizations shows that from 2006 to 2008 it increased by 2.2 units, and from 2007 to 2008 decreased by 0.5 units and amounted to 107.5 people. The highest number of seats in pre-school organizations are observed in Astana (152.9 persons), Atyrau (118.0 persons), South-Kazakhstan (115.7 persons), Aktobe (113.4 persons), Zhambyl (113.1 persons) areas. The lowest rate is in the Kyzylorda region (86.0 persons) (Figure 11).

Figure 11. Proportion of children to 100 seats in pre-school educational institutions regions of Kazakhstan, 2006 and 2008



Source: Natsionalnyi tsentr kachestva obrazovaniya RK

The number of children per 100 seats in pre-school institutions located in urban areas of the Republic of Kazakhstan has not changed – 113.2 people. The number of children in pre-school educational institutions in rural areas is increasing. In 2008, 90.6 people accounted for the 100 planed seats in pre-school institutions in rural areas, which 3.7 persons more than in 2006.

The development of pre-school education is one of the factors improving the demographic situation in Kazakhstan. The shortage of kindergartens in Kazakhstan is still obvious. But the state has taken decisive steps to develop a network of pre-schools, which is one of the priorities for education set by the President of Kazakhstan (Natsionalnyi tsentr kachestva obrazovaniya RK 2009).

5.2 Astana

After the collapse of the Soviet Union in the city of Akmola (now Astana) the same nationwide tendency of pre-school education development was observed. First of all, pre-school organizations funded by the enterprises began to close. A wave of privatizations of enterprises, objects of social welfare began in the country. The number of pre-school organizations has declined sharply. The change came when in 1997 with the transfer of the capital in the city of Akmola, which was renamed to Astana. Many objects of pre-school education were transferred to the administrative buildings of various government agencies.

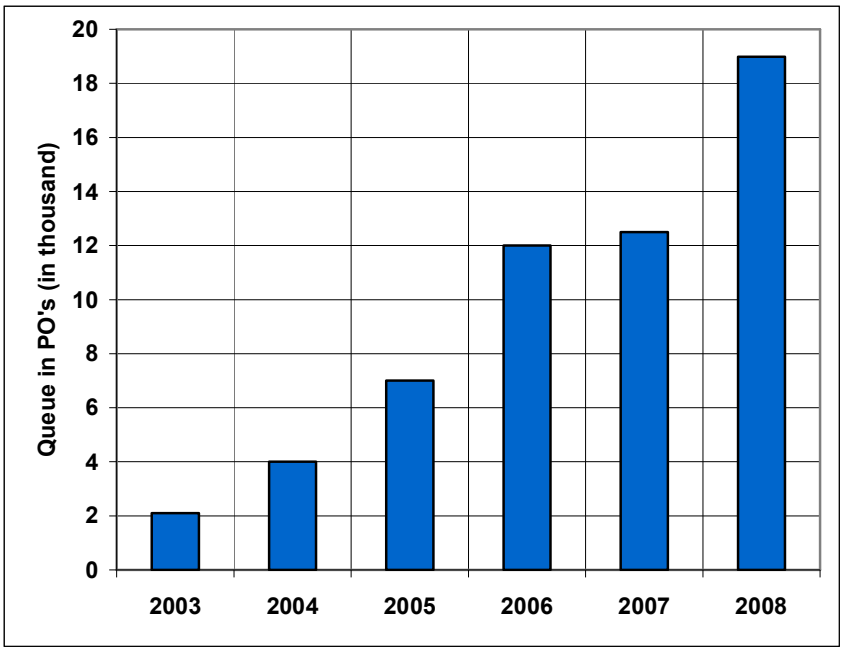
There are 38 public, 15 private pre-schools and 5 complexes “School – Kindergarten” in Astana. The total contingent is 14,605 children are covered by pre-school education, this amount 44.3 % (These children attend kindergartens, pre-school groups in the complexes, PPE classes in secondary schools). The pre-school education needs in Astana is growing every year, as population is growing due to internal migration to the city. According to the statistics, in 2008, the number of children on a waiting list for pre-school institutions was 18,981children (Figure 12) (Centr ustoichevogo razvitia stolici 2009).

The shortage is caused firstly by the fact that the system in its present form is unable to increase the admission to pre-school education institutions – kindergartens, especially in Astana city, because they are overcrowded and the children’s waiting list is growing with the decrease of the relative possibilities of the pre-school organizations.

On January 1st, 2009 the pre-school education needed about 38 thousand seats in Astana. The existing capacity of the pre-school facilities covers only 37 % of demand. For the elimination of prevailing deficit in the short term - in 2009 - akimat of Astana the following measures were taken: due to the return to communal ownership, the premises and equipment of new apartment complexes the need is planning to be reduced to 1,216 seats. This measure resulted in the increase of capacity to 39 %.

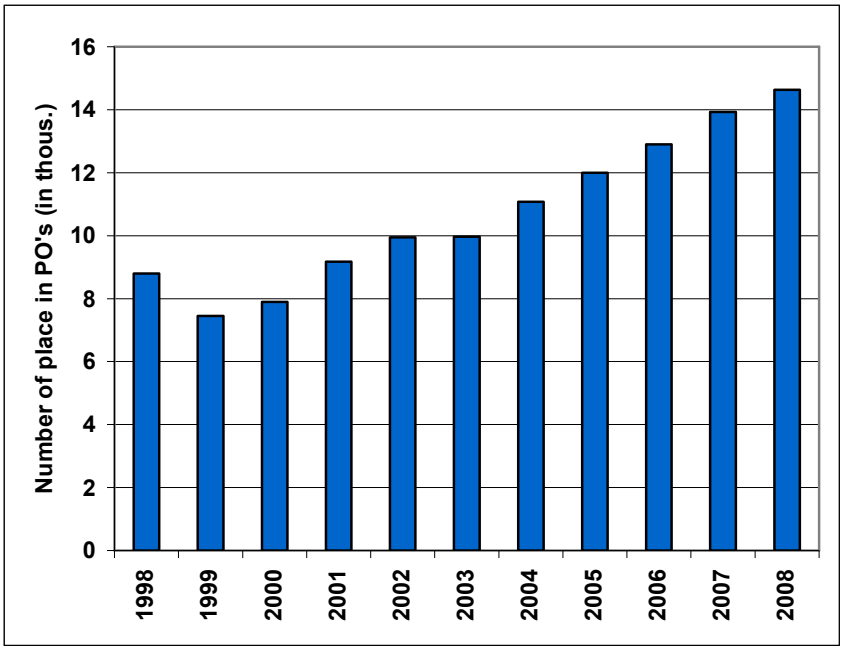
According to the parameters of the main plan of Astana city, by the end of 2012 the need for kindergartens will be 41,580 seats. To meet these needs Akim of Astana city has drafted an action plan according to three main directions. First, allocation of premises at ground-2-nd floors of residential commercial construction for pre-school organizations will ensure that in 2010 – 1,820 places in 2011 - 4,967 places in 2012 – 2,240 places will be created. It is necessary to make amendments to the licensing procedure, waiving the requirement for private ownership at the premises relating to the standards of the area and the location of pre-school organizations.

Figure 12. The number of children on a waiting list for pre-school education, Astana, 2003-2008



Source: Own calculation. Department of Education of Astana

Figure 13. Number of places in pre-school organizations, Astana, 1998-2008



Source: Own calculation. Department of Education of Astana. www.astana.kz

Second, due to construction with the help of LLC "Jana Kurylys", it became possible convert some houses to mini-centers for a short-term staying of children (up to 4 hours) in 2010 on the total area of 15,337 m^2. This provided approximately 3,067 seats. Third, the transfer of the kindergartens' buildings used for other purposes. There are 14 types of kindergarten buildings used for other purposes. Fourth, construction of new kindergartens according to the typical projects. Currently, Astana akimat allocated

land for construction of 30 kindergartens and reserved the land for 14 kindergartens. This will allow placing 44 new kindergartens for 11,780 seats in 2010-2013 in the city. Thus, in general, new construction will provide the seats for 12,300 persons by 2013 through a variety of sources (Tasmagambetov 2009).

The current investment strategy of the Government can be described as the main policy to restore the network of pre-school organizations, with the emphasis on kindergartens. Although the alternative services have been introduced, kindergartens are still the main form of pre-school education, and their number should increase to a traditional form - well equipped with sufficient number of qualified teachers, providing a rich set of additional services (for example, choreography, sports, and so etc.) along with the basic kinds of training. But such high-quality kindergarten, however, is expensive. Therefore, the government is trying to find the necessary funds, with a budget of 216,3 billion tenge, according to theprogram “Balapan” which is designed for 2010-2014 year. Also, it is planned to increase the access to kindergartens and increase pre-school education to 31 845 by 2014.

Chapter 6

Past and future of the population development components

The main purpose of this chapter is to provide a sufficiently detailed overview of the basic features of the current demographic development of Astana. The individual components of this development process represented by fertility, mortality, migration and age and sex structure were analyzed separately and the results are presented in the context of the development of these components at the higher territorial unit, namely the Republic of Kazakhstan. Analysis of the current population trend does create an informational base for the preparation of forecasts, as well as the fundamental basis for a more detailed discussion of the results of the forecasts and considerations related to them.

6.1 Population development of Astana

In order to formulate assumptions for the forecast the descriptive analysis of current demographic situation must be highlighted. Accordingly, this chapter is aimed to answer following questions: what is the current demographic structure of the population of Astana? In this regard, it is necessary to provide with information regarding the historical conditions of origin the modern population of Astana. Additionally the influential factors on the ethnic structure of modern population will be analyzed.

Initially, on the territory of modern Astana there was an Akmolinskaya fortress raised on the right bank of Ishym River in the tract named Kara-Otkel in 1830. At the beginning it primarily consisted of wooden buildings and after the housing dwellings were built. Additionally, the soldier barracks as settlements for peddlers and craftsmen were constructed. Later on in 1845 this fortress got the status of stanitsa (village), where Kazakhs with families started to resettle. During this period (30 years) the population of Akmolinskaya fortress had increased to 2,000 people. In 1862 they adopted a resolution on changing the status of stanitsa to a district town Akmolinsk. This was officially announced on 16 July 1863 and on 21 October 1968 they established Akmola region with the center in Omsk. In 1869 Akmolinsk became the center of Akmola district. The population of Akmolinsk in 1893 made up 6,428 people. After a while the city started to play an important role of the center as a transit and local trade. Generally, the contribution to the growth of Akmolinsk was not only at the expense of natural increase of the population but also by the help of the governmental centralized and organized flow of migrants.

October revolution of 1917 meant the turning period in the history of Akmolinsk. The size and ethnic structure of Akmolinsk population was changed by the following factors: the consequences of the Soviet policy of collectivization, the policy of conversion of Kazakhs to sedentism, 1921–1922 famine, the internal exiles of wealthy peasants and deportation of disloyal nations at pre-war period, the population evacuation at the time of Second World War. But the biggest influence on formation of Akmolinsk population was determined by the domestication of the virgin and fallow lands as this caused the surge of migration activity in 1954–1956. During this period 640 thousand people arrived to Kazakhstan which made up 45.3 % of rural population of the virgin region (Artikbayev 2000). In December 1969 Akmolinsk was given the status of virgin region's center and Akmolinsk population had reached 100,000 people. One year later Akmolinsk had been renamed to Tselinograd (City of virgin land) (Zabirova 2008). Astana city's population size, amounted to 602.7 thousand people on 1 January 2008, while the total population of the Republic of Kazakhstan as the same period amounted to 15 565.6 thousand people, where the urban population that made up 8 230.3 thousand people (52.9 %) and rural population – 7 335.3 thousand people or (47.1 %). However, ten years ago according to the 1999 census the population of Tselinograd region made up 326.9 thousand people (Agency of the Republic of Kazakhstan on Statistics 2009). Conclusively, it is obvious that the current population structure was affected by the numerous historical factors that played an important role in the becoming the Astana to the second city of Kazakhstan.

Accordingly it is important to evidently analyze how the Astana population increased. This process of changing the population size and structure had started from 1998. For instance, if in 1999 the population of Astana made up 326.9 thousand people, then 2008 it reached 602.7 thousand people. In relative terms, if the population of Astana in 1999 amounted to 2.2 % of the total population of the Republic of Kazakhstan, then in 2008 it had already amounted to 3.8 % (Table 3).

Table 3.The changes of population size, 01.01, 1999-2008, Astana and Kazakhstan

Year	Population (in thous.)		Share of population of Astana to Kazakhstan population (in %)
	Astana	Kazakhstan	Astana
1999	327	14 955	2,2
2000	381	14 902	2,6
2001	440	14 866	3,0
2002	493	14 851	3,3
2003	502	14 867	3,4
2004	511	14 951	3,4
2005	529	15 075	3,5
2006	550	15 219	3,6
2007	574	15 397	3,7
2008	603	15 572	3,9

Source: Statistic Agency of the Republic of Kazakhstan

The statistical data shows that the main factor of essential component of the growth of Astana population is migration. Mainly it was the migration of the rural population to the large cities. According to the current registration, the number of the population of Astana for 1 January 2008 had amounted 602.7 thousand people. It was increased by 28.3 thousand people, in comparison with 2007 and this increase was mainly due to the expense of interregional migration (Table 4).

Table 4.Components of population change, 01.01, Astana, 1999-2008

Years	Population at the beginning of the year (in thous.)	Total increase for the given period 1999-2008 (in thous.)	Natural increase (in thous.)	Net migration (in thous.)	The total increase (in %)
1999	326.9	54.1	0.8	53.3	16.5
2000	381.0	59.2	1.5	57.7	15.5
2001	446.2	52.9	1.5	51.4	12.0
2002	493.1	8.9	2.2	6.7	1.8
2003	502.0	8.5	3.2	5.3	1.7
2004	510.5	18.8	4.6	14.2	3.7
2005	529.3	21.1	5.4	15.7	4.0
2006	550.4	24.0	6.3	17.7	4.4
2007	574.4	28.3	8.9	19.4	4.6
2008	602.7	36.9	12.0	24.9	6.1

Source: Agency of Statistics of the Republic of Kazakhstan, Zabirova A.T. "Astana population".

As a consequence of the transfer of capital from Almaty to Akmola (Astana) the changes of the population of Astana developed more intensively. Essentially, the population growth in the previous years was due to the migration, mainly due to movement of governmental and administrative workers. For example, from 1999 to 2002 a big amount of the immigrants were government employees. At the same period the number of population in the Republic of Kazakhstan decreased, and this was caused by international out-migration.

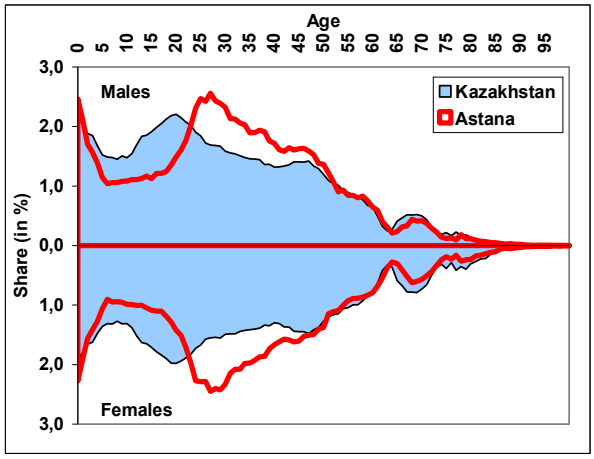
It is important to note that according to some experts (Zabirova 2008) the 30–40 % of people who arrived to Astana in first years since the relocation of the capital, were unrecorded inhabitants (this was mostly caused by such reasons like difficulties to get registration and seasonal character of migration). Due to these factors there a problem of measuring not only the number of in-migrants to Astana, but also their sex and age structure, as well as the social-professional and economic conditions occurred. As such, the number and the structure of population in Astana were underestimated. The statistics of the regional migration to Astana became uncertain. This is the reason for carrying out an action named "I am a resident of Astana" by the city authorities in September 2001. The action was aimed to deal with rules of documenting and registration of the population of the republic which were broken by physical and juridical bodies of the city. It was known to many people including the legal authorities, that majority of city inhabitants rented flats, lived in suburban area without any registration (Tasmagambetov 2008). In order to achieve the aim of this action the migration police had organized the registration offices for the citizens of Kazakhstan by the place of permanent residence and for those who temporary staying more than for three months in Astana. The migration police had filled out the statistic registration cards for these people and passed them to statistic bodies. After the proper processing at the administration of statistics in Astana these cards were given to the Agency of Statistics of the Republic of Kazakhstan where they were exposed to thorough logic and program control by the use of different methods (Zabirova 2008).

The population balance of the individual components of reproduction (fertility and mortality) and migration play the comparable role in the current trends in population development. The importance of

these components is not determined solely by its effect on the overall population, but above all, by the sense of their different influence on shaping the demographic structure. If the birth process affects only the structure of the younger age-groups, then mortality and migration have a direct impact on the population in all age groups. The importance of these components is not determined solely by its effect on the overall population, but also by their different influence on shaping the demographic structure.

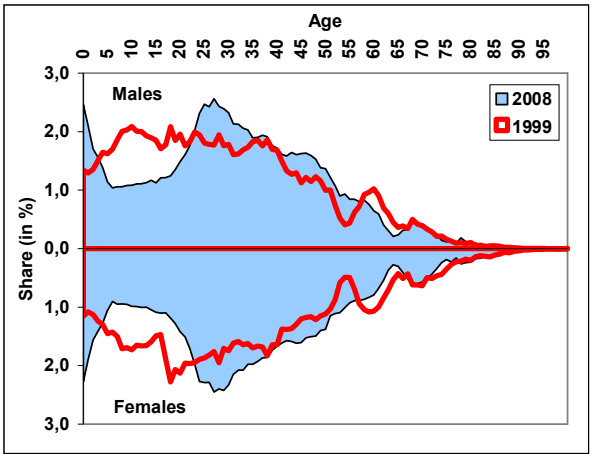
After the relocation of the capital, the structure of the population of Astana had started to change very quickly. This is mainly due to the large in-flow of labor migration. In the beginning this migrants were mostly civil servants from Almaty, the former capital of Kazakhstan. In the early 2000s the construction boom started, which resulted in an increase of the population of the city, and the joining of closest villages to Astana. The low birth rate of the 1990s had made changes to the structure of the population in age-group 5–19 years. Since the beginning of 2000s, the birth rate had started to increase. This was accompanied by the economic growth of the country. The structure of the population of Astana is different from the population age and sex structure of Kazakhstan. For instance, according to Figure 14–15 the gender and age similarities only can be found in the older generations over 50 years.

Figure 14. Age structure of population, Astana and Kazakhstan, 2008



Source: Agency of Statistics of the Republic of Kazakhstan

Figure 15. Age structure of Astana population, 1999 and 2008



Source: Agency of Statistics of the Republic of Kazakhstan

The 20–24 and 25–29 age-groups prevail in the age structure of Astana population for over a period of from 1999 to 2008. Currently, the share of the youth in the total number of population aged 14-28 makes more than a quarter 27.7 %. The population aged 29 and older makes 72.7 %. The statistical data analysis demonstrates a solid tendency for the growth of the economically active population: 20- 39 (Figure 15).

Table 5. The balance of population, 01.01, Astana, 1999-2008

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of population	326 939	380 990	440 209	493 062	501 998	510 533	529 335	550 438	574 448	602 684
Live births	3 750	4 465	4 750	5 585	6 449	7 990	9 042	10 026	12 511	15 054
Deaths	2 941	2 952	3 273	3 410	3 286	3 374	3 618	3 724	3 590	3 307
Natural increase	809	1 513	1 477	2 175	3 163	4 616	5 424	6 302	8 921	11 747
Immigrants	61 772	68 824	62 380	15 217	15 243	24 542	26 754	29 450	31 533	43 900
Emigrants	8 530	11 118	11 004	8 456	9 871	10 356	11 075	11 742	12 218	19 020
The balance of migration	53 242	57 706	51 376	6 761	5 372	14 186	15 679	17 708	19 315	24 880
Total increase	54 051	59 219	52 853	8 936	8 535	18 802	21 103	24 010	28 236	36 627

Source: Own calculation, Agency of Statistics of the Republic of Kazakhstan

Table 6. The balance of population, 01.01, Kazakhstan, 1999-2008

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of population	14 955 106	14 901 641	14 865 610	14 851 059	14 866 837	14 951 200	15 074 767	15 219 291	15 396 878	15 571 506
Live births	217 578	222 054	221 487	227 171	247 946	273 028	278 977	301 756	321963	356 575
Deaths	147 416	149 778	147 876	149 381	155 277	152 250	157 121	157 210	158 297	152 706
Natural increase	70 162	72 276	73 611	77 790	92 669	120 778	121 856	144 546	163 666	203 869
Immigrants	273 747	324 141	325 276	327 303	357 342	386 247	373 434	361 788	365 137	390 777
Emigrants	397 374	432 448	413 438	389 315	365 648	383 458	350 766	328 747	354 175	389 660
The balance of migration	-123 627	-108 307	-88 162	-62 012	-8 306	2 789	22 668	33 041	10 962	1 117
Total increase	-53 465	-36 031	-14 551	15 778	84 363	123 567	144 524	177 587	174 628	204 986

Source: Own calculation, Agency of Statistics of the Republic of Kazakhstan

Statistical data demonstrate significant share of the population of the 0–15 age-group and this in turn is the factor of the family migration to Astana. The lowest share of people in Astana is the proportion of people of retirement age: age-group 70 and older but their numbers are rising every year. Therefore, the analysis of the age and sex structure of Astana city shows the domination of the economically active population, which has both a positive and negative consequences. From the first sight it is related to the positive satisfaction of demand at the capital's labor market on the highly educated professionals and at the same time there a big amount of non-qualified professionals in labor market which has an affect on the quality of work. The sex composition of the population of Astana could be characterized by gender "balance". An analysis of the demographic structure of the population of Astana shows the similarly equal proportions of men and women at the marriageable age.

Table 7. The number of male and female population, 01.01, 1999-2008, Astana

Year	Total population (in thous.)	Males (in thous.)	Females (in thous.)	Males (in %)	Females (in %)
1999	326.9	158.6	168.3	48.5	51.5
2000	381.0	185.1	195.9	48.6	51.4
2001	446.2	213.5	226.7	47.8	52.2
2002	493.1	239.2	253.9	48.5	51.5
2003	502.0	243.8	258.2	48.6	51.4
2004	510.5	247.9	262.6	48.6	51.4
2005	529.3	257.2	272.1	48.6	51.4
2006	550.2	267.4	282.8	48.6	51.4
2007	574.4	282.2	292.2	49.1	50.9
2008	602.5	296.0	306.5	49.1	50.9

Source: Agency of Statistics of the Republic of Kazakhstan

Consequently, this fact could be an influential factor on positive prospects related to the level and dynamics of marriages in Astana. At the same time taking into account the significant share of men from rural area without the high education and a high share of women living in the city with the high education it is possible to make a conclusion that these two demographic groups don't always have a chance to meet and create a new family (Zabirova 2008).

From the analysis of the sex and age structure it is obvious that the ratio of working-age population is equal to 50/50, additionally the population at younger than working-age groups are mostly represented by male population. The proportion of females at older age group is greater in comparison to males and equals to 70.7 % (Department of the statistics on Astana city 2009). In summary, the age and sex structure of Astana city shows the similarly equal distribution of males and females among economically active population. This fact closely related to the migration flows of economically active males from rural areas. At the same time the other age groups show significant disproportion among males and females. This fact closely related to the gap between male and female expectation of life at birth.

The structure of population according to the ethnicity plays important role on the future development of population in Astana. Historically Astana mostly was inhabited by Slavic ethnic groups but later on under the influence of aforementioned factors Kazakhs became major ethnic group. Essentially, according to an analysis of statistical data it is obvious that the more dominant share of Kazakhs and non-European ethnic groups is observed in the population structure of the capital city (Table 10).

Table 8. The number of population by age groups, 01.01, Astana, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Absolute number										
Total	380 990	440 209	493 062	501 998	510 533	529 335	550 438	574 448	602 684	639 311
Preproductive (0-14)	81 796	85 315	91 185	91 002	91 275	94 112	97 773	102 571	109 990	122 749
Productive (15-59)	262 988	315 204	359 735	368 416	376 682	392 396	409 101	426 647	444 521	464 628
Postproductive (60+)	36 206	39 690	42 142	42 580	42 576	42 827	43 564	45 230	48 173	51 934
Relative (in%)										
Total	100	100	100	100	100	100	100	100	100	100
Preproductive (0-14)	21,5	19,4	18,5	18,1	17,9	17,8	17,8	17,9	18,3	19,2
Productive (15-59)	69	71,6	73	73,4	73,8	74,1	74,3	74,3	73,8	72,7
Postproductive (60+)	9,5	9	8,5	8,5	8,3	8,1	7,9	7,9	8	8,1
Development Index (1999 = 100)										
Total	100	116	129	132	134	139	144	151	158	168
Preproductive (0-14)	100	104	111	111	112	115	120	125	134	150
Productive (15-59)	100	120	137	140	143	149	156	162	169	177
Postproductive (60+)	100	110	116	118	118	118	120	125	133	143

Source: Own calculation, Agency of Statistics of the Republic of Kazakhstan

Table 9. The number of population by age groups, 01.01, Kazakhstan, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Absolute number										
Total	14 901 641	14 865 610	14 851 059	14 866 837	14 951 200	15 074 767	15 219 291	15 396 878	15 571 506	15 776 492
Preproductive (0-14)	4 172 117	4 056 383	3 936 515	3 822 238	3 741 903	3 700 535	3 680 579	3 691 682	3 729 940	3 810 073
Productive (15-59)	9 100 293	9 155 334	9 254 294	9 394 850	9 602 124	9 809 979	10 004 366	10 169 227	10 281 908	10 378 328
Postproductive (60+)	1 629 231	1 653 893	1 660 250	1 649 749	1 607 173	1 564 253	1 534 346	1 535 969	1 559 658	1 588 091
Relative (in%)										
Total	100	100	100	100	100	100	100	100	100	100
Preproductive (0-14)	28	27	27	26	25	25	24	24	24	24
Productive (15-59)	61	62	62	63	64	65	66	66	66	66
Postproductive (60+)	11	11	11	11	11	10	10	10	10	10
Development Index (1999 = 100)										
Total	100	100	100	100	100	101	102	103	104	106
Preproductive (0-14)	100	97	94	92	90	89	88	88	89	91
Productive (15-59)	100	101	102	103	106	108	110	112	113	114
Postproductive (60+)	100	102	102	101	99	96	94	94	96	97

Source: Own calculation, Agency of Statistics of the Republic of Kazakhstan

For example, if in 1989 the share of Kazakhs in the total population of Astana (Tselinograd) was 17.7 %, then by the 1st January 2008, the share of Kazakhs had reached 65.2 % of the total population. At the same time, the share of Russians in 1989 was 54 %, and in 2008 it had declined to 27.6 %. Consequently, in 2008 the ethnic and demographic composition of the population of Astana was changed, where Kazakhs made up the majority. Additionally, it is important to highlight that the majority of Kazakhs moved from the South and West regions of Kazakhstan. This fact closely related to the fertility behavior, which is different according to the different ethnic groups. For instance, historically Kazakh women from the South part of Kazakhstan behave more traditionally compared to the Russian, Ukrainian and German ethnic groups. The traditional fertility behavior considers such factors as: low average age at first birth, high number of children per woman, etc. (Alekseenko, Aubakirova, Sarsembayeva 2011).

Table 10. The population of Astana by main nationalities, 01.01, Astana, 1989, 1999, 2008

Nationality	1989	1999	2008	
	(in thous.)	(in thous.)	(in thous.)	Share in %
Total population	281,3	326,9	639,3	100.0
Kazakhs	49,8	133,6	405,4	65.2
Russians	152,1	129,5	161,0	23.8
Ukrainian	26,1	18,1	19,5	2.9
Tatars	9,3	8,3	11,3	1.7
Germans	18,9	9,6	9,9	1.5
Others	25,1	27,8	31,9	4.9

Source: Agency of Statistics of the Republic of Kazakhstan

In summary, this subchapter addresses the analysis the development of age, sex and ethnicity structure of population and the factors influential on the changes of number of total population in Astana city. The analysis of current population structure is a key factor in population projection. The historical past played an important role in development of modern population in Astana. The most important role in this population dynamics belongs to in-migration flows, related to the global political and economic changes in Astana. However, it should be highlighted that these changes are not completed yet and the population structure will be stabilized in the future according to Zabirova (2002). The ethnic structure of population faced great shift: from the majority of Russian population in the past to the Kazakhs nowadays. Accordingly, all aforementioned factors must be taken under the consideration in the further analysis of fertility, mortality and migration trends.

6.2 Fertility

This subchapter aimed to analyze current fertility trends and on the base of this analysis to construct assumptions for the future population forecast. Additionally, it is important that the level of birth rates in current population affects not only its current size, but also has a significant impact on its future size and structure. After gaining independence in 1991, Kazakhstan has experienced substantial economic, social, and demographic changes. The dissolution of the Soviet Union significantly affected on the population development in former Soviet Republics generally, and in Kazakhstan particularly. Kazakhstan population has endured both, dramatic socio-economic changes and a rapid and deep decrease of total

fertility rate. For instance, in the period between 1991 and 1999 the total fertility rate declined from 2.73 to 1.78 live births per woman at reproductive age (15–49). Additionally, the total fertility rate in Astana also decreased and showed 1.04 in 1999.

Essentially, the principal economic and political changes that occurred in Kazakhstan during the 1990s had significant influence not only on family life in general, but on population reproduction in particular. At the same time, postponement of family formation became a mass phenomenon during this period. Additionally, married couples more frequently postponed the realization of their reproductive intentions. As a consequence fertility rates were fallen to unprecedentedly low levels. For instance, during the period between 1993 and 1999 the total fertility rate in Kazakhstan decreased and remained 1.78 live births per woman, which is below replacement level. Notably, the modern types of family-conjugal relationships as an alternative to traditional nuclear families became more widespread, such as: premarital cohabitations. Moreover, first marriages were more frequently postponed by many young men and women, this fact related to economic conditions, women's education and labor-force participation. Additionally, the number of divorce dramatically increased and became more accepted by society. At the same time, the rapid spread and easy accessibility of modern types of contraception significantly contributed to a family planning process. Essentially, all of these factors were accompanied by the great shift to the less traditional and less family-centered values in society.

Table 11. The main indicators of fertility development, Astana and Kazakhstan, 1999-2008

Indicator	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Astana										
Crude birth rate	10.6	10.9	10.2	11.2	12.7	15.4	16.7	17.8	21.3	24.2
Total fertility rate	1.04	1.03	0.94	1.01	1.15	1.40	1.55	1.68	2.06	2.38
Mean age at childbearing	26.7	26.9	27.3	27.4	27.5	27.4	27.4	27.3	27.2	2.72
Index (1999=100)	100	99	90	97	111	135	148	161	198	228
Kazakhstan										
Crude birth rate	14.6	14.9	14.9	15.3	16.6	18.2	18.4	19.7	20.8	22.7
Total fertility rate	1.78	1.85	1.84	1.88	2.03	2.21	2.22	2.35	2.47	2.68
Mean age at childbearing	26.5	26.7	26.9	27.1	27.3	27.5	27.7	27.9	28.0	28.1
Index (1999=100)	100	104	103	106	114	124	125	132	139	151

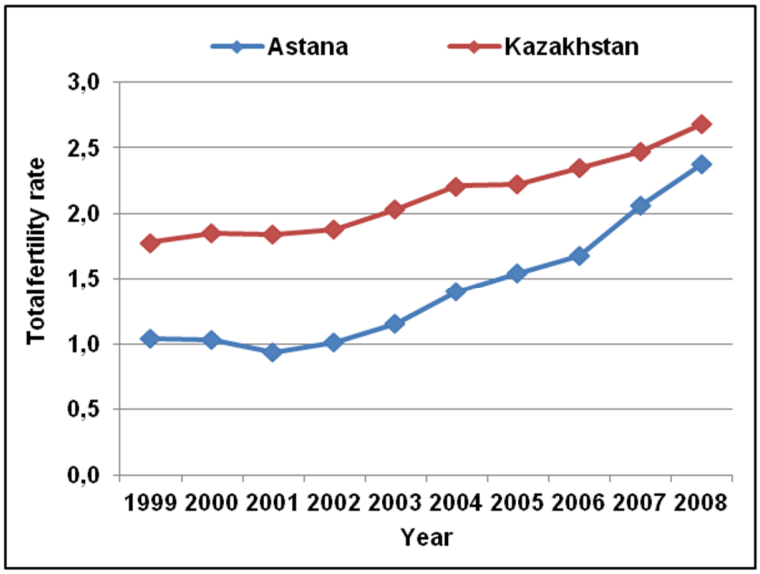
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

As a result of aforementioned factors the total fertility rate dropped to the lowest level in 2001 and reached 0.94 live births per woman in Astana city. However, from 2002 the total fertility rate started to rise and reached the level of 2.38 live births per woman in 2008 (Table 11). Perhaps this could be due to the economic stabilization observed from 2000s in Kazakhstan generally and in Astana particularly, and this fact affected on the recuperation of postponed fertility. In the previous period women experienced termination of their fertility mostly due to insufficient socio-economic conditions. Later on the majority of women at fertile age received an opportunity to deliver postponed children. Additionally, the fertility level in Kazakhstan also shows the same trend: the total fertility rate increased from 1.78 in 1999 to 2.68 in 2008. This could be explained by economic stabilization, improvements of living standards and strong belief in the future stability of living arrangements.

The chapter aimed to concurrently analyze the fertility patterns in Astana and compare it with overall Kazakhstani fertility level. One of the most important measures affecting the fertility level is timing of fertility. In order to measure the timing of fertility the mean age at childbearing of women at reproductive

age from 16 to 49 for the period from 1999 to 2008 was calculated. Accordingly, the results for Kazakhstan show an increasing trend of the mean age of childbearing from 26.48 to 28.08. Arguably, this could be affected by the fact of emancipation of women in society. Nowadays women prefer to be higher educated and gather a highly paid job with the possibility to make a career before building a family. Consequently, all this factors affect on the women's fertility behavior and termination or postponement of childbearing for the later period. This trend is general for Kazakhstan, but the differences between fertility behaviors of rural and urban inhabitants are still relevant. The rural women behave more traditionally in comparison with their urban counterparts. Essentially, the traditional fertility behavior is characterized by the lower average age at childbearing and the higher number of children per woman. This corresponds with the Soviet model of fertility when women became mothers for the first time mostly at early ages after reaching their age of twenty. It is important to highlight the differences between fertility behaviors of rural and urban women due to the high in-migration flows from the rural areas to Astana. Consequently, the fertility timing shows different trend in Astana compared to general trend in Kazakhstan. The women's mean age of childbearing increased during the period from 1999 to 2003, when it reached its highest value 27.5, and then started to decline (Table 11).

Figure 16. Total fertility rate, Kazakhstan and Astana, 1999-2008

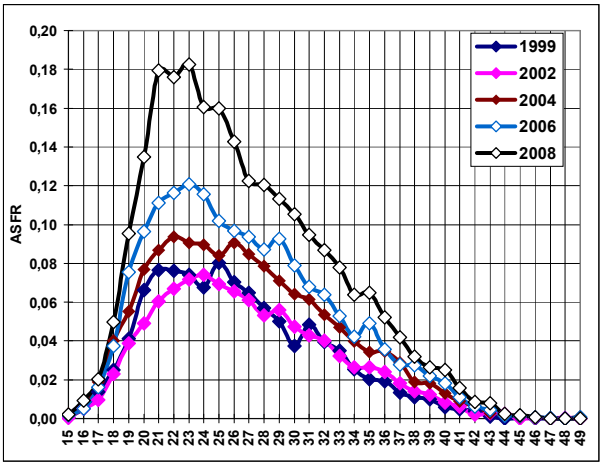


Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

At the same time, the additional factors related to the family policy which are influential on the growth of fertility level must be highlighted. Development of the fertility during this period was connected to aforementioned factors such as: socio-economic development and growing stability of the country and intensive realization of births postponed during the crisis of the 1990s. Among important elements of socio-economic stabilization and progress one can find measures of population and family policies implementation, the extensive housing programs and growing employment. Government has supported in particular the families with children in terms of cash benefits like birth grants, child allowances and paid maternal leave (40 % of the last salary) which allows women to stay at home looking after a child up to three years. The housing programs are targeted to young families where special preferences are given to young families with higher number of children (Ukaz Prezidenta Respubliki Kazakhstan № 1388 2004).

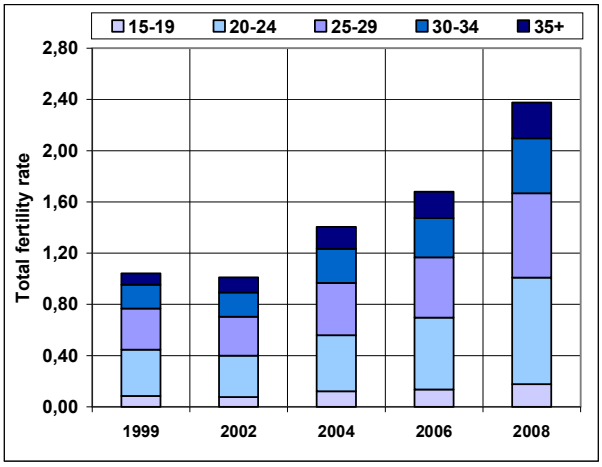
In order to understand the observed changes in fertility levels, it is necessary to go into details and to analyse the changes of fertility by age that directly mirrors changing reproductive behavior. The distribution of fertility rates based on the statistical data for Astana city shows the highest childbearing intensities for the age group 20-24 (Figure 17–18). The comparative analysis of the distributions of ASFRs in Kazakhstan and Astana for the selected calendar years (1999-2008) shows the process of fertility ageing in Kazakhstan, while in Astana this trend is not observed. At the same time it is essential to note the growth overall fertility. The occurred changes of its values are strongly differentiated by age. For instance, Kazakhstan experienced decrease of fertility at youngest reproductive ages, especially for the ages: 18 and 19, while at older ages, particularly between 21 and 46, the fertility level significantly increased. This could be explained by the transformation of women's fertility behaviors and mostly by the recuperation of postponed births. Undoubtedly, the magnitude of changes at older ages has been somehow influenced by previous fertility developments, especially by the postponement of maternity. However, the established trend of fertility ageing itself seems to be independent from the scale of postponement realization (Meldeshova 2010). Controversially, the distribution of ASFRs in Astana city shows slightly different trend. Accordingly, the increase of fertility level could be observed among all ages. In spite of fertility increase practically in all age groups during the years of observation, the contribution of the first two age groups (20–24 and 25–29) to the overall fertility (TFR) is significantly high. At the same time the contribution of older age-groups also increased, but remains low in comparison with younger generations. In summary, the comparative analysis of distributions of ASFRs shows the different trends for Astana city and Kazakhstan. However, this analysis do not allow making clear conclusion regarding changing dynamics of age-specific and period fertility levels in the period from 1999 to 2008.

Figure 17. Distribution of fertility by age, Astana, 1999-2008, selected years



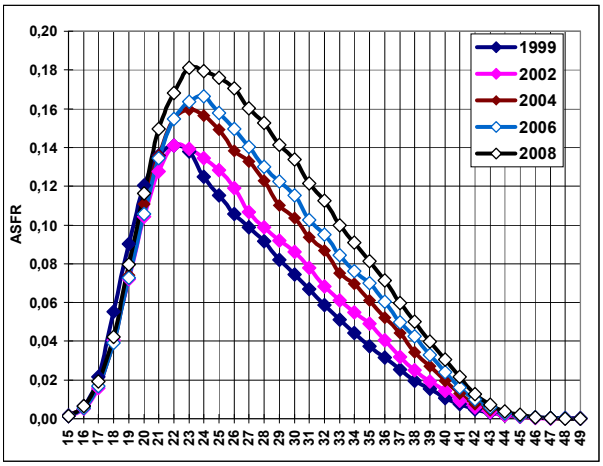
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 18. Dynamic of changes of TFR by age groups, Astana, 1999-2008



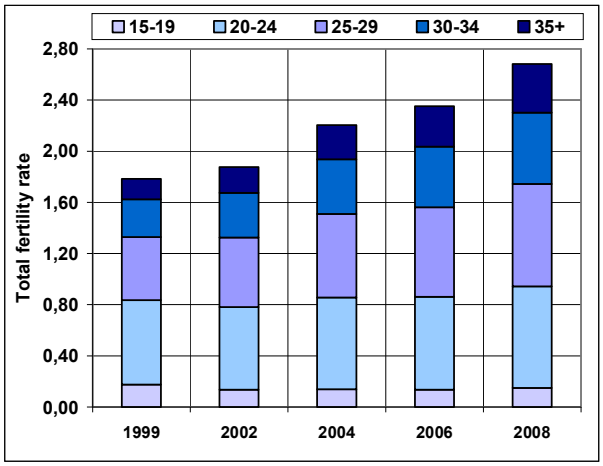
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 19. Distribution of fertility by age, Kazakhstan, 1999-2008, selected years



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 20. Dynamic of changes of TFR by age groups, Kazakhstan, 1999-2008



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

In order to highlight the changing dynamics of fertility levels which needed for the formulating of assumptions in the analysis of future development of population in Astana the development indexes were calculated (Table 12). Initially, in 1999, women in Astana showed significantly lower fertility than women in Kazakhstan as a whole, which corresponds to a greater difference between the urban and rural fertility behaviors. The intensity of the increase in fertility was observed in all age groups in Astana city. Surprisingly, the fertility level for the 15–19 age group in Astana doubled in 2008 and reached 200 % compared to 1999, while the same age group in Kazakhstan generally decreased their fertility level by 7 %. At the same time it must be highlighted that the fertility level for the 40–44 age group also increased in both regions: in Astana city and in Kazakhstan. However, the increase in Astana was more essential. These result closely related to the aforementioned recuperation of postponed births due to economic and political changes in early 1990s.

Table 12. The age-specific fertility rates, Astana and Kazakhstan, 1999-2008

Age group	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Astana (number of live births per 1000 women)									
15-19	19	20	17	17	20	28	28	29	38	38
20-24	72	69	60	65	72	88	99	113	142	168
25-29	65	63	55	61	70	82	87	95	113	131
30-34	37	35	35	38	45	53	59	62	76	86
35-39	15	17	18	19	23	27	32	33	38	44
40-44	3	3	4	4	5	7	7	8	10	12
	Development index, in % (Astana 1999 = 100)									
15-19	100	106	88	93	104	147	151	154	201	200
20-24	100	96	83	90	100	122	138	157	197	233
25-29	100	98	85	95	108	127	135	146	174	203
30-34	100	94	95	103	120	144	158	166	204	232
35-39	100	118	122	130	159	186	220	225	259	301
40-44	100	98	122	136	152	205	213	250	311	364
	Kazakhstan (number of live births per 1000 women)									
15-19	33	31	28	26	26	27	27	28	29	31
20-24	132	132	129	129	136	143	139	144	146	158

Table 12. Continued

Age group	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Kazakhstan (number of live births per 1000 women)										
25-29	99	105	105	109	120	131	133	140	147	160
30-34	59	64	66	70	76	86	87	95	102	112
35-39	26	28	30	33	38	44	46	52	55	61
40-44	6	6	6	7	8	9	10	11	13	15
	Development index, in % (Kazakhstan 1999 = 100)									
15-19	100	92	84	76	79	81	80	83	88	93
20-24	100	100	98	98	103	108	106	109	111	120
25-29	100	106	106	110	121	132	134	142	149	162
30-34	100	108	111	119	129	146	148	161	173	190
35-39	100	108	114	127	146	169	178	200	213	235
40-44	100	108	111	120	136	160	176	198	221	257

Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The age contribution to the overall fertility level from 1999 to 2008 is shown in Table 13. The total fertility rates increased in Kazakhstan generally and in Astana particularly. For instance, if in 1999 the TFRs were below the replacement level, in 2008 period fertility levels significantly increased. However, it must be noted that the increase in total fertility rate in Astana was more significant (1.33 children per woman) in comparison with Kazakhstani level (0.90 children per woman). The age contribution to the overall fertility level changed dramatically for the 15–19 age group in Kazakhstan. However, in Astana city this age group increased their fertility level compared to the previous years. At the same time in Astana city the changes were experienced by the women at age groups: 20– 24; 25–29. Notably, in Kazakhstan the changes related to the age contributions to the overall fertility were observed among following age groups: 25–29; 30–34 (Table 13).

It could be concluded that the highest contribution to the overall fertility in Astana belongs to the younger age groups in comparison with Kazakhstan. However, it is expected that the future development of fertility trends will be closely related to the observed trends in Kazakhstan. This means that Astana city will be faced the process of fertility ageing in the future and the age contribution to overall fertility will be shifted to the older generations.

Table 13. Change the overall intensity of fertility between 1999 and 2008, Astana and Kazakhstan

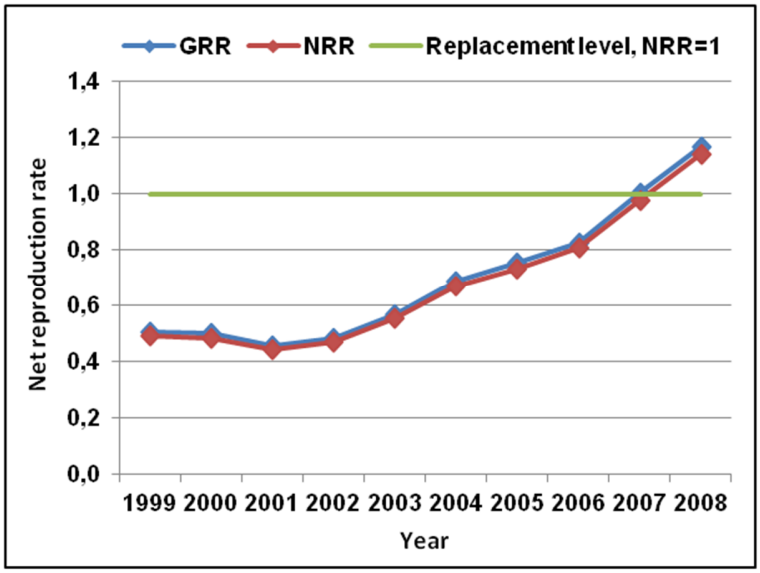
	Astana	Kazakhstan
TFR in 1999	1,04	1,78
TFR in 2008	2,38	2,68
Difference	1,33	0,90
Change per age group		
15-19	0,09	-0,03
20-24	0,47	0,13
25-29	0,34	0,31
30-34	0,24	0,26
35-39	0,14	0,17
40-44	0,04	0,05
45-49	0,00	0,00
Total	1,33	0,90

Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

In this study in order to evaluate the role of fertility in the future population development in Astana Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR) were calculated. The GRR is the average number of daughters that would be born to a woman during her life time if she conformed to the age-specific fertility rates of a given year. The NRR is the average number of daughters born per woman if she passes through her lifetime from birth conforming to the age specific fertility and mortality rates of a given year. In contrast to GRR, the NRR takes into account that some women will die before completing their childbearing years. Observed from the Figure 21 a decrease in the difference between the GRR and NRR values means that mortality risks among females were permanently declining over the whole period.

The GRR along with NRR are similarly to the TFR measure the number of live births, the only exception is that GRR and NRR are concentrated on the number of females in a given population. As it is well known, if the NRR equals to one, then it complies with the requirements of the replacement level of generations. For the case when the NRR is larger than one, it means that mother will replace more than herself. The populations with NRR value below 1.0 do not meet the requirement of the generational replacement and a long term insufficient fertility can lead to a natural decline (Figure 21). Consequently, it can be argued that the fertility rate which is expressed by the low values of NRR and GRR could lead to a more pessimistic assumption on the future development of the population in the future than in terms of TFR. Therefore, the values of NRR and GRR in Astana during the last 10 years were positioned below the replacement level. This means that girls born during this period could not replace their mothers. However, in 2007 these values seemingly reached the replacement level. On the base of these results one can assume that there will be a gradual decline in fertility in the future (until 2020). Additionally, after a while with entry of girls born after the year 2007 to the reproductive age, it could be expected that the level of fertility will have positive growth (Figure 21).

Figure 21. Gross reproduction and net reproduction rates, Astana, 1999-2008



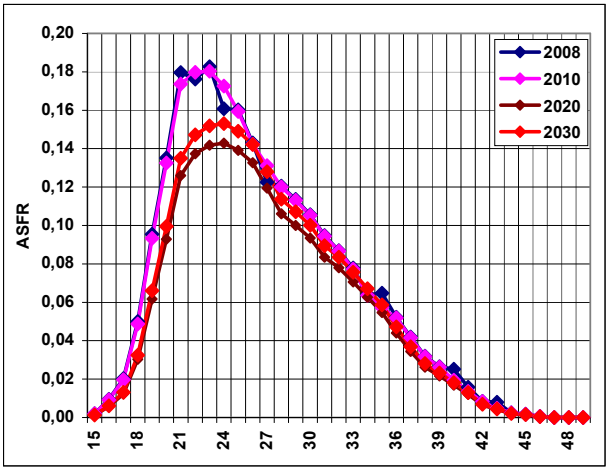
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The age contribution to the overall fertility showed the significant shift to the older age groups (25–29), observed in Kazakhstan. Hence, this tendency closely related to the aforementioned changes in society, such as: recuperation of postponed births due to economic and political changes in early 1990s and will cause slight shifts in the age groups in the future. Essentially it is important to highlight that in

Kazakhstan the average age of women at childbearing is already increased to 28.08 years. However, it is essentially to note that this process is still going on. Accordingly, on the base of analysis of fertility timing in Kazakhstan it could be concluded that Astana will experience the same trend. Meanwhile, the high flows of in-migration to Astana city from other regions of Kazakhstan could correct the fertility timing in the nearest future. However, it is important to highlight that it is likely to deviate slightly from the current level of average age at childbearing in Astana and the values will be located within boundaries of 15–35 age groups with higher concentration in the group of 20–29. Conclusively, the mean age of childbearing expected to be shifted to the older ages despite the observed decrease in average age at childbirth. Aforementioned, rapid social changes along ect with the increasing emancipation of women will lead to the postponement of first childbearing to the later period. All this factors such as: women's education and transformation of the education system from 11 years to 12 years in a basic school, increasing labor force participation of women, socio-economic conditions, measures of population and family policies directed to increase the number of kindergartens and contraception usage could decrease the fertility level generally and on the average age of childbearing particularly.

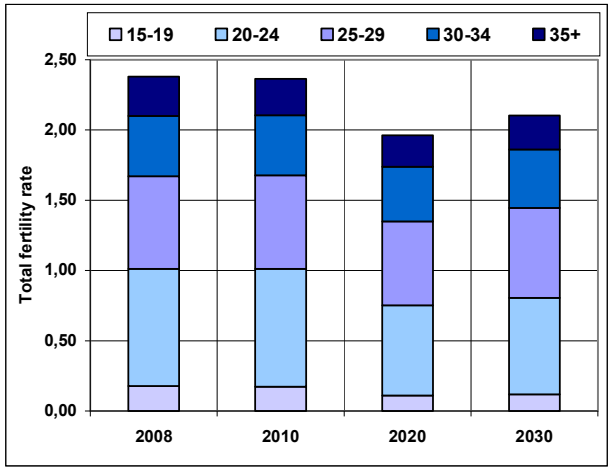
According to the analysis of the NRR and GRR values in Astana which were positioned below the replacement level during the last 10 years it is expected that the low number of daughters born in this period will be not able to meet the requirement of the generational replacement and as a consequence a long term insufficient fertility can lead to a natural decline. However, in 2007 these values seemingly reached the replacement level. At the same time, on the base of previous analysis it could be argued that in Astana will be a gradual decline in fertility during the period from 2009 to 2020. Additionally, along with entry of girls born after the year 2007 to the reproductive age, which is out of timing boundaries of this research (in the end of forecasting period), it could be expected that the level of fertility will have slightly positive growth.

Figure 22. Age specific fertility rate, Astana, 2008-2030, medium variant



Source: Own calculations

Figure 23. The changes of total fertility rates by age groups, Astana, 2008-2030, medium variant



Source: Own calculations

5.3. Mortality

Analysis of mortality presented in this study is based on the official data of the Statistical Agency of Kazakhstan on the number of deaths by age and sex and age composition of the population. Reduction is

a key element of mortality developments in Astana observed during more than 10 years since the beginning of 1999. Nowadays in Kazakhstan, the standardized mortality rates for the period from 1999 to 2008 decreased by more than 2 per cent points (Table 14). At the same time Astana shows another trend for the same period the standardized mortality rate decreased by almost 4 %. However, it is essential to highlight observed increase in the absolute numbers of deaths by nearly 12.5 % (2,941 to 3,307) in Astana city and (147,416 to 152,706) in Kazakhstan. It is due to the increase of population in Astana in this period (from 326,900 to 602,700, in relative terms by 84 %) mostly because of internal migration of population to Astana from the other regions of Kazakhstan.

The differences between mortality levels in Kazakhstan and Astana city must be explained more precisely. There are two kinds of factors which could be influential on the level of mortality: external and internal conditions. The external factors include: healthcare facilities, as well as medical, economic, ecological conditions and governmental policy aimed on reduction of mortality level and etc. The internal factors consist of population life-style, prevention of diseases on the earliest stages and etc. Arguably, due to the special status of Astana city as a capital of Kazakhstan, the population of Astana has easier access to the healthcare and medical facilities, governmental programs aimed to reduce the number of deaths compared to the overall Kazakhstani population. Also the factors related to features of urban life and specific geographical location (sufficient ecological conditions). Additionally this decrease refers to a significant improvement in quality and accessibility of medical care, as well as improvements in the overall health of the population. The 80 % of medical institutions in Kazakhstan are governmental. That is why the government plays an important role in medicine. The share of private medicine is larger in specific sectors (for example, 70 % of dental clinics are private), but, in general, health care is controlled by republican and municipal governments and is more accessible for the population.

In order to eliminate errors caused by the small size of the population of Astana, as well as the statistical influence of random factors a the values of mortality rates were calculated by the 5-year groups. In order to make more reliable forecast of changes in structures, current trends and development of mortality in Astana, the comparative analysis these trends with mortality level in Kazakhstan must be introduced for the better assessment of situation. In this case it seems to be important to evaluate the changes in these processes in comparison with the overall mortality in Kazakhstan. The main realistic picture of the overall trends in mortality in Astana city and in Kazakhstan can be achieved by the analysis of the values of time series of total life expectancies at birth (Figure 25). This indicator is one of the main functions of life tables and in practice is one of the main forecasting assumptions about the future parameters of mortality. Additionally, the life expectancy is a single application of empirical methods for calculating mortality tables, and therefore has very good opportunities for comparison. Generally, life expectancy is an average years of life in the population that was left at birth or at a certain age, and assuming that the mortality rate recorded mortality table remains unchanged throughout the entire life.

Changes in overall mortality during the period from 1999 to 2008 are shown the certain difficulties in the explanation of not smoothed data. In order to make the data smoother and to avoid related to this, deviations from the original situation, mortality tables for Kazakhstan and Astana were designed with the help of software «DeRaS» (version 1.0.20.). The software is aimed to eliminate the sudden fluctuations. During the period from 1999 to 2008 Kazakhstan experienced an increase in the life expectancies at birth for men from 60.9 to 62.0 and for women from 71.0 to 72.5 years, which respectively represents the

difference 1.1 and 1.5 years. At the same time the life expectancies at birth in Astana shows the same trend: they increased from 62.6 to 70.7 for males and from 72.8 to 78.1 for females. The average level of increase in life expectancies at birth for males and females is 8.1 and 5.9 years respectively.

Table 14. The main mortality indicators, Astana and Kazakhstan, European Standard Population (WHO), 1999-2008

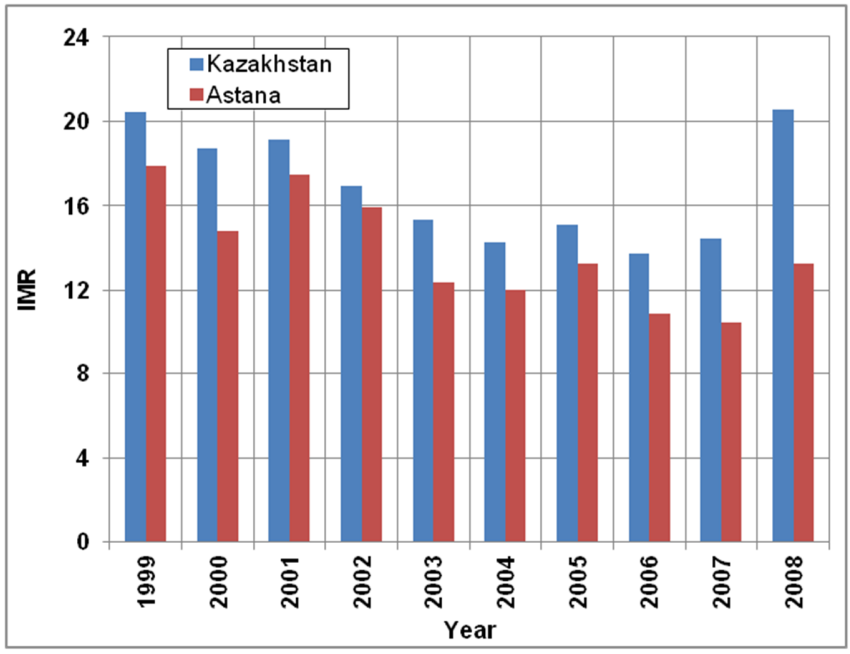
Indicator		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Astana											
Number of deaths		2 941	2 952	3 273	3 410	3 286	3 374	3 618	3 724	3 590	3 307
Crude death rate		8,3	7,2	7,0	6,9	6,5	6,5	6,7	6,6	6,1	5,3
Life expectancy at birth	**Male**	62,6	64,4	64,1	64,9	67,6	66,3	66,0	66,8	69,1	70,7
	Female	72,8	73,9	73,9	74,2	75,3	76,0	75,7	76,0	77,1	78,1
	Difference	10,2	9,4	9,9	9,3	7,7	9,7	9,7	9,3	8,1	7,4
Life expectancy at 65	**Male**	12,2	12,7	13,0	14,0	14,8	14,8	15,2	15,3	17,5	16,9
	Female	15,2	16,0	15,9	16,2	16,3	17,3	17,0	17,1	18,3	18,8
	Difference	3,0	3,3	2,8	2,2	1,5	2,5	1,8	1,9	0,9	2,0
Kazakhstan											
Number of deaths		147 416	149 778	147 876	149 381	155 277	152 250	157 121	157 210	158 297	152 706
Crude death rate		9,9	10,1	10,0	10,0	10,4	10,1	10,3	10,2	10,2	9,7
Life expectancy at birth	**Male**	60,7	60,2	60,6	60,8	60,5	60,7	60,4	60,7	60,8	62,0
	Female	71,0	71,2	71,4	71,5	70,8	72,0	71,7	72,0	72,3	72,5
	Difference	10,3	11,1	10,8	10,8	10,3	11,3	11,3	11,3	11,5	10,5
Life expectancy at 65	**Male**	11,0	11,0	11,2	11,1	11,5	11,3	11,2	11,3	11,3	11,6
	Female	14,5	14,6	14,8	14,7	14,7	15,0	14,9	15,1	15,2	15,4
	Difference	3,5	3,6	3,6	3,6	3,2	3,7	3,7	3,7	3,9	3,8
The difference in life expectancy (Astana, Kazakhstan)											
Life expectancy at birth	**Male**	1,9	4,2	3,5	4,1	7,1	5,6	5,5	6,1	8,3	8,7
	Female	1,8	2,6	2,6	2,7	4,5	4,0	3,9	4,0	4,8	5,6
Life expectancy at 65	**Male**	1,2	1,7	1,9	2,9	3,2	3,6	4,0	3,9	6,1	5,3
	Female	0,6	1,5	1,1	1,5	1,6	2,4	2,1	2,0	3,1	3,5

Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The analysis of infant mortality rate is also showing the current situation in mortality level in Kazakhstan in general and in Astana in particular. The Figure 24 shows the changes in the infant mortality rates for Kazakhstan and Astana during the period from 1999 to 2008 Essentially, the infant mortality rates in Kazakhstan and Astana is showing the same trend of decreasing during this period. However, the infant mortality dropped up in 2008 in both Kazakhstan and particularly in Astana. This was caused by the changes in reporting live births and stillbirths and implementation the new rules according to the international criteria (Department of statistics in Astana 2009). Additionally, in this period in Kazakhstan in general and in Astana in particular the programs aimed to reduce maternal and infant mortality were

implemented. The government established prenatal centers in all regions of Kazakhstan for urgent actions aimed to reduce maternal and infant mortality. However, the main causes of infant deaths during the first year of life should be highlighted. The main causes of infant deaths are congenital anomalies and respiratory diseases.

Figure 24. Infant mortality rate, Astana, 1999-2008



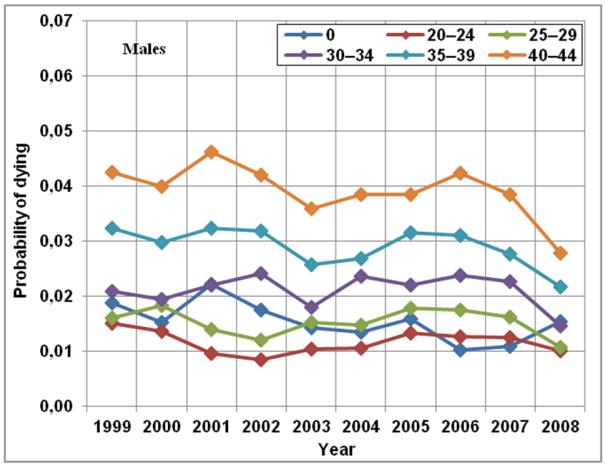
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The degree of the shift in mortality by age in Astana and in Kazakhstan from 1999 to 2008, perhaps, clearly shows the difference in mortality developments. If the reduction in probability of dying in Astana is visible in all age groups, the positive shift in Kazakhstan is not significant compared to Astana. In Astana, in each five-year age group, probability of dying had decreased to a level that corresponds to the intensity of mortality in the younger age groups at the beginning of the observed period. The comparison of probabilities of dying in Astana in 1999 and 2008 shows that the probability of dying among males corresponding to the year 2008 has dropped to the level of previous age group in 1999. For example, the probability of dying for males at age 40–44 reached the level observed in 1999 for males aged 35–39.

However, it should be highlighted that the probability of dying in Kazakhstan in the same period in five-year age groups has not changed. The same trend is observed amongst females in Astana: it also has significantly decreased. Notably, the decrease of the probability of dying is essential at the older ages (55 years and older). In contrast with males Kazakhstani females have experienced the big changes of probabilities of dying during the study period, the only exception is females at age of 0 years. It is noteworthy that the sharp increase in the probability of dying at the age of 0 for both sexes in Astana and Kazakhstan observed in 2008 is due to the aforementioned fact that Kazakhstan has moved to international standards of registration of the infant deaths. These changes in mortality level related to the decrease in the probability of dying for males and females and were common for almost all age groups. In relative terms the decrease in the probability of dying for males in Astana during the period from 1999 to 2008 is more than 45 %. Essentially, the probability of dying is different not only according to the age but

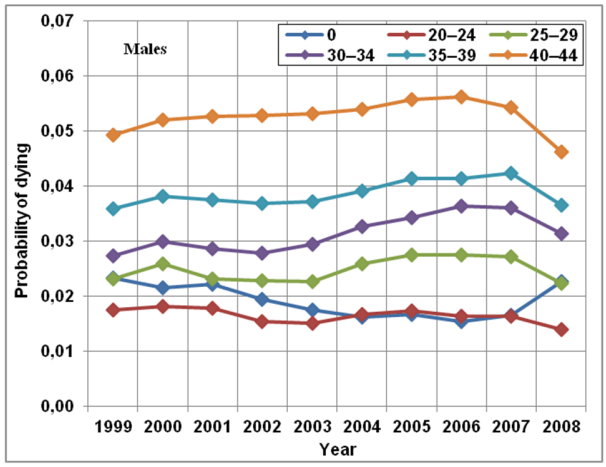
also according to gender. For instance, the probability of dying is higher for males compared to females in both regions: Kazakhstan and Astana city.

Figure 25 a. Probability of dying by sex and age, selected age groups, males, Astana, 1999-2008



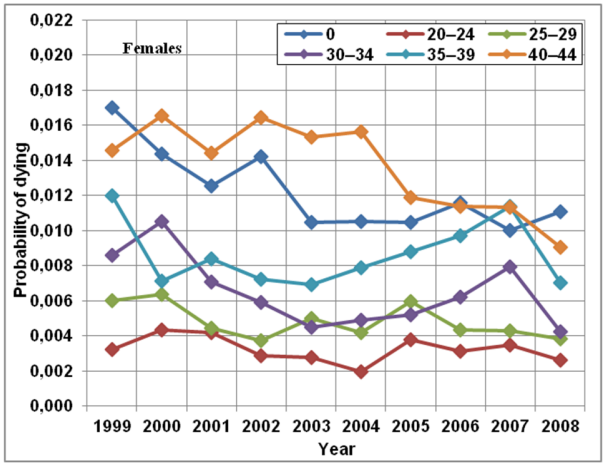
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 b. Probability of dying by sex and age, selected age groups, males, Kazakhstan, 1999-2008



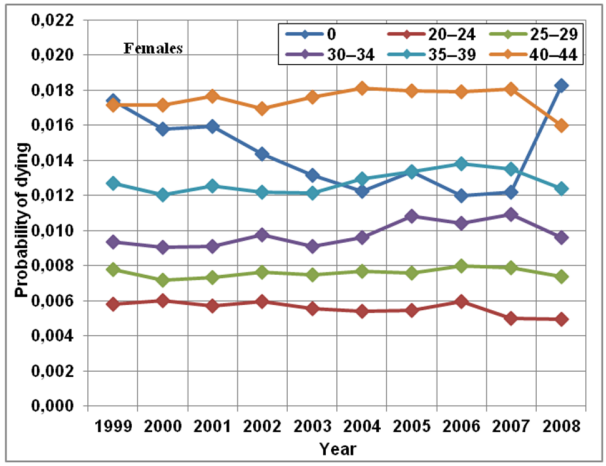
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 c. Probability of dying by sex and age, selected age groups, females, Astana, 1999-2008



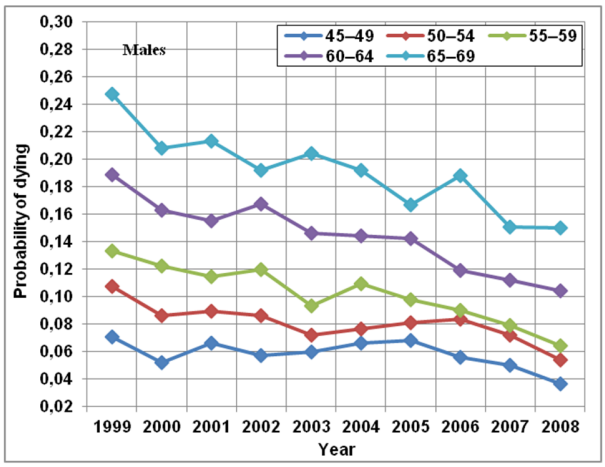
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 d. Probability of dying by sex and age, selected age groups, females, Kazakhstan, 1999-2008



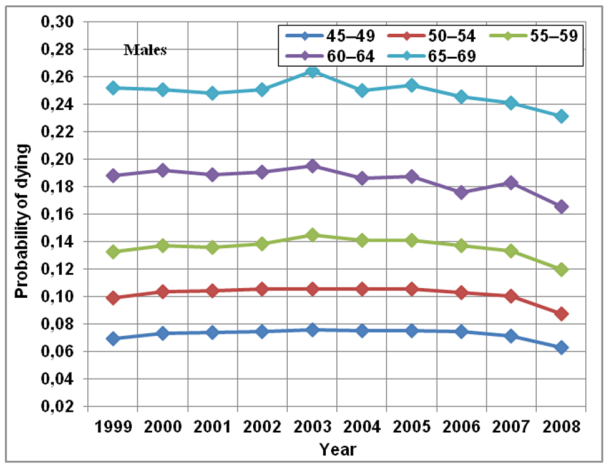
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 e. Probability of dying by sex and age, selected age groups, males, Astana, 1999-2008



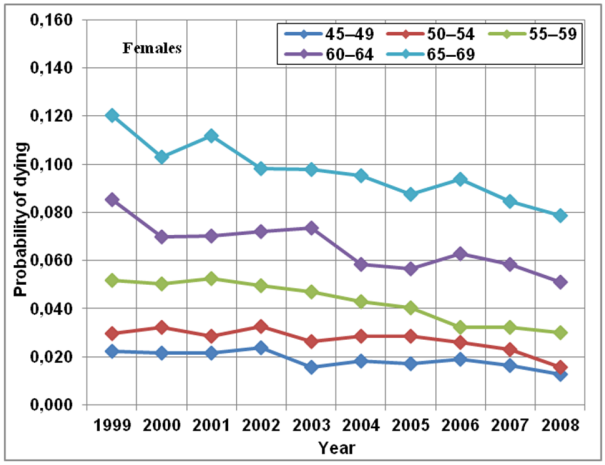
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 f. Probability of dying by sex and age, selected age groups, males, Kazakhstan, 1999-2008



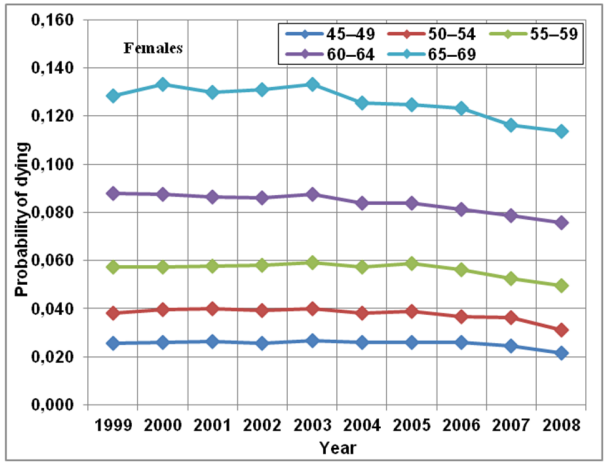
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 g. Probability of dying by sex and age, selected age groups, females, Astana, 1999-2008



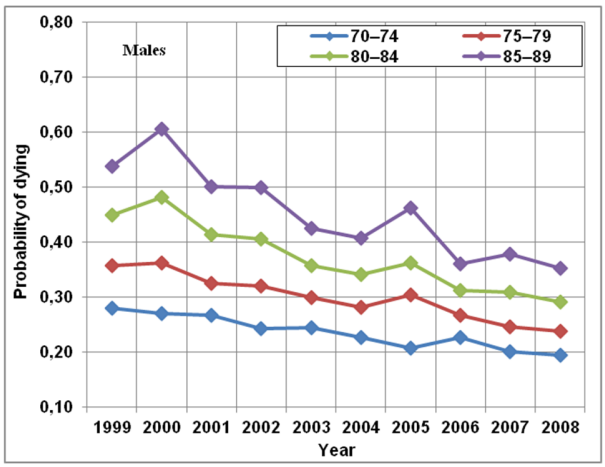
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 h. Probability of dying by sex and age, selected age groups, females, Kazakhstan, 1999-2008



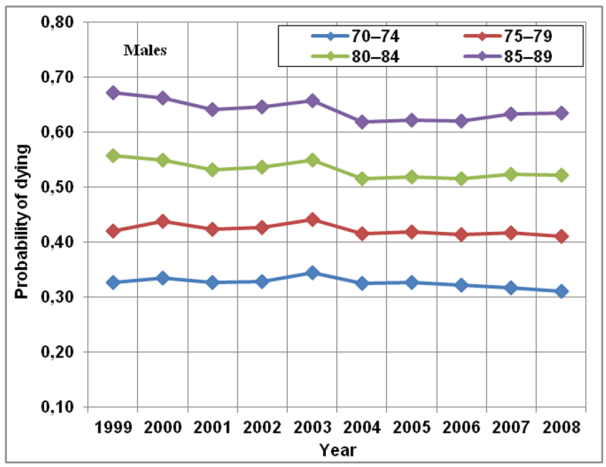
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 i. Probability of dying by sex and age, selected age groups, males, Astana, 1999-2008



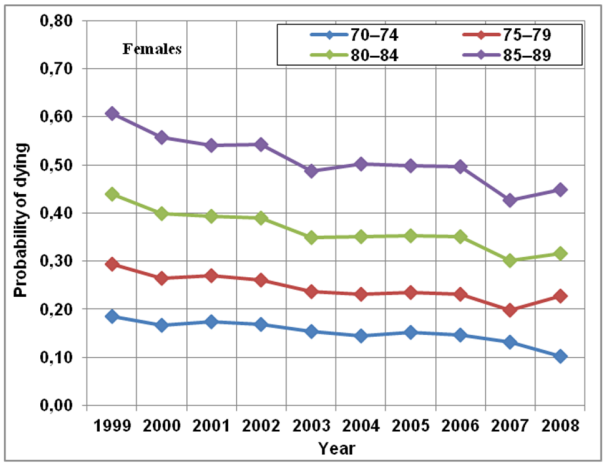
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 j. Probability of dying by sex and age, selected age groups, males, Kazakhstan, 1999-2008



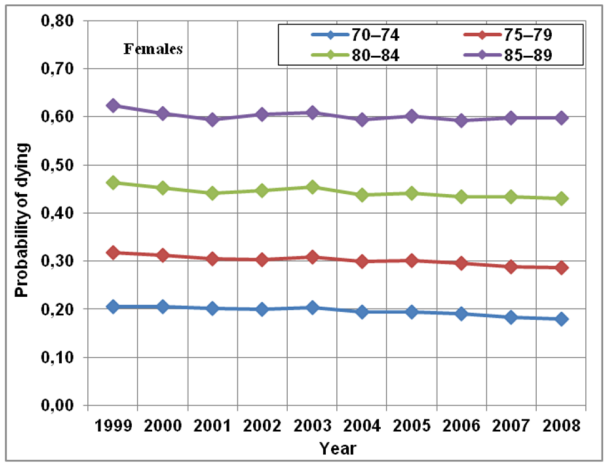
Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 k. Probability of dying by sex and age, selected age groups, females, Astana, 1999-2008



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 25 l. Probability of dying by sex and age, selected age groups, females, Kazakhstan, 1999-2008



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The changes in mortality intensities between 1999 and 2008 for both sexes are located in Table 15. The main indicator is comparative indexes related to the probabilities of dying according to age. The probability of dying in Astana city in comparison to overall Kazakhstani level is reduced at adult ages for both sexes. At the same time the child mortality is increased in Astana city in 2008 and remained at higher level compared to 1999 level. Conclusively, it expected that this reduction of mortality intensities at adult ages will continue in the future. It could be explained by the current improvement of healthcare facilities, medical conditions and general lifestyles of population expressed in reduction of so called Russian patterns, such as: smoking, drinking heavy alcohol and etc.

Table 15. Probability of dying by age and sex (per 1,000 person), Astana and Kazakhstan, 1999, 2003, 2008

	Probability of dying (x 1000)						Index			
	Males			Females			2008/1999 (per cent)		2008/2003 (per cent)	
Age groups	1999	2003	2008	1999	2003	2008	Males	Females	Males	Females
Astana										
0	19	14	15	17	10	11	82	65	108	106
1-4	3	2	4	2	2	2	137	123	156	106
5-9	2	1	2	1	1	1	94	94	188	90
10-14	2	2	1	2	2	1	64	87	60	70
15-19	7	5	5	2	3	3	75	133	106	94
20-24	15	10	10	3	3	3	67	81	98	95
25-29	16	15	11	6	5	4	67	64	71	77
30-34	21	18	15	9	4	4	70	49	81	95
35-39	32	26	22	12	7	7	67	59	84	102
40-44	42	36	28	15	15	9	65	62	77	59
45-49	71	60	36	22	16	13	51	56	61	80
50-54	108	72	54	30	26	16	50	52	74	59
55-59	133	93	64	52	47	30	48	58	69	64
60-64	189	146	104	85	73	51	55	60	71	69
65-69	247	204	150	120	98	79	61	65	73	80
70-74	281	244	194	185	155	102	69	55	80	66
75-79	357	299	238	293	237	228	67	78	80	96
80-84	448	357	292	440	349	316	65	72	82	91
85-89	537	425	352	607	488	449	66	74	83	92

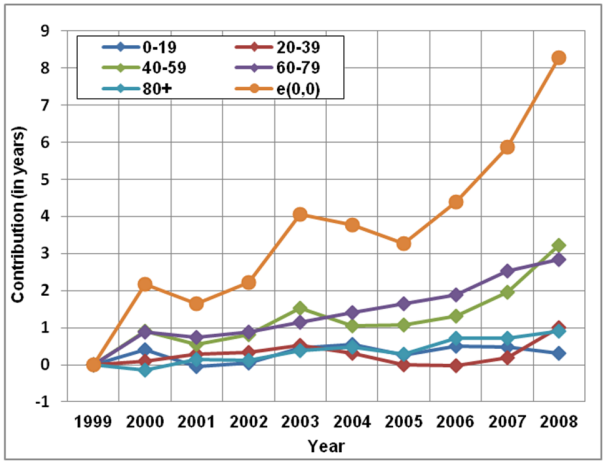
Table 15. Continued

Age groups	Probability of dying (x 1000)						Index			
	Males			Females			2008/1999 (per cent)		2008/2003 (per cent)	
	1999	2003	2008	1999	2003	2008	Males	Females	Males	Females
Kazakhstan										
0	23	17	23	17	13	18	97	105	130	139
1-4	7	5	4	6	4	3	58	54	80	74
5-9	3	3	2	2	2	2	84	86	89	88
10-14	3	3	3	2	2	2	80	95	93	93
15-19	8	7	7	4	4	3	80	90	92	98
20-24	17	15	14	6	6	5	80	86	92	90
25-29	23	23	22	8	7	7	96	94	98	99
30-34	27	29	31	9	9	10	115	103	107	105
35-39	36	37	37	13	12	12	102	97	98	102
40-44	49	53	46	17	18	16	94	93	87	91
45-49	70	76	63	26	27	22	90	85	83	82
50-54	99	105	88	38	40	31	88	82	83	78
55-59	133	145	120	57	59	50	90	87	83	84
60-64	188	195	165	88	88	76	88	86	85	86
65-69	251	264	231	128	133	114	92	89	87	85
70-74	326	344	310	206	204	180	95	87	90	88
75-79	420	442	410	317	308	286	98	90	93	93
80-84	557	549	521	462	454	431	94	93	95	95
85-89	671	657	635	624	610	597	95	96	97	98

Source: Statistic Agency of the Republic of Kazakhstan

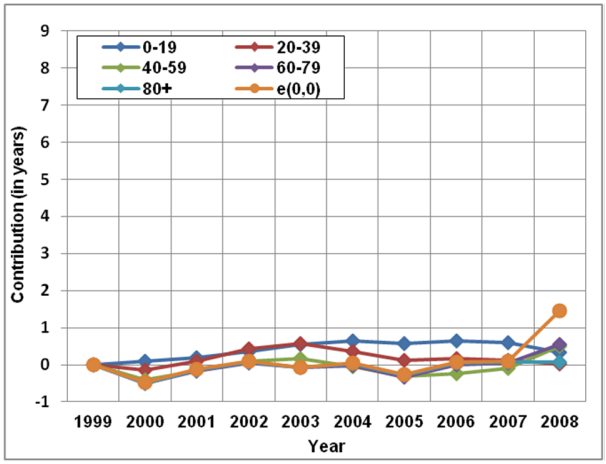
The next four figures represent the contributions of selected age groups to the overall changes in the life expectancies in Astana and Kazakhstan for males and females. Notably, the large gender gap between men and women life expectancies is common for Kazakhstan generally and Astana city particularly. Accordingly, the males' life expectancy in Astana faced big changes during the observed period. The highest contribution to these changes belongs to the age groups: 40-59 and 60-79. At the same time, the Kazakhstani level of life expectancy for males did not change significantly in comparison with trend in Astana.

Figure 26 a. Contribution of basic age groups to change in life expectancy at birth, Astana, 1999-2008 males



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

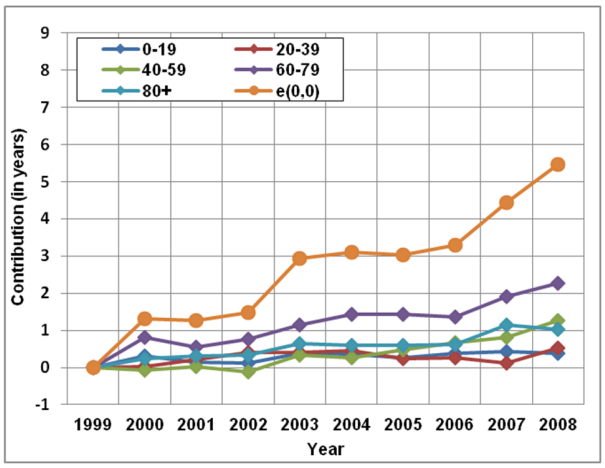
Figure 26 b. Contribution of basic age groups to change in life expectancy at birth, Kazakhstan, 1999-2008 males



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

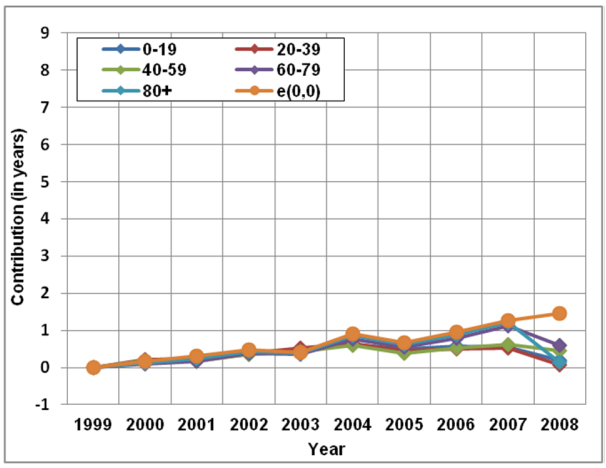
Perhaps this is caused by the aforementioned changes in healthcare, medical and economic conditions in the capital city, while the situation in Kazakhstan and particularly in rural areas and regions with the worst ecological conditions is still negatively affect on the ability to survive. Additionally, the changes among the life expectancies of female population in Astana city are significantly different from the overall Kazakhstani level. The contribution of 60-79 age group to changes in female life expectancies is higher compared to other age groups.

Figure 27 a. Contribution of basic age groups to change in life expectancy at birth, Astana, 1999-2008 females



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure27 b. Contribution of basic age groups to change in life expectancy at birth, Kazakhstan, 1999-2008 females



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Conclusively, the large gender gap between male and female life expectancies allow making an assumption that the life expectancy of males in Astana will grow due to big reserve and gradually reach the females' level. At the same time it expected that due to favorable healthcare, medical, economic and ecological conditions in capital city will lead to increase female life expectancy. However, this increase will be not so rapid as for males.

The differences between male and female mortality intensities are obvious. This could be explained by the excess male mortality caused by specific life style for men in Kazakhstan. In this case it is important to analyse the mortality according to main causes of death. Essentially, the socially conditioned diseases which are mostly related to the economic damage could significantly reduce the life expectancy. Accordingly, in this thesis the main causes of death are under the consideration, such as: the diseases of the circulatory system, neoplasm and external causes of death (suicide, accidents, etc.). From the Table the reduction of deaths according to the selected causes of death for males and females in Astana city is clearly observed. It expected that this tendency will continue in the future for both sexes. However, the contribution of the circulatory system diseases and neoplasm is higher compared to the other causes of death. Nowadays the government implemented the program which is aimed to build the Medical center of prevention and treatment of cancer. The main goal of this medical center is application of international methods, standards and principles of diagnostics and treatment of cancer (Makulbekov 2006). Conclusively, the accessibility of healthcare, medical facilities is key factor in reduction of mortality level in Astana.

Table 16. Standardized death rate by main cause of death (WHO European standard, per 100,000 person), Astana, 1999-2008

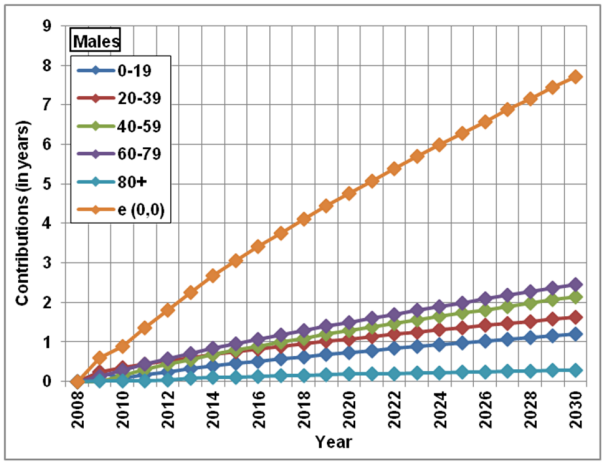
Cause of death	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Males									
Neoplasm	275	234	226	213	181	207	186	169	174	158
Circulatory system diseases	607	536	550	572	539	489	533	492	439	421
Respiratory system diseases	131	117	104	118	107	99	86	92	78	48
Digestive system diseases	49	51	43	36	57	53	49	45	52	35
External causes	278	267	277	253	243	229	225	242	204	139
Other causes	242	207	211	187	173	148	138	133	118	116
Total	1 581	1 412	1 411	1 379	1 301	1 225	1 217	1 172	1 066	916
	Females									
Neoplasm	135	140	133	122	119	103	115	102	100	94
Circulatory system diseases	402	364	365	374	334	324	321	296	277	276
Respiratory system diseases	42	33	30	38	38	31	42	29	28	20
Digestive system diseases	28	28	28	32	31	34	30	35	31	22
External causes	75	64	70	59	70	47	55	65	40	38
Other causes	157	120	141	133	133	137	111	116	120	99
Total	839	750	768	758	725	676	675	643	596	549
	Index (1999=100), Males									
Neoplasm	100	85	82	78	66	75	68	62	64	57
Circulatory system diseases	100	88	91	94	89	81	88	81	72	69
Respiratory system diseases	100	90	79	90	82	76	66	70	60	36
Digestive system diseases	100	103	87	74	116	108	100	92	107	72
External causes	100	96	99	91	87	82	81	87	73	50
Other causes	100	86	87	77	72	61	57	55	49	48
Total	100	89	89	87	82	77	77	74	67	58
	Index (1999=100), Females									
Neoplasm	100	104	98	90	88	76	85	75	74	70
Circulatory system diseases	100	91	91	93	83	81	80	74	69	69
Respiratory system diseases	100	79	72	89	90	74	100	69	67	47
Digestive system diseases	100	102	101	114	113	121	108	124	110	79
External causes	100	86	94	79	94	63	74	87	53	51
Other causes	100	76	89	85	84	87	71	74	76	63
Total	100	89	91	90	86	81	80	77	71	65

Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Accordingly, on the base of the descriptive analysis of mortality trends it could be concluded that mortality level will be stabilized in the nearest future. This is related to the assumption that Astana will transform from a provincial town to the capital during the next 15 years. As a consequence it expected that economic situation, healthcare facilities and other factors influential on the mortality intensities also will reach the international standards. However, the high in-migration flows from the other regions of

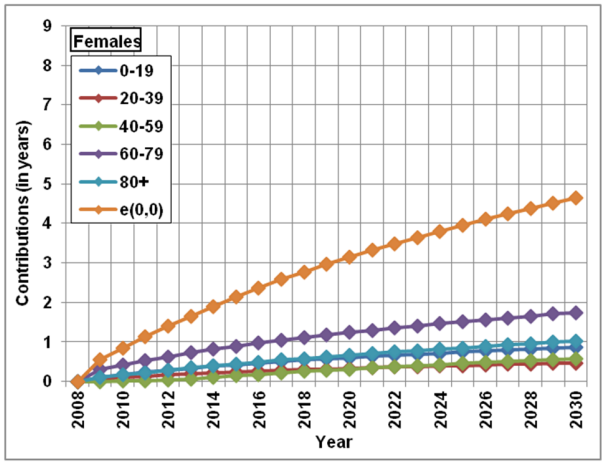
Kazakhstan to Astana expected to be also influential. At the same time it is important to highlight that the in-migrants are mostly highly educated, economically active people. It is essential that according to the several researchers the mortality intensities stratified by the educational level, and level of income is significantly different. For instance, the level of mortality among highly educated population with stable socio-economic conditions is relatively low in comparison to population with basic education and low income. Moreover, the gap between male and female life expectancies is going to shorten. It is obvious that males will survive better and reach the same level of expectation of life at birth as it is observed for females. At the same time, it is expected that the life expectancy at birth for females also will increase. The main contribution in this increase belongs to the decrease in mortality caused by the circulatory diseases and neoplasm for both genders. Meanwhile the infant mortality rate is also expected to decline. The analysis of infant mortality during the period from 1999 to 2008 showed the same trend for Kazakhstan generally and for Astana particularly: this indicator declined during the observation period. At the same time it is obvious that the process of death also depend on other structural characteristics such as: social, educational and occupational categories of population, the physical and social elements of the environment, either separately or in accordance with individual characters and their interactions.

Figure 28 a. Expected contribution of basic age groups to change in life expectancy at birth, Astana, males, 2008-2030, medium variant



Source: Own calculations

Figure 28 b. Expected contribution of basic age groups to change in life expectancy at birth, Astana, females, 2008-2030, medium variant



Source: Own calculations

6.3 Migration

The population of the smallest territorial units was mostly determined by the balance of migration - the total amount and structure of immigrants and emigrants. Furthermore, migration is an important factor in the terms of population development in Astana. Consequently it is important not only for general changes in the population structure, but also for the formation of the demographic, economic and social structures. The forecast of migration of the population is always a problematic issue. Migration flows and its structure is the result of a complex interplay of social, economic, demographic and environmental conditions on the one hand, and active behavior of individuals, on the other. The difficulty in assessing the development of external conditions and the reaction of potential migrants to the Republic of Kazakhstan has also been increased from "atypical" period of total transformation. This chapter considers

the expected migration events in the designated area and based on the general principles of human settlement and spatial mobility of population, an analysis of current trends and assumptions of speculative factors influencing the migration behavior.

The main direction of migration is closely linked to the general pattern of residential development schemes. Currently, the extensive rising stage of urbanization is characterized by both absolute and relative growth of urban population, and the geographic mobility of the population which is mainly oriented unidirectional migration from rural to urban areas. The ongoing transition from quantitative to qualitative growth puts an end to the static concentration of population in urban areas. If in the previous period, migration had primarily stressed the concentration and selectivity, it is now more pressing the function of relational integration. A clear indicator of these changes is the unpredictability of migration and reduction of the balance of migration. Another important feature is the increasing importance of these forms of spatial mobility, which are not associated with a change of residence, but which are increasingly influenced by the regional differences in the distribution of the current population (on the way to work and services, tourism, etc.). The transition from extensive to intensive development phase of the settlement systems in a specific context is reflected in the development of many new forms of settlement.

The development of migration in Kazakhstan, in many cases is characterized by a specific political and economic situation mainly due to external factors. In the 20th century on the territory of Kazakhstan various nationalities were forcibly relocated from other regions of the USSR. This may include the repressions of the Stalin era, when the territory of Kazakhstan was forced for opening of the labor camps. During the Second World War the ethnic Germans were resettled in Kazakhstan, as well as Poles and Caucasus. That had the subsequent impact on the dramatic changes in the structure of the population of Kazakhstan. With the development of virgin Kazakhstan lands Ukrainians and Russians were resettled also. In the 1960s, the titular nation was only 30 % of the total population of Kazakhstan. The situation has reached the point in 1979 when near to Tselinograd (Astana) in the town Yereimentau the resettles wanted to create a German autonomous region. The main goal of the autonomy was the civil rehabilitation of deported German population of Kazakhstan and its legitimization in the places of residence. The important was the desire of the Soviet authorities to fix the Germans in their places of residence and to prevent their emigration; in particular it concerned the security and often among them there were highly skilled specialists in agricultural and industrial sectors of Kazakhstan (Riskozha 2009). With the collapse of the USSR Kazakhstan rapidly began to loose some of its population. Emigration rate was huge. Throughout the nineties of the last century, the predominant migration flow was an emigration from Kazakhstan mainly to Russia, Germany and CIS countries. For over 14 years 3 million out of 16,4 million had left the country. 2,1 million of them left the country permanently. Thus, from 1992 to 2002 due to emigration and declining birth rate the population of Kazakhstan was reduced by 10 percent and amounted to 14,825 million. In the migration flow Slavs and Germans were dominating. Almost 63 – 65 percent of out migrants were persons at working age, and about 45 percent of them had a higher and special secondary education.

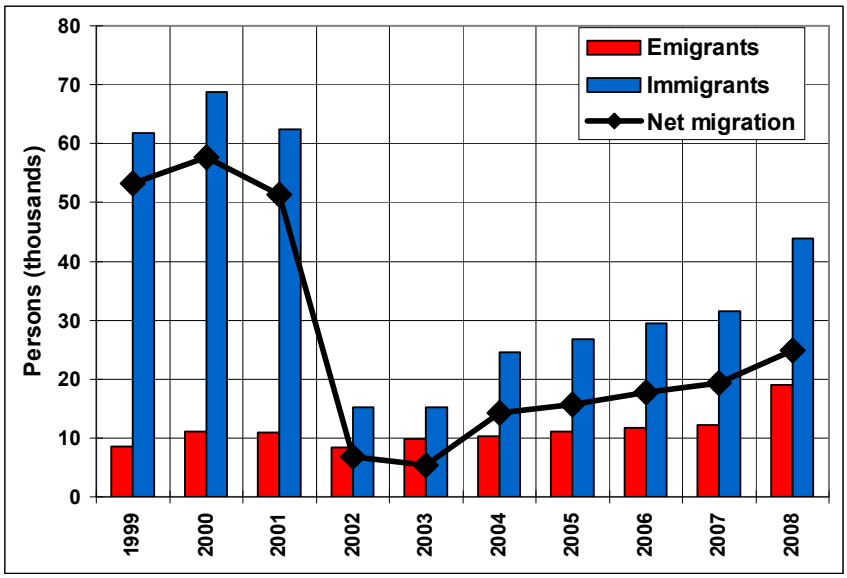
The migration processes in Kazakhstan at this time cannot be called prosperous, as the number of people who left the country was many times greater than the number of immigrants. In the contrast, the migration processes of 2000s show the positive trends. The intensity of emigration flows had declined, and the negative migration had stabilized the balance. Compared with 1994 (when a peak of emigration

from Kazakhstan was reached), in 2004 emigration has decreased by 7,3 times and amounted to 66,5 thousand people. In 2004 for the first time in 36 years there was recorded the positive net migration, which amounted to 2.7 thousand people. In 2005 the trend of increasing trade surplus increases and reaches 22.1 thousand people (Sadovskaya 2011). These changes were mostly caused by implementation of new program aimed at inviting oralmans (Kazakhs who moved from Kazakhstan in the past during establishing Soviet Union, famine, political changes etc.).

In the modern world the population growth of cities depends on different factors. In some places the population increases at the expense of natural increase of urban population and this mainly happens in the eastern countries. In other cases the growth of urban population happens as a result of the changes of administrative territorial borders and joining of suburbs to cities. But the most important factor of urban population size increase is made by mechanic migration increase, representing the difference between those who arrived to the city and the ones who departed.

What are the summands of increase of Astana population size? The answer to this question can be given by the data of current statistics. They prove the factor of migration as the essential component of the growth of Astana's population: migration of population from villages, minor, medium and large cities of Kazakhstan to capital city. It should be mentioned that rural-urban migration as the essential source of urban increase is the indicator of initial level of urbanization in developing countries. According to the current registration the number of the population of Astana on 1st January 2008 had amounted to 602,7 thousand people. Compared with the corresponding period in last year it had increased by 28,3 thousand people, mainly due to the expense of internal migration.

Figure 29. The total migration (in abs. numbers), Astana, 1999-2008



Source: Own calculation. Statistics Agency of the Republic of Kazakhstan.

In 1999-2001 the net migration was greater because of the relocation of public bodies from Almaty to Astana. The subsequent reduction in net migration was due to the fact that many visitors simply had no place to register. They were mainly employed on construction sites of new capital. And their main places of residence were construction projects in Astana.

Table 17. Internal migration (in persons), Astana, 1999-2008

Years	In-migration	Out-migration	Net migration
1999	60 533	2 924	57 609
2000	67 554	3 442	64 112
2001	58 700	3 491	55 209
2002	13 559	4 177	9 382
2003	10 499	4 698	5 801
2004	19 785	4 966	14 819
2005	21 457	5 316	16 141
2006	23 640	5 699	17 941
2007	26 099	6 004	20 095
2008	33 696	8 019	25 677

Source: Agency of Statistics of the Republic of Kazakhstan

Table 17 shows the high rate of internal migration to Astana. This is because large investments were concentrated in Astana. The construction boom has been so overwhelming that Astana has become a magnet for domestic and foreign investors who have invested to the city about $ 13 billion US dollars, although observers believe that this figure is the lower bound estimates, as astounding growth rate of private investment is difficult to estimate. Since the establishment of the Special Economic Zone in 2002, which offers investors tax incentives, it was invested $ 5 billion only in the government quarter (Novy 2008).

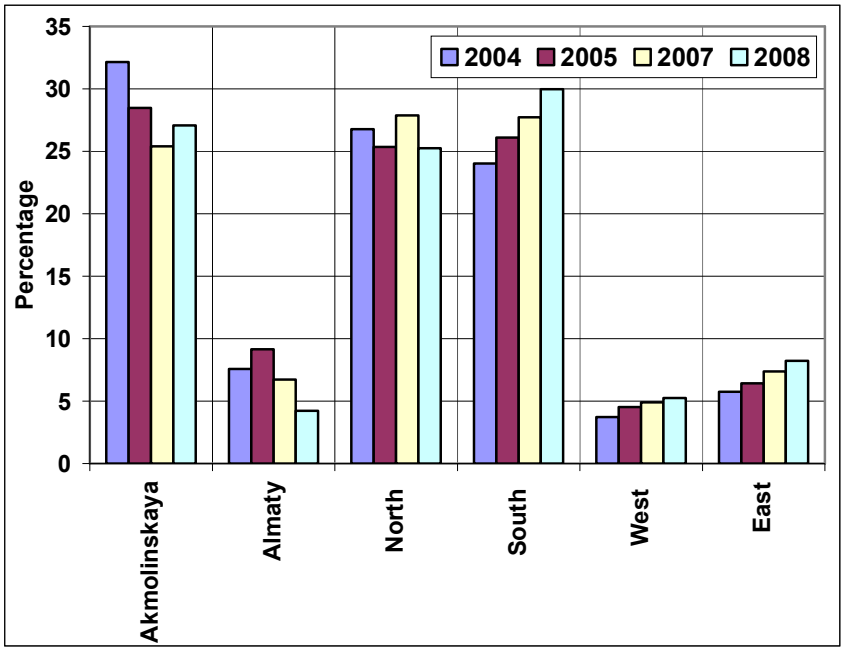
Table 18. International migration (in persons), Astana, 1999-2008

Years	Immigration	Emigration	Net migration
1999	775	5 142	-4 367
2000	604	7 010	-6 406
2001	2 055	5 888	-3 833
2002	705	3 326	-2 621
2003	1 317	1 746	-429
2004	958	1 591	-633
2005	625	1 087	-462
2006	455	688	-233
2007	184	964	-780
2008	526	1 323	-797

Source: Agency of Statistics of the Republic of Kazakhstan

The analysis of migration flow to Astana for the recent years shows several firm channels of migration. The major part of migrants to Astana during the observed period was from Akmola region. The second flow for more than 10 years is formed by previous residents of Almaty, a major part of which is composed of the group of public employees redirected to Astana in connection with the capital transfer including state institutions and organizations. The third flow can be combined by residents of northern and central regions of Kazakhstan: Karagandy region, Kostanai region and North Kazakhstan region. The fourth flow is composed of residents of southern region of the country: Almaty region, South Kazakhstan region, Zhambyl region and Kyzyl-Orda region. In other words, according to the official statistics of inter-territorial migration people migrate to Astana not only from nearest regions but also from farther southern regions of the country (Centr ustoiichivogo razvitiya stolici 2009).

***Figure 30. Net internal migration (in percentage),*Astana, 2004 - 2008, selected years**



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Note: Group of regions by geographic and administrative divisions: North: Kostanaiskaya (Kostanai Oblast), Karagandinskaya (Karaganda Oblast), Pavlodarskaya (Pavlodar Oblast), North Kazakh (North Kazakhstan Oblast); South: Almatinskaya (Almaty Oblast), Zhambylskaya (Zhambyl Oblast), Kyzylordinskaya (Kzyl Orda Oblast), South Kazakh (South Kazakhstan Oblast) West: Aktyubinskaya (Aktobe Oblast), Atyrauskaya (Atyrau Oblast), West Kazakh (West Kazakhstan Oblast), Mangystauskaya (Mangystau Oblast), East: East Kazakh (East Kazakhstan Oblast);Akmolinskaya: in Akmolinskaya (Almola Oblast) located Astana; Almaty: migrants from Almaty

In the future the increasing proportion of southerners among in-migrants will only grow, since this region is considered socially disadvantaged, and population density is higher than in other regions of the country. This is because the investments in the economy are distributed unevenly across the regions. Astana is the leader in attracting of investments from the private and public institutions.

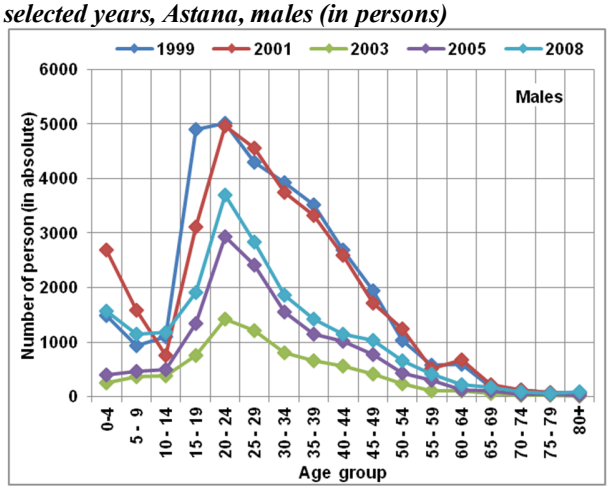
Today the attention of specialists on migration problems in Astana is attracted first of all by the fact that there is one of the largest migration increases of the country. This is demonstrated by dynamics of capital population size: if there were 278.7 thousand people living in the city in 1996, then for October 1, 2001 it made up 490.8 thousand people (Department of the statistics on Astana city 2009). This situation was influenced by demographic (high capacity of population in the south of the Republic and low in the north) and geopolitical (the transfer of capital from Almaty to Astana) factors as well. The main point is that the migration flows consist of bearers of new tendencies and peculiarities of modern replacements of Kazakh part of the country. According to them it is important to note the two flows below.

The first flow consists of Kazakh inter-town migrants arriving to Astana from region centers (except the South part of the country) that have high or special education, qualification, endowed and mostly speak Russian. The second flow is the group of Kazakhs arriving from villages (including the South part of Kazakhstan) with no high education, qualification, with low income and speaking only Kazakh language. Comparative analysis of these two groups (differing not only territorially but also by resources) gives a better picture of a changing social cultural appearance of Astana due to changes of ethnic demographic structure of the city population. During the soviet period it was the Russian culture and

Russian language that dominated in the city for many years. At the moment of capital transfer the city mainly consisted of East-European population and Russian-speaking Kazakhs. Here is the urgency of the question – how the previous residents of mono-ethnic and mono-lingual regions will act at a new place? It is quite obvious, that preferences of these groups in the sphere of occupation, culture and language will influence in many ways the social cultural mosaic of the new capital of Kazakhstan, the development of modern or traditional way of life of the city (Zabirova 2002).

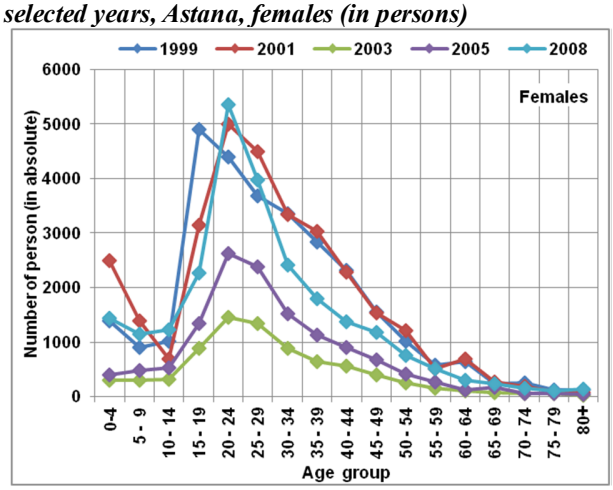
The important factor is the age of immigrants who arrived in Astana. The main factor influencing on the immigration to Astana is the socio-economic factors and the desire to get qualified higher education. Every year the graduates from all regions of Kazakhstan arrive to Astana for studies. The balance of migration shows that the migration process involves mostly the population of the economically active age (Figure 31 a-b).

Figure 31 a. Number of immigrants by age groups, selected years, Astana, males (in persons)



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 31 b. Number of immigrants by age groups, selected years, Astana, females (in persons)

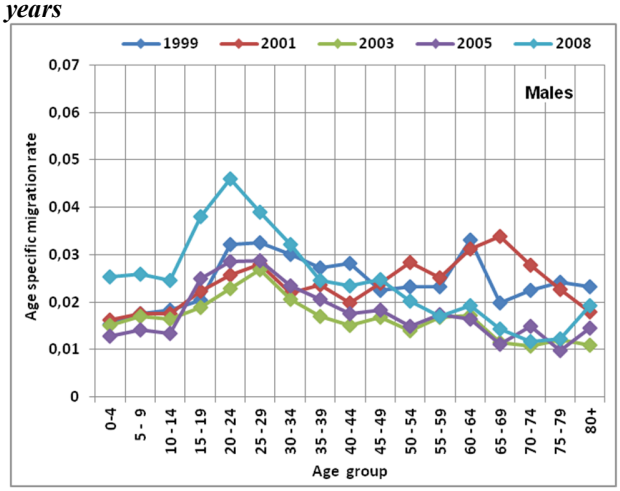


Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The high level of emigration rate to Astana in 2008 can be attributed to the financial crisis. Building objects of Astana began to stop rapidly. This sector involves a lot of visitors. Most visitors mainly were engaged in the construction sector.

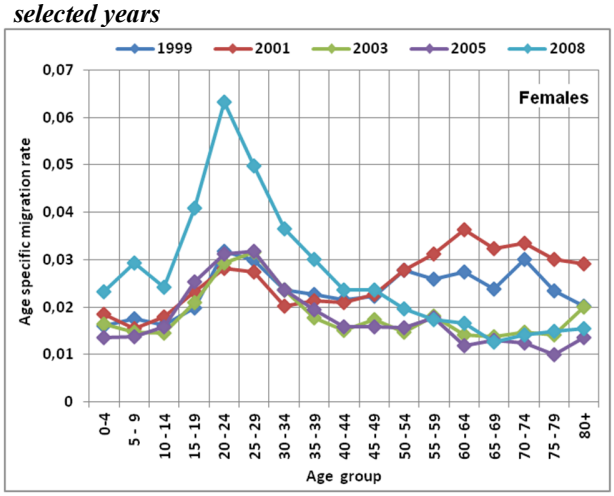
High net migration for the 18-30 age groups was due to the fact that 18 years old persons were tend to migrate in order to complete secondary education. Young people mostly prefer to study in the capital city. Consequently, those who did not begin their career in the construction and service sector which do not require higher education are in the majority in Astana. At the age of 22-23 years young people receive their higher education. Accordingly, their work is becoming more popular and highly paid. Today there are only few cities which are attractive for young people with higher education. Among them: dynamically developing young capital Astana, financial and cultural center Almaty, and oil capital Atyrau.

Figure 32 a. Emigration rates, Astana, males, selected years



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

Figure 32 b. Emigration rates, Astana, females, selected years



Source: Own calculation. Statistic Agency of the Republic of Kazakhstan

The development of migration process is characterized by considerable uncertainty and wider magnitude of unknown factors than any other component to some extent, since migration flows and its structure is the result of comprehensive social, economic, demographic and environmental components. Better opportunities which were mentioned in "Theory of migration" (Lee E. S. 1966) clearly state that "gravity force" which attracts people to Astana will be increasing within future decades. Therefore, this component is very sensitive to environmental changes or better say to "feeling of amenities".

Nowadays Astana faces an issue in assessing the development of external conditions and the reaction of potential migrants multiplied by the overall changes of society. Based on this assumption, it is undoubtedly that an impact of migration will reflect to the future development of Astana population more significantly than fertility and mortality once. Moreover, both mortality and fertility will be formed from incoming of "new Astanians" flow. According to some specialists the main factor is impressive investments into the development of Astana, 13 billion of USD spent being another proof for such attractiveness. Migration will have mainly interregional nature. At the interregional level, net migration is always positive while international migration presents negative values (Table 17-18).

Conclusively it is essential that gravity force of "better opportunities" impresses the development of population by components.

6.4 Overview of future scenarios

Projected findings presented descriptive understanding of population development in Astana starting from 2008-2010. At this time, the availability of definitive data about the population in 2008 and the preliminary total number of births, deaths, immigrants and emigrants were available. By default, the sex and age structure of population was chosen as 31 December 2008, which was published by the Agency of Statistics of the Republic of Kazakhstan. Finally, classic way to get a deterministic forecast is the result of three options for capturing the future of its facilities and sex structure of the population of Astana: medium variant represent the forecasts of the likely future development; low variant is presenting

"poorest" values respectively. High variant changes imaginary boundary of the field within the upper limit. Variants of total projections respectively mark changes in the expected trends in the components.

Table 19. Expected development of total fertility rate, life expectancy at birth and net migration rate, Astana, 2008-2030

Year	Total fertility rate			Life expectancy at birth						Net migration,		
	Low	Medium	High	Males			Females			person		
				Low	Medium	High	Low	Medium	High	Low	Medium	High
2008	2,38	2,38	2,38	70,7	70,7	70,7	78,1	78,1	78,1	24 880	24 880	24 880
2010	2,32	2,36	2,44	71,3	72,1	72,0	78,7	78,9	79,1	16 000	19 000	25 000
2020	1,75	1,96	2,10	73,9	75,2	76,3	80,5	81,4	82,1	12 000	16 000	19 000
2030	1,83	2,10	2,19	76,0	77,9	79,3	81,6	82,9	83,8	12 000	16 000	19 000

Source: Own calculation based on descriptive analysis

In terms of aggregate performance parameters (Table 19) assumes a new versus the previous outlook slightly above the final level of fertility, which should be dynamic and move away from this level. It reflects the experienced higher levels of recovery (i.e. recovery) after the fertility decline in 90's, as well as a higher level of implementation of the pending birth rate than what we have in the case with previous forecasts predicted. Deferred compensation in the parental generation that participated in the transformation described above intensively, that is, especially for women born in the 70's, started later, or starts now slower, than was generally expected. In recent years, however, gained in intensity and accumulated losses, women manages to catch up in different ways. Projected assessment of the level and structure of mortality by sex and age, collectively expressed in terms of value of total life expectancy at birth received a significant increase especially in men. Investment policy in health is yielding positive results in life expectancy at birth (Baimukhanov 2011; Pravitel'stvo R.K. 2006). Expected development of migration was partially revised on the basis of the development process from 2002 to 2008 and taking into account estimates of individual pending the development of migration (Resolution of the Government of the Republic of Kazakhstan 2001). Master plan was developed a research group of Japan International Cooperation Agency (JICA) under the guidance of world-renowned Japanese architect Kisho Kurokawa (Centr ustoichevogo razvitia stolici 2009), according to a sketch - the idea that won the international competition. But the rapid development of the city of Astana has identified a higher rate of population growth of capital as well as economic development. As a result, inherent in the master plan prepared by Kisho Kurokawa urban numbers for 2010 have surpassed in 2004 by population and 2005, regional gross domestic product. So now it is needed to make adjustments to the current master plan in the light of new circumstances and opportunities. However, the basic ideas, principles of construction of territories laid down in the master plan prepared Kisho Kurokawa, remain in force. Study group of the Kazakhstan Institute of Management, Economics and Planning research conducted new calculations prospective population of the city until 2030. According to the group in 2030, Astana will have more than 1,2 million people. World financial crisis in 2008 slowed down economic growth and construction boom in Astana, where the bulk of the migrants involved. Most of the money allocated by the Government went to the resumption of construction in Astana as one of the anti-crisis measures. With these actions the uneven distribution of financial flows makes Astana attractive to migrants from less developed regions of Kazakhstan for several decades.

Chapter 7

Forecast results

7.1 Total population

Forecast of the population of Astana for the period 2008–2030 was prepared with the application of traditional cohort component method of population development. For this purpose the population was divided into three groups by age and two groups by gender identification. The structure of population was represented by detailed age structure of the population at the end of the calendar year, particularly the year 2008. The model considers the process when the new born cohort is gradually pushing the one-year time step to a higher age with taking into account the mortality and migration processes, which are two out of three major components of reproduction. The third component of model is fertility, mostly represented by the intensity of fertility according to the age of mothers.

During the construction of the model of future population development, a general plan of the city for 2030 was used. A set of selected combinations with forecasted values of reproduction parameters with application of the classical cohort-component forecasting model to the structure of population at the beginning of 2009 was applied. The forecasting by one-year steps provides the expected population size by sex and age groups and additionally gives the expected number of demographic events. The obtained results show that according to the medium variant the population of Astana is expected to increase gradually from 639,310 in 2008 to 1 131,360 by 2030 (figure 33). Additionally, it is expected that the population will continue to grow during the forecasted period. Also it is expected that the internal migration flows to the capital city will be stabilized in the future. According to the governmental plan developed in 2002, the estimated number of population in 2030 will reach the level of 800 000. However, with taking into account the high migration intensities the plan was corrected in 2005. Consequently, the expected number of population in 2030 reached 1.2 million. (Centr ustoichevogo razvitia stolici 2009).

Figure 33. Population size in three variants, Astana, 2008-2030

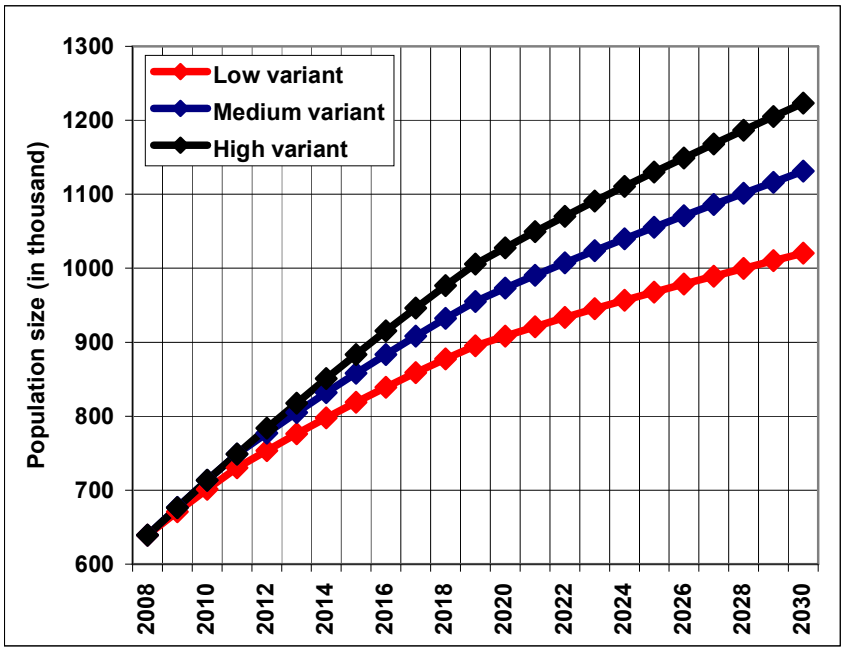
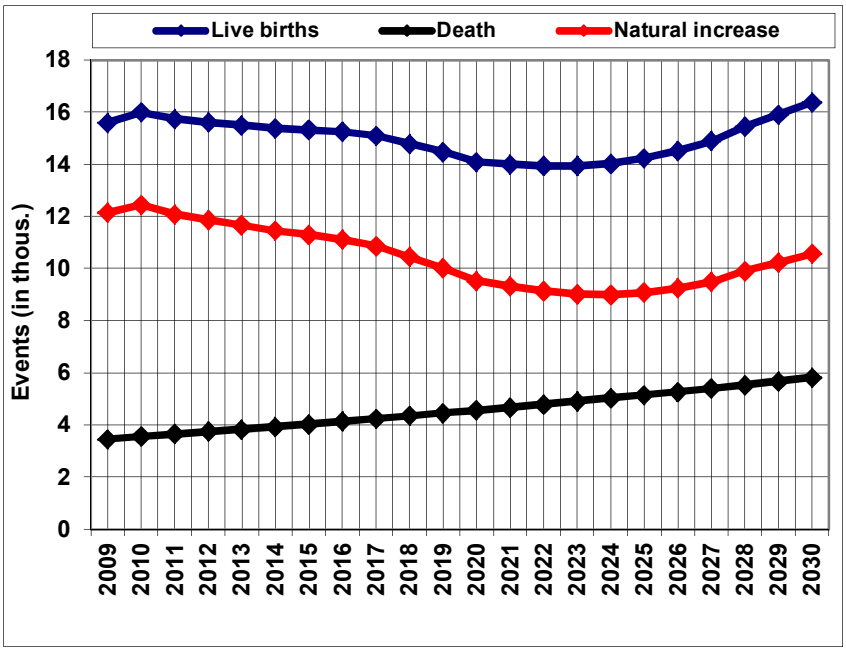


Figure 34. Births, deaths and natural increase, Astana, 2008-2030, medium variant



Additionally, according to the forecasting results the fertility rates in Astana will gradually stabilize, and will have a tendency to decrease. For example, the TFR in 2008 was equal to 2.38, while in 2030 it is expected to be at level 2.10. At the same time the annual number of death is expected to increase compared to the level of mortality in 2008. Relatively large cohorts born after the Second World War and large number of births born during the 1950–1960s reached elderly ages and contribute this increase. Additionally, annual migration in Astana will be 16 thousand persons per year in forecast period.

7.2 Age and sex structure of population

Immediately following the declaration of Astana as the new capital, economic forces brought a tide of immigration leading to further economic and demographic changes which are still the in process of settling towards their sustainable norms. Migration due to the availability of new jobs acts as a self-selection criteria for immigrants; those of working age will be at the center of any migrating group entity which in the case of Astana has greatly influenced the 'new' demographic of the young capital. The changes in age distribution historical and projected from 2008 to 2030 are shown in figures 35–37 and illustrate the process of restoration to the 'new normal'.

Forecasted results show greater life expectancy causing an overall ageing of the population of Astana throughout the period from 2008 to 2030. Particular impact will come from the children of the 'baby boom' which followed World War II, now reaching 60 years old and expecting to live considerably longer than their ancestors, consequently accelerating the increase of the population at older ages

Figure 35. Age and sex structure of the population, Astana, 2010 in comparison with 2008, medium variant

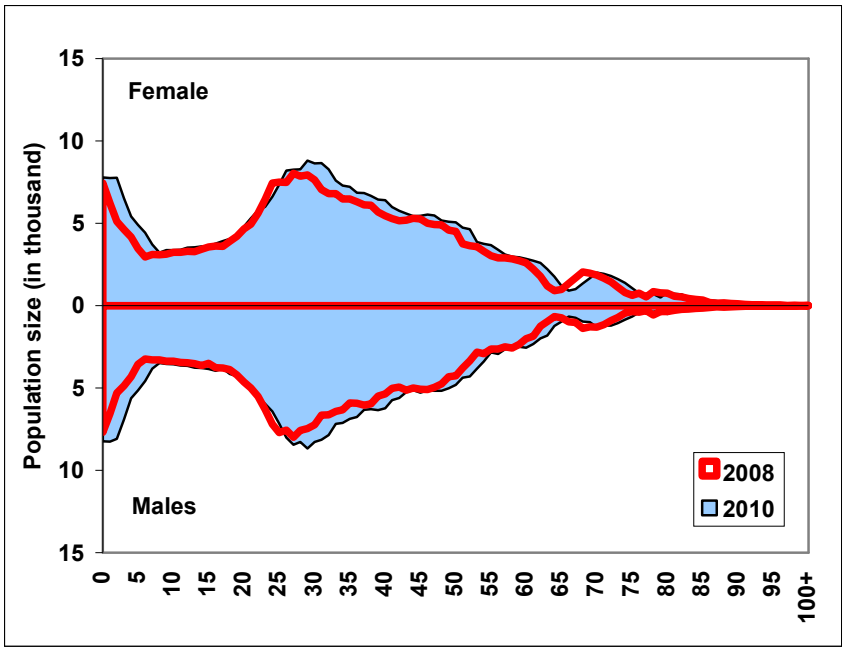


Figure 36. Age and sex structure of the population, Astana, 2020 in comparison with 2008, medium variant

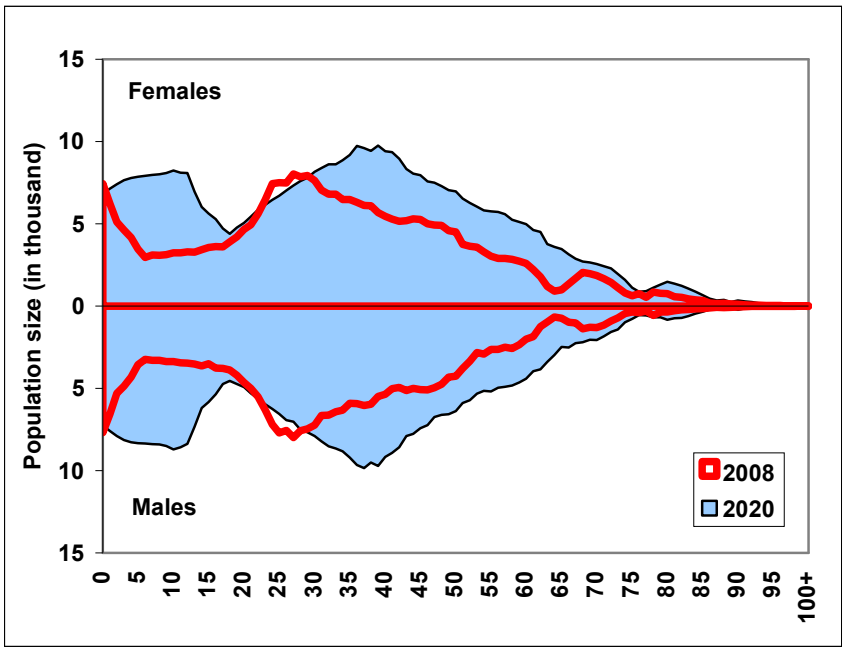
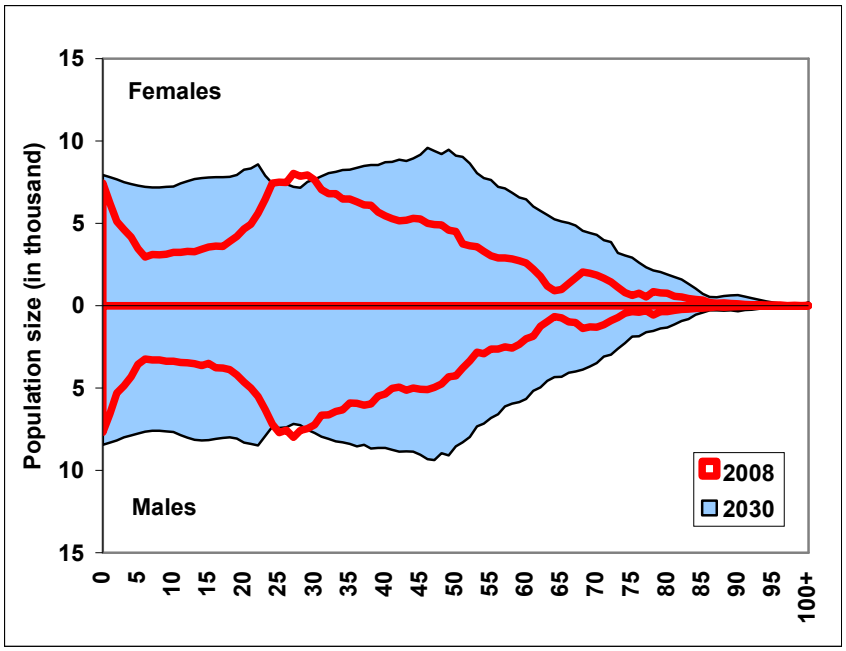
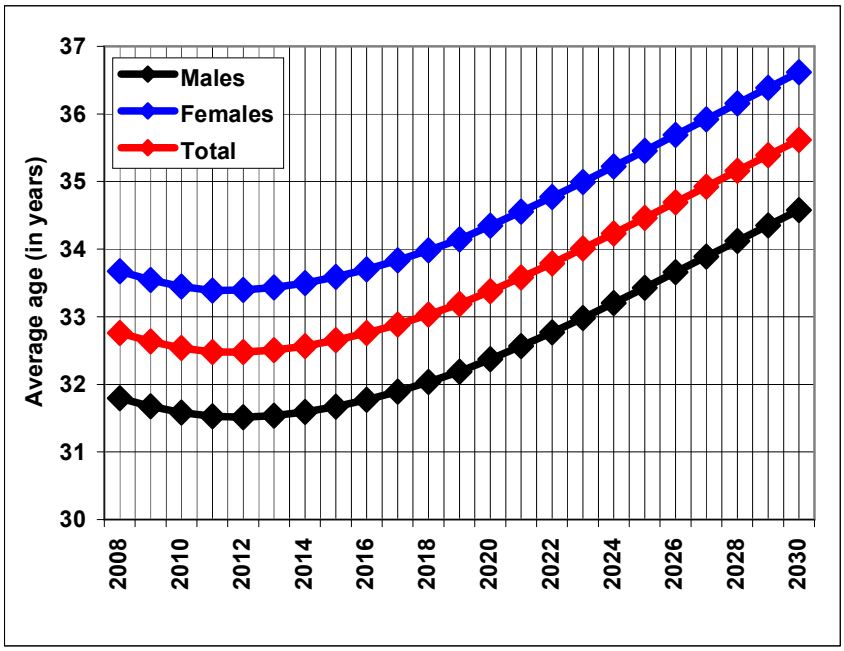


Figure 37. Age and sex structure of the population, Astana, 2030 in comparison with 2008, medium variant



Similarly, while the proportion of the old population will grow, the age structure will become gradually older and the average age will rise as well. Thus, between 2008 and 2030 the mean age will rise from 31.8 to 34.6 years for males and from 33.7 to 36.6 years for females (figure 38). From 2008 to 2030 the gap of average age between males and females will be stable.

Figure 38. Average age of population, Astana, 2008-2030, medium variant



Projected future trends with changes in the size of the three broad subgroups of the population are illustrated in the figures below (figure 39 and figure 40). The total number of children under the age of 15 is forecasted to increase by 53 per cent from 122,749 in 2008 to 230,920 persons to 2030. During the same period the proportion of this age group in relative terms will be continuously increase from 19.2 to 20.4 per cent.

Figure 39. Population age composition, Astana, 2008-2030, medium variant

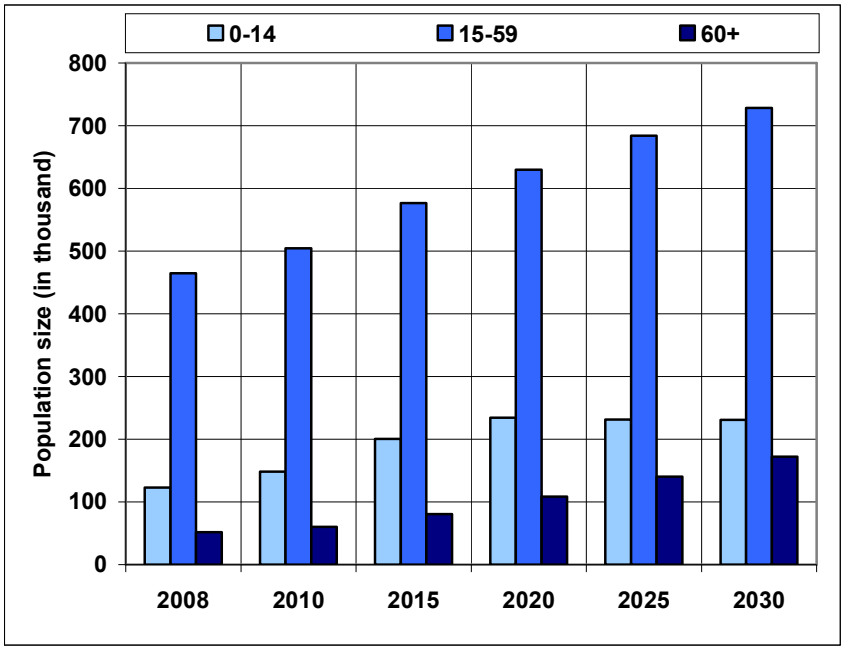
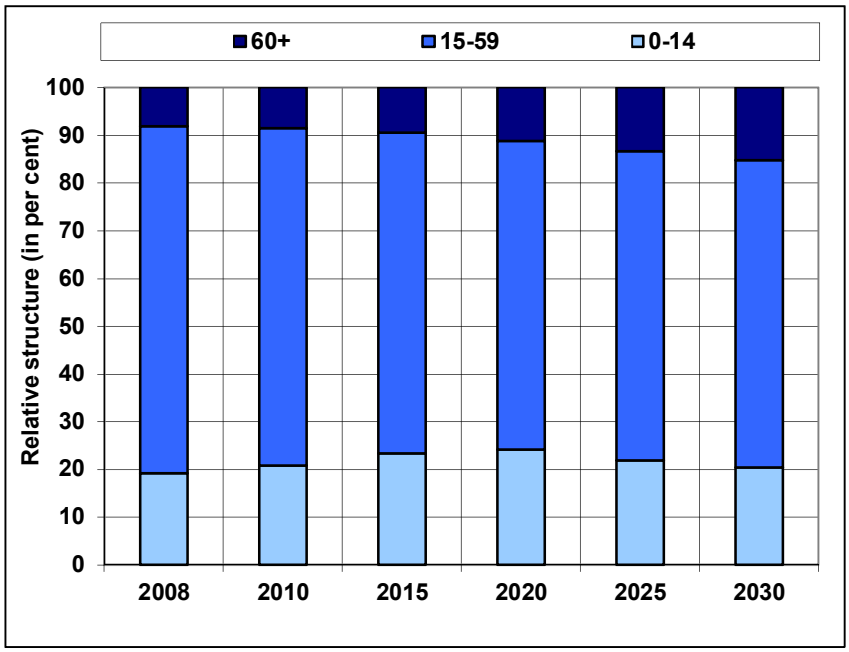


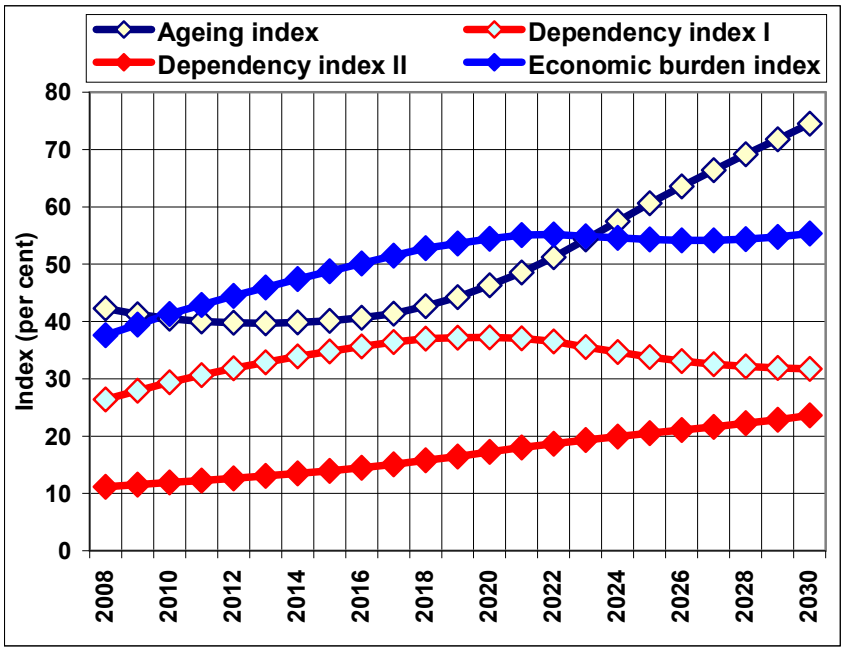
Figure 40. Population age composition, Astana, 2008-2030, medium variant



Despite of the increase of the forecasted number of population for age group of 15-59 which expected to reach 728,188 persons in 2030, the weight of this age group in age composition will decrease from 72.7 per cent in 2008 to 64.4 in 2030. It is important to mention, that the population increasingly growing at older ages coupled with the reduction in young population effects the working age population in such a way that it becomes older.

During the forecasted period, the number of people at age of over 60 is projected to increase (331 per cent) from 51,914 persons in 2008 to 172,016 persons by 2030. In relative terms the population of this age group will rise from 8.1 to 15.2 per cent. Accordingly, these changes in the age structure will have significant effect on the future proportion of dependants in the population. Figure 41 shows changes in the projected dependency ratios. The economic burden index represents the "total" dependency ratio in the forecast period. Additionally, it is expected that it will gradually rise from 37.6 in 2008 to 55.3 dependants per 100 persons of working age in 2030. However, it is necessary to take into account that the age boundaries used for the computation of the indexes are not strictly fixed and somewhat approximate, for example the age when full-time education ends and retirement starts can cover quite a range. However, labor market changes may have a greater impact than demographic tendencies in their influence on real (economic) dependency (Jonson and Falkingham 1992), (Verdiyeva 2010).

Figure 41. Dependency ratios, Astana, 2008-2030, medium variant



Note:

Aging index-member of persons aged 60 and older per 100 children aged 0-14

Dependency index I – number of persons aged 60 and older per 100 persons aged 15-59

Dependency index II- number of persons aged 60 and older per 100 persons aged 15-59

Economic burden index – number of children aged 0-14 and number of person aged 60 and older per 100 people at 15-59

Chapter 8

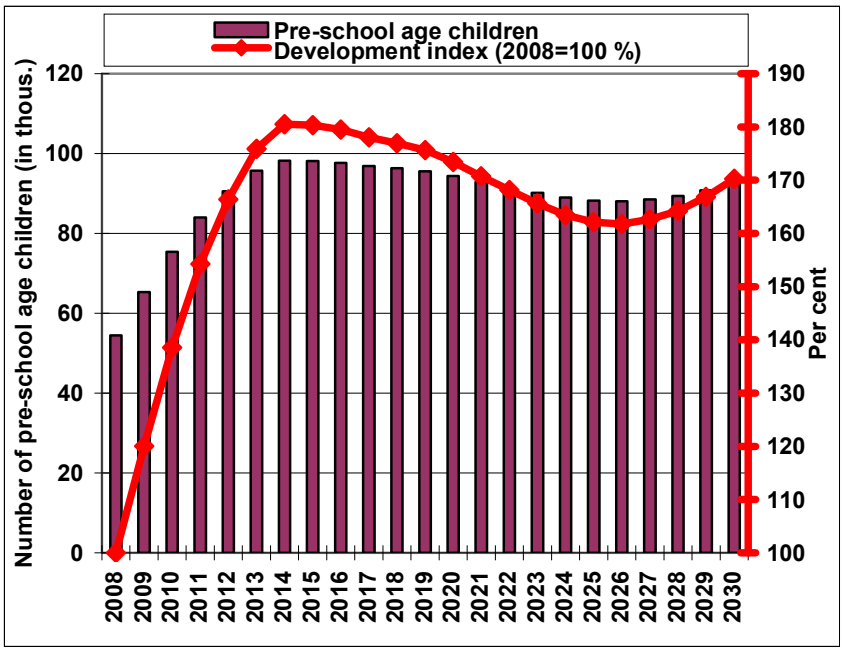
Pre-school education needs

8.1 Results and measures

Pre-school education as a basic part of the education system of the Republic of Kazakhstan has significant influence on developing the character and training abilities of children in the process of preparation for secondary school. The rise in demand for pre-school education institutions to service a growing population is not challenged, none the less it appears the pre-school education infrastructure currently in place cannot effectively cover even a third of current requirements; for example, when the number of children at pre-school age in Astana were counted at 54,417 persons in 2008, the capacity in kindergartens was equal to 14,605 seats (Department of Education of Astana city 2009).

The results of population forecast allow correction of existed governmental plans in this field, and also gives the possibility to reflect over the future constructions of social buildings, mainly pre-school institutions. According to the results gathered here, it is evident that the demands of future pre-school population will grow in Astana, mainly due to significant increase in fertility rates, until 2014, at which point women born in 1990 (who are in minority compared to the other age groups) will reach the fertile age. Analysis of the current situation suggests that demand for pre-school education institutions will undoubtedly rise until 2014 and stabilize by 2030 According to the forecast results, pre-school education needs will reach the point of 98,137 seats in 2014 and in 2030 this number will be equal to 94,645. Figure 42 shows the development of pre-school education needs in relative terms from 2008. Accordingly, the presented results suggest the high growth of future pre-school education needs in first decade of the period under consideration. The pre-school education needs will reach the highest value in 2014 (181 percent), then will gradually decrease, and finally will reach the forecasted degree at 172 percent.

Figure 42. Number of pre-school age children and development index (2008 = 100 %), Astana, 2008-2030, medium variant



Taking into account the forecasting results of the population development at the starting point of new social programs can minimize the risks of huge and expensive social projects. According to the data given by the department of education of Astana by the end of the Governmental program "Balapan"current pre-school education institutions can cover only 70-72 percent of new born babies. Further, it is expected that this level remains at 71 percent in the near future. The results of pre-school education needs forecasting given below (Table 20) suggest the similar situation until 2019.

The results show the increase of pre-school education needs in the near future. Based on this trend the government of Republic of Kazakhstan implemented the "Balapan" program for the period from 2010 to 2014, aimed to satisfy pre-school education needs. Government policy options include covering part of the costs of private pre-school education institutions for children born in families with young parents (under the age of 29). The main goal of this program is to satisfy all pre-school education needs by providing qualitative services in pre-school education centers. According to this project it is planned to increase the number of pre-school education institutions by building additional pre-school centers, with capacity of 8,275 places in 2010, 9,370 places in 2011, 7,640 places in 2012, 4,880 places in 2013, and 1,600 places in 2014 respectively (Komitet po ohrane prav detei 2010). As a result of this project the number of new places in pre-school education institutions it is expected to increase by up to 31,845. Accordingly, in 2014 in Astana the number of places in kindergartens is expected to reach 46,450. However, according to the forecasting results the pre-school needs are expected to reach 69,743 in 2014 thus in relative terms the coverage of pre-school education needs will remain at 67 percent.

Table 20. Future pre-school education needs in Astana, 2009-2030, medium variant

Age	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Absolute numbers												
1 year	12 776	15 523	16 000	16 377	16 019	15 849	15 751	15 640	15 591	15 533	15 395	15 099
2 year	10 422	13 146	15 851	16 309	16 609	16 254	16 088	15 994	15 884	15 837	15 781	15 646
3 year	9 493	10 767	13 442	16 101	16 492	16 789	16 437	16 276	16 184	16 076	16 030	15 976
4 year	8 501	9 802	11 040	13 663	16 242	16 614	16 908	16 559	16 402	16 312	16 206	16 162
5 year	7 030	8 783	10 051	11 251	13 793	16 329	16 682	16 973	16 628	16 474	16 387	16 283
6 year	6 195	7 301	9 016	10 247	11 382	13 873	16 362	16 695	16 983	16 641	16 491	16 407
Total	**54 417**	**65 322**	**75 399**	**83 949**	**90 536**	**95 708**	**98 230**	**98 137**	**97 671**	**96 873**	**96 291**	**95 572**
Development index (2008=100 %)												
1 year	100	121	125	128	125	124	123	122	122	122	120	118
2 year	100	126	152	156	159	156	154	153	152	152	151	150
3 year	100	113	142	170	174	177	173	171	170	169	169	168
4 year	100	115	130	161	191	195	199	195	193	192	191	190
5 year	100	125	143	160	196	232	237	241	237	234	233	232
6 year	100	118	146	165	184	224	264	269	274	269	266	265
	2008	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Absolute numbers												
1 year	12 776	14 738	14 339	14 255	14 199	14 202	14 290	14 503	14 783	15 131	15 666	16 112
2 year	10 422	15 301	14 947	14 554	14 474	14 418	14 421	14 508	14 717	14 992	15 334	15 861
3 year	9 493	15 793	15 455	15 108	14 720	14 643	14 589	14 592	14 677	14 883	15 153	15 488
4 year	8 501	16 063	15 885	15 552	15 213	14 831	14 757	14 704	14 707	14 791	14 993	15 257
5 year	7 030	16 198	16 101	15 927	15 601	15 269	14 894	14 823	14 770	14 773	14 855	15 053
6 year	6 195	16 265	16 182	16 088	15 919	15 599	15 275	14 907	14 839	14 788	14 791	14 871
Total	**54 417**	**94 358**	**92 909**	**91 485**	**90 125**	**88 962**	**88 226**	**88 036**	**88 494**	**89 358**	**90 791**	**92 642**
Development index (2008=100 %)												
1 year	100	115	112	112	111	111	112	114	116	118	123	126
2 year	100	147	143	140	139	138	138	139	141	144	147	152
3 year	100	166	163	159	155	154	154	154	155	157	160	163
4 year	100	189	187	183	179	174	174	173	173	174	176	179
5 year	100	230	229	227	222	217	212	211	210	210	211	214
6 year	100	263	261	260	257	252	247	241	240	239	239	240

Finally, it must be highlighted that the pre-school education needs expected to increase up until 2014. However, from 2014 to 2025 the pre-school education needs will decline. Finally, this trend expected to grow again and stabilize at a significantly lower level that that of 2014.

Chapter 9

Conclusion

This thesis aimed to investigate the future population development and from this construct a forecast future pre-school needs in Astana until 2030. In this regards the analysis on development of pre-school education needs in the Republic of Kazakhstan and Astana for the period from 1999 to 2008 were considered. As a result of this thesis, the picture of trend development and its impact on future population size and structure were obtained. During an analysis of pre-school education needs the following tasks were fulfilled: using existing available data the description of the main parameters, the analysis of main forecast parameters, forecasting of pre-school education needs with the help of forecasting methods, and presentation of the main results. Moreover, during an analysis of future pre-school needs the comparative analysis of trends in Astana and at national level (Republic of Kazakhstan) is employed.

In this thesis, the population forecasting was estimated by cohort-component model. Additionally, the population forecasting inputs were obtained in three scenarios (presented in chapter 6) and underlying assumptions were based on analysis of the recent demographic trends, exhaustively investigated with regard to factors influential upon them. Also comprehensive explanations of observed current trends as well as diligently calculated results of the forecasting process were provided. However, it is necessary to highlight that any future, including the demographic future of every single country or city is uncertain (Keilman, 1990).

During the analysis the set of hypotheses were formulated. According to the publications of some demographers the fertility level is declining over the world. This trend caused by health care facilities improvement, female empowerment, changing attitudes towards family, children, and conjugal relationships. The first hypothesis was related to the assumption that in the nearest future the fertility level in Astana as well as in Kazakhstan will be reduced. Additionally, it was expected that the natality in Astana will decrease.

The results show that the age contribution to the overall fertility showed a significant shift towards an older age group (25-29) in Kazakhstan. Hence, this tendency closely related to the aforementioned changes in society, such as: recuperation of postponed births due to economic and political changes in early 1990's will cause slight shifts in the age groups in the future. Essentially it is important to highlight that in Kazakhstan the average age of women at childbearing is increasing and has reached 28.08 years. It

is essentially to note that this process is ongoing, accordingly, on the base of analysis of fertility timing in Kazakhstan it could be concluded that Astana will experience the same trend. While, the high flows of in-migration to Astana from other regions of Kazakhstan could serve to 'correct' the fertility timing in the immediate future, it is important to highlight that this effect will be reduced over time in Astana and the values will be located within boundaries of 15-35 age groups with higher concentration in the group of 20-29. Conclusively, the mean age of childbearing is expected to shift towards older ages despite the currently observed decrease in average age at childbirth. As mentioned before, rapid social changes along with the increasing emancipation of women lead to the postponement of first childbearing. All these factors such as: women's education and transformation of the education system from 11 years to 12 years in a basic school, increasing labor force participation of women, socio-economic conditions, measures of population and family policies directed to increase the number of kindergartens and contraception usage could decrease the fertility level generally and on the average age of childbearing particularly.

According to the analysis of the NRR and GRR values in Astana which were positioned below the replacement level during the last 10 years it is expected that the low number of daughters born in this period will be not able to meet the requirement of the generational replacement and as a consequence a long term insufficient fertility can lead to a natural decline. However, in 2007 these values seemingly reached the replacement level. At the same time, on the base of previous analysis it could be argued that in Astana will be a gradual decline in fertility during the period from 2009 to 2020. Additionally, along with entry of girls born after the year 2007 to the reproductive age, which is out of timing boundaries of this research (in the end of forecasting period), it could be expected that the level of fertility will have slightly positive growth.

The other hypothesis was related to the assumption which considers gradually decreasing mortality rates all over the world. This is objective consequence of improvement of health care facilities, living conditions, increasing availability of medicine and new technologies. The hypothesis to be tested during an analysis of future population trends is that life expectancy at birth in Astana will increase, while the mortality rates will decrease.

Consequently, in 1999, life expectancy at birth for men was equal to 62.56 and 72.78 for women. Life expectancy at birth for males in 10 years increased to 70.87 and for women to 78.51. Accordingly, on the base of the descriptive analysis of mortality trends, the following conclusion will be reached: the mortality level will be stabilized in the near future. This is related to the assumption that Astana will become a "real" capital from a "provincial" town in the next 15 years period. As a consequence it expected that the economic situation, healthcare facilities and other factors influential on mortality intensities will also reach international standards. However, the high in-migration flows from other regions of Kazakhstan to Astana are expected to be also influential. At the same time it is important to highlight that the in-migrants are mostly highly educated, economically active people. It is essential that according to the several researchers the mortality intensities stratified by the educational level, and level of income is significantly different. For instance, the level of mortality among highly educated population with stable socio-economic conditions is relatively low in comparison with basic education population and low income. Moreover, the gap between male and female life expectancies is going to shorten. It is expected that males will survive better and reach the same level of expectation of life at birth as it is currently observed for females. At the same time, it is expected that the life expectancy at birth for

females also will increase. The main contribution in this increase belongs to the decrease in mortality caused by the circulatory diseases and neoplasm for both genders. Meanwhile the infant mortality rate is also expected to decline. The analysis of infant mortality during the period from 1999 to 2008 showed the same trends for Kazakhstan generally and for Astana particularly: this indicator declined during the observation period. At the same time, it is observed that the process of death also depends on other structural characteristics such as: social, educational and occupational categories of population; the physical and social elements of the environment, either separately or in accordance with individual characters and their interactions.

The next hypothesis based on the aforementioned assumptions and considering the following statement: the future pre-school education needs will decrease as a consequence of fertility and mortality levels decrease. According to the results it is observed that the sum of future pre-school population will grow in Astana. This is mainly caused by the significant increase in fertility rates until 2014 at which point women, born in 1990 will reach the fertile age however they shall be fewer in number than previous years, the natality thus are expected to descend. The analysis of the current situation suggests that demands on pre-school education institutions will undoubtedly rise until 2014 and stabilize by 2030. Accordingly, the presented results suggest the high growth of future pre-school education needs in first decade of the period under consideration. The pre-school education needs will reach their highest value in 2014 (181 percent), then it will gradually descend, and finally will reach the forecasted degree at 172 percent. Finally, it must be highlighted that whereas pre-school education demand is expected to increase until 2014, from 2014 to 2025 the pre-school education needs will continually decline. Finally, this trend expected to recover and grow again until it will stabilize at a level significantly lower than that of 2014.

Production of new reviewed forecasts on a regular basis may contribute to the accuracy of the population forecast. Incorporation into the model of more detailed parameters may also contribute towards their veracity. At the same time research based on special surveys may shed light into the many influential factors mentioned within the basic analysis of study. Detailed analysis, assessment of accuracy and quality of statistical data focused on ascertaining the appropriate set of methods and approaches for demographic estimations deserve special research. Broadly speaking, as future research should be concentrated narrowly on the in-depth analysis and estimation of current population development, so it should enumerate, investigate and validate the wide scope of methods and approaches which may contribute to the population forecasting in Astana.

References

Alekseenko, A., Aubakirova, Z., Sarsembayeva, G. (2011). Demograficheskie uspehi Kazakhstana. http://demoscope.ru/weekly/2011/0451/tema01.php

Arriaga, E. (1994). Population Analysis with Microcomputers. Chicago, Vol. 1. P.335-342

Artikbayev, Zh. O. (2000). *Istoria Kazakhstana*. Astana: Foliant

Asian Development Bank (2004). Education reforms in countries in transition: Policies and processes www.adb.org/Education/educ-reforms-countries.pdf

Becker, Gary S., (1960). "An economic analysis of fertility," Demographic and Economic Change in Developed Countries, Gary S. Becker, ed., Princeton: Princeton University Press,

Baimukhanov, A. (2011). V Astane poyavitsa novyi oncocentr. http://profinance.kz/2011/04/14/v-astane-povits-novy-onkocentr.html

Basu, K. (2001). Gender and Say: A Model of Household Behavior with EndogenouslyDetermined Balance of Power," Cornell University, unpublished manuscript.

Becker, H.S. (1960). Notes on the concept of commitment. Am. J. Sociol.66: 32−40.

Becker, G. S., Barro, R. J. 1988 . ''A Reformulation of the Economic Theory of Fertility,'' Quarterly Journal of Economics 103, 1]25.

Becker, G. S., and Lewis, H. G. 1973 . ''On the Interaction between the Quantity and Quality of Children,'' Journal of Political Economy 2, 279]288

Bestuzhev-Lada, I.V. (1999). Depopulyatsiya: sotsialnye problemy// Demograficheskie problemy semyeinaya politika: regionalnye problemy. Materialy nauchno-prakticheskoi konferentsii (Lipetsk, sentyabr 1999 goda).

Bogue, D.J. (1980). Techniques for Making Population Projections: Age-Sex Projections. Chicago.

Bogue, D.J. (1993). Readings in Population Research Methodology, Volume 5. Population Models, Projections and Estimates. Chicago.

Bongaarts, J., Watkins S.C. (1996). "Social interactions and contemporary fertility transitions," Population and Development Review 22(4):639-682.

Bongaarts, J. (2001). "Fertility and reproductive preferences in post-transitional societies," in *Global Fertility Transition*, Rodolfo A. Bulatao and John B. Casterline, eds. *Population and Development Review*, Supplement to Vol. 27. New York, Population Council, pp. 260-281.

Bongaarts, J. and Johansson E.(2002). "Future trends in contraceptive prevalence and method mix in the developing world," Studies in Family Planning, 33(1): 24-36.

Bulatao, R. A. and Casterline J.B. eds. (2001). Global Fertility Transition. Population and Development Review, Supplement to Vol. 27. New York: Population Council.

Caldwell, J. C. (1982). Theory of Fertility Decline. Academic Press, London

Castro, Luis, J. Rogers A. (1983). "What the age composition of migrants can tell us". Laxenburg: International Institute for Applied Systems Analysis.

Centr ustoichevogo razvitia stolici, (2009). Social'naya sfera goroda Astany. http://www.curs.kz/about_city/socialnaya_sfera/

Centr ustoichevogo razvitia stolitsy, (2009). Demograficheskaya situatsiya g. Astany http://www.curs.kz/about_city/demograf/

Cleland, J. and C.Wilson. (1987). 'Demand theories of the fertility transition: an iconoclastic view' Population Studies 41(1), 5-30.

Coale, A.J., Demeny, P., Vaughan, B. (1983). «Regional model life tables and stable populations». New York: Academic Press.

Davis, K (1945). "The world demographic transition", Annals of the American of political and Social Science, 273 (Jan.) 1-11

Department of Education of Astana city, (2009). Razvitie obrazovania v gorode Astana. www.bilim.astana.kz

Department of the statistics of Astana city, (2009). Demografichesky ezhegodnik goroda Astany. http://astana.stat.kz/docs/3505.rar

Department of the statistics of Astana city (2008). Demografichesky ezhegodnik goroda Astany.

Dorius, S.F. (2008). "Global demographic convergence? A reconsideration of changing intercountry inequality in fertility." Population and Development Review. 34(2): 519-537.

Easterlin,R. (1975). "An Economic Framework for Fertility Analysis" Studies in Family Planning, 6.

Gali, D. (2006). Klasternoe razvitie ekonomiki i osobennosti protsessov urbanizatsii naseleniya Kazahstana (na primere g. Astany) // Ekonomika i statistika. -№2.

Gavrilov L.A., Gavrilova N.S. (2001). The reliability theory of aging and longevity. *Journal of Theoretical Biology*, 213(4): 527-545.

Gorelyi, A.B., Kovalenko, N.A. (2009). Prognozirovanie izmeneniya chislennosti uchashchihsya obshchyeobrazovatelnyh uchebnyh zavedeniyah. Harkova// Vestnik NTU «HPI». Sbornik nauchnyh trudov. Tematicheskii vypusk «Sistemnyi analiz, upravlenie i informatsionnye tehnologii». – Harkov: NTU «HPI» – № 4.

Grazhdannikov, Y.D. (1974). “Obzor analiticheskih modelyei, ispolzuemyh dlya prognozirovaniya dinamiki chislennosti naseleniya, sm. v: Prognosticheskie modeli sotsialno-demograficheskih protsessov. Novosibirsk: S. 16-23.

Heligman, L. and Pollard, J.H. (1980). The Age pattern of mortality. Journal of the Institute of Actuaries, 107, 49-77.

Hirschman, C. (1994). “Why Fertility Changes”. Annual Review of Sociology Vol.20, pp. 203-233

International Union for the Scientific Study of Population (1958). “Multilingual demographic dictionary”. New York: United Nations Department of Economic and Social Affair.

Iontsev, V.A., Sagradova, A.A (2003). Vvedenie v demografiyu. Moskva: TEIS.

Isserman, A.M. (1985). Economic-Demographic Modeling with Endogenously Determined Birth and Migration Rates: Theory and Prospects// Environment and Planning. Vol. 17. P. 25 – 45. http://www.envplan.com/abstract.cgi?id=a170025

Jonson, and Falkingham, (1992). “Ageing and economic welfare”. London: Sage.

Kabeer, N. (1994). Reversed Realities: Gender Hierarchies in Development Thought. Verso: London

Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. Development and Change, Volume 30, Number 3, July 1999. Blackwell Publishing

Kaldybayeva, T.Zh. (2000). Sotsialnye problemy doshkolnogo obrazovaniya v Kazahstane. http://www.ecsocman.edu.ru/data/664/974/1219/011.KALDYBAEVA.pdf

Keilman, N. (1990). “Uncertainty population forcasting: issues, backgrounds, analyses, recommendations”. Amsterdam: Swets & Zeitlinger Publishers.

Keilman, N., Cruijsen H. (1992) “A comparative analysis of the forecasting process”. Amsterdam: Swets and Zeitlinger Publishers.

Kishor, S. (2000). "Women's Contraceptive Use in Egypt: What Do Direct Measures of Empowerment Tell Us?" Population Association of America, Los Angeles.

Knodel, John E., and E. van de Walle. 1979. "Lessons from the Past: Policy Implications of Historical Fertility Studies."Population and Development Review, 5(2): 217-45. Reprint No. 169.

Komitet po ohrane prav detei (2010). Pasport programmi “Balapan”. http://www.bala-kkk.kz/

Lee, E.S. (1966).A Theory of Migration. Demography, Vol. 3, No. 1., pp. 47-57. http://links.jstor.org/sici?sici=0070370%281966%293%3A1%3C47%3AATOM%3E2.0.CO%3B2-B

Lesthaeghe, R. (1983). “A century of demographic and cultural change in Western Europe: An exploration of underlying dimensions”, Population and Development Review, New York, 1983 (3): 411-435.

Long, F.J. (1992).”Accuracy, monitoring, and evaluation of national population projections” in National Population Forecasting in Industrialized Countries edited Keilman, N.; Cruijsen, H.129-142.

MacQuarrie, K. (2008). Time to Conception in India: Does Women‟s Empowerment Weaken the

Influence of Son Preference and Sex Composition? .

MacQuarrie, K., J. Edmeades, et al. (2007). Women, Husbands, and In-Laws: Abortion Decision-making in Madhya Pradesh, India Population Association of America. New York, NY.

Malhotra, A, R Vanneman, et al. (1995). "Fertility, Dimensions of Patriarchy, and Development in India." Population and Development Review 21(2): 281-305.

Malhotra, A. and M. Mather (1997). "Do Schooling and Work Empower Women in Developing Countries? Gender and Domestic Decisions in Sri Lanka." Sociological Forum 12(4), p. 599-630.

Malhotra, A., and Rekha Mehra (1999). Fulfilling the Cairo Commitment: Enhancing Women's Economic and Social Options for Better Reproductive Health. International Center for Research on Women. Washington, D.C.

Malhotra, A., S. R. Schuler, et al. (2002). Measuring Women's Empowerment as a Variable in International Development. Washington, DC, ICRW: 58.

Malhotra, A. and S. Shuler (2005), "Women‟s Empowerment as a Variable in International Development." In Measuring Empowerment: Cross-Disciplinary Perspectives. 71–88. Narayan, D. ed. Washington D.C.: World Bank, Gender and Development Group.

Makulbekov, N. (2006). Poruchenie glavi gosudarstva vipolnyaiutsa. http://www.zakon.kz/60916-poruchenie-glavy-gosudarstva.html

Mason, K.O. (1986). "The Status of Women: Conceptual and Methodological Issues in Demographic Studies." Sociological Forum 1(2): 284-300.

Mason, K.O. (1997). Demography, Volume 34, Issue 4, November,443-454.

Medkov, V.M. (2008). Demografiya: uchebnik. 2-ye izd. Moskva: INFRA-M,

Meldeshova, A (2010). "Differentiation and dynamics of fertility in Kazakhstan during the period of rapid economic growth" Prague: Charles University in Prague, Faculty of Science

Ministry of education and science of the RK, (2009). Programma po obespecheniyu detyei doshkolnym vospitaniem i obucheniem «Balapan» na 2010 - 2014 gody http://www.bala-kkk.kz/fileadmin/user_upload/files/monitoring_i_informacionno-analiticheskoi_dejatelnosti/BALAPAN.doc

Morgan, S., S. Stash, et al. (2002). "Muslim and Non-Muslim Differences in Female Autonomy and Fertility: Evidence from Four Asian Countries." Population and Development Review 28(3): 515-737.

Mumtaz, Z. and S. Salway (2005). "„I Never Go Anywhere‟: Extricating the Links between Women's Mobility and Uptake of Reproductive Health Services in Pakistan." Social Science and Medicine 60(8):1751-1765.

Multilingual Demographic Dictionary (1982). Dolhain, Belgium: Ordina Editions

Murphy, K. M., and Topel R. H. (2005): "The Value of Health and Longevity," Journal of Political Economy, 114, 871–904. [1859]

Natsionalnyi tsentr kachestva obrazovaniya (2009). Natsionalnyi doklad o sostoyanii i razvitii obrazovaniya. Astana: NCOKO.

Natsionalnyi tsentr kachestva obrazovaniya (2010). Natsionalnyi doklad o sostoyanii i razvitii obrazovaniya. Astana: NCOKO.

Novy, D. (2008). Astana: novoe chudo Evrazii. http://www.zakon.kz/114390-astana-novoe-chudo-evrazii.html

O'Neill, B.C., Balk, D., Brigman M., Ezra, M. (2001) "A Guide to Global Population Projections", Demographic Research, Vol. 4, Article 8. Max-Plank-Gesellschaft, 203-288.

Pande R., et al. (2008). "Son Preference, Family Composition and Women‟s Reproductive Behaviors in Madhya Pradesh, India." Under submission.

Poslanie Prezidenta Respubliki Kazahstan «Novoe desyatiletie - novyi ekonomicheskii podem - novye vozmozhnosti Kazahstana» (2010). http://www.akorda.kz/

Pravitel'stvo R.K. (2006). Postanovlenie Pravitel'stva Respubliki Kazahstan ot 31 iyulya 2006 goda N 719. http://ru.government.kz/docs/p060719~1.htm

Resolution of the Government of the Republic of Kazakhstan № 1064 on approval of the General Plan of the city of Astana was adopted on August 15, 2001

Respublikanski centr "Doshlkol'oe detstvo" (2005). Sistema doshkol'nogo vospitania. http://www.predschool.kz/ru/

Respublikanski centr "Doshlkol'oe detstvo" (2009). Analyze sostoyaniya doshkolnogo obrazovaniya. http://www.predschool.kz/ru/

Riskozha, B. (2009). "Pochemu 30 let nazad pitalis' sozdat' nemeckuiu avtonomiu". http://rus.azattyq.org/content/nemeckaja_avtonomia_v_Kazakhstane/1775802.html

Ryder, Norman B. (1983). "Cohort and Period Measures of Changing Fertility," pp.737-756 in R.A.Bulatao and R.D.Lee (eds.), Determinants of Fertility in Developing Countries, Volume 2, London: Academic Press.

Sadovskaya, E. (2011). "Sovremennaya migracionnaya situacia v Kazakhstane: novie vyzovy, reshenya problem". http://www.baiterek.kz/index.php?journal=7&page=127

Sidorov, A.A. (2005). "Territorialnaya organizatsiya naseleniya". Uchebnoe posobie. V 2-h razd. Tomsk: Tomskii mezhvuzovskii tsentr distantsionnogo obrazovaniya, - R.2. - 211 str.114

Smirnova, I.V. (2004). Demografiya: Uchebno-metodicheskoye posobiye dlya studentov spetsial'nosti «Gosudarstvennoye i munitsipal'noye upravleniye» / filial SZAGS v g. Kaluga. – Kaluga, 138 s.

Sostoyanie doshkol'nogo vospitaniya i obucheniya Respubliki Kazahstan v 2010 godu (2011). http://www.edu.gov.kz/en/activity/doshkolnoe_i_srednee_obrazovanie/doshkolnoe_vospitanie_i_obuchenie/soderzhanie_doshkolnogo_vospitanija_i_obuchenija/sostojanie_doshkolnogo_vospitanija_i_obuchenija_respubliki_kazakhstan_v_2010_godu/

Spiegelman, M. (1968). "*Introduction to Demography*". Cambridge, MA, P. 406.

Strategicheskii plan razvitiya Respubliki Kazahstan do 2020 goda (2010). http://www.climate-action.kz/uploads

Strulik, H. and Vollmer, S. (2010). "The fertility transition around the world – 1950-2005". PGDA Working Paper №57.

Tasmagambetov, I. (2008). Encyclopedia of Astana. Almaty: Atamura.

Tasmagambetov, I. (2009). Ezhegodny otchet pered naseleniem goroda Astany. http://www.astana.kz/ru/taxonomy/term/27

Thompson, W.S. (1929): 'Population", American Journal of sociology, 34(6),959-75

Tuimebaev, Zh. (2010), Obrazovanie skvoz prizmu Poslaniya. *Bolashak,* № 1 (15), Nauryz, s. 7.

Ukaz Prezidenta Respubliki Kazakhstan № 1388, (2004). Gosudarstvennaya programma razvitiya zhilishchnogo stroitel□stva v Respublike Kazakhstan na 2005-2007 gody

UNESCO (2005). "UNESCO / OECD policy review of early childhood care and education". Paris.

UNESCO Cluster Office in Almaty (2004). The Status of Pre-school Education in the Republic of Kazakhstan. http://unesdoc.unesco.org/images/0013/001390/139025e.pdf

Ungarova, M. (2007). Kuznitsa kadrov. http://www.dialog.kz/?tpl=print&lan=ru&id=93&pub=183.

Van de Kaa, D.J. (1996). "Anchored narratives: The Story and Findings of a Half a Century of Research into the Determinants of Fertility." Popoluation Studies 50 (3):389-432.

Verdiyeva, N. (2010), "Population forecast for the Republic of Azerbaijan for the period 2009-2050". Prague: Charles University in Prague.

Vorotnoy, I. (2005), "Obrazovanie, doginim i peregonim" Izvestia Kazakhstan 31.03.2005.

Zabirova, A. T. (2002). «Tendentsii migratsionnoi podvizhnosti kazahov» (na primere Astany). http://www.ecsocman.edu.ru/data/466/710/1217/010.ZABIROVA.pdf

Zabirova, A.T. (2008), «Narodonaselenie» opublikovana v entsiklopedii «Astana». Almaty : Atamura.

LIST OF APPENDICES

Population forecast, Astana, 2008-2030, medium variant, females, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 447	7 990	8 252	7 967	7 650	7 943
1-4	20 125	27 540	34 062	33 372	31 755	31 747
5-9	15 730	19 625	37 227	43 101	41 768	40 025
10-14	16 473	17 428	22 106	37 642	42 474	41 284
15-19	18 859	19 615	21 042	24 784	37 646	41 673
20-24	29 112	28 483	28 507	28 980	30 800	40 648
25-29	38 799	40 896	37 299	36 470	35 407	36 684
30-34	34 761	40 454	46 372	42 651	40 787	39 963
35-39	30 681	33 976	43 205	47 692	43 769	42 222
40-44	26 391	29 158	36 366	44 069	47 472	44 060
45-49	24 672	26 736	31 205	37 375	43 777	46 855
50-54	18 785	22 041	27 812	31 669	36 904	42 666
55-59	14 396	16 091	22 421	27 532	30 828	35 581
60-64	8 700	12 140	15 940	21 645	26 229	29 263
65-69	8 047	6 101	11 478	14 886	20 010	24 166
70-74	6 847	8 708	5 927	10 732	13 765	18 377
75-79	3 530	3 616	7 540	5 239	9 303	11 852
80-84	2 679	3 183	2 983	5 949	4 199	7 365
85-89	988	1 294	2 194	2 089	4 018	2 859
90-94	339	437	739	1 211	1 175	2 210
95-99	116	126	190	318	522	516
100+	24	29	45	69	118	196
Total	**327501**	**365669**	**442911**	**505441**	**550374**	**588155**
Index (2008=100%)						
0	100	107.3	110.8	107.0	102.7	106.7
1-4	100	136.8	169.3	165.8	157.8	157.7
5-9	100	124.8	236.7	274.0	265.5	254.4
10-14	100	105.8	134.2	228.5	257.8	250.6
15-19	100	104.0	111.6	131.4	199.6	221.0
20-24	100	97.8	97.9	99.5	105.8	139.6
25-29	100	105.4	96.1	94.0	91.3	94.5
30-34	100	116.4	133.4	122.7	117.3	115.0
35-39	100	110.7	140.8	155.4	142.7	137.6
40-44	100	110.5	137.8	167.0	179.9	167.0
45-49	100	108.4	126.5	151.5	177.4	189.9
50-54	100	117.3	148.1	168.6	196.5	227.1
55-59	100	111.8	155.7	191.3	214.1	247.2
60-64	100	139.5	183.2	248.8	301.5	336.4
65-69	100	75.8	142.6	185.0	248.7	300.3
70-74	100	127.2	86.6	156.7	201.0	268.4
75-79	100	102.4	213.6	148.4	263.5	335.8
80-84	100	118.8	111.3	222.1	156.7	274.9
85-89	100	131.0	222.1	211.4	406.6	289.4
90-94	100	129.0	217.9	357.2	346.5	652.0
95-99	100	108.3	163.7	274.2	450.1	444.6
100+	100	122.6	186.4	289.5	492.9	817.3
Total	**100**	**111.7**	**135.2**	**154.3**	**168.1**	**179.6**

Population forecast, Astana, 2008-2030, medium variant, females, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	59 775	72 583	101 647	122 082	123 647	120 998
15-59	236 456	257 452	294 228	321 222	347 389	370 353
60+	31 270	35 634	47 036	62 138	79 339	96 804
Total	**327 501**	**365 669**	**442 911**	**505 441**	**550 374**	**588 155**
Relative structure (in per cent)						
0-14	18.3	19.8	22.9	24.2	22.5	20.6
15-59	72.2	70.4	66.4	63.6	63.1	63.0
60+	9.5	9.7	10.6	12.3	14.4	16.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	121.4	170.0	204.2	206.9	202.4
15-59	100	108.9	124.4	135.8	146.9	156.6
60+	100	114.0	150.4	198.7	253.7	309.6
Total	**100**	**111.7**	**135.2**	**154.3**	**168.1**	**179.6**

Population forecast, Astana, 2008-2030, medium variant, males, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 682	8 489	8 752	8 446	8 105	8 413
1-4	21 067	28 997	36 217	35 461	33 755	33 737
5-9	16 774	20 601	39 029	45 458	44 114	42 286
10-14	17 451	18 403	23 065	39 436	44 857	43 653
15-19	19 155	20 076	21 517	25 198	38 543	42 936
20-24	28 658	27 502	27 415	28 075	30 153	40 552
25-29	38 289	40 561	36 367	35 675	35 131	36 721
30-34	33 275	38 511	46 073	42 012	40 584	40 158
35-39	29 324	32 532	41 579	47 715	43 682	42 516
40-44	25 441	27 918	34 484	42 169	47 292	43 804
45-49	24 192	25 792	28 859	34 505	41 090	45 721
50-54	17 132	20 645	25 716	28 409	33 375	39 324
55-59	12 706	13 584	20 046	24 507	26 874	31 338
60-64	6 729	9 955	12 961	18 559	22 400	24 505
65-69	5 407	4 328	8 994	11 453	16 133	19 372
70-74	4 531	5 688	3 936	7 799	9 840	13 765
75-79	1 993	2 067	4 631	3 269	6 369	7 996
80-84	1 248	1 637	1 619	3 515	2 512	4 858
85-89	520	640	1 174	1 152	2 453	1 767
90-94	157	259	442	793	782	1 643
95-99	68	80	175	286	506	502
100+	11	24	66	142	245	426
Total	**311810**	**348289**	**423117**	**484035**	**528796**	**565993**
Index (2008=100%)						
0	100	110.5	113.9	109.9	105.5	109.5
1-4	100	137.6	171.9	168.3	160.2	160.1
5-9	100	122.8	232.7	271.0	263.0	252.1
10-14	100	105.5	132.2	226.0	257.0	250.1
15-19	100	104.8	112.3	131.6	201.2	224.2
20-24	100	96.0	95.7	98.0	105.2	141.5
25-29	100	105.9	95.0	93.2	91.8	95.9
30-34	100	115.7	138.5	126.3	122.0	120.7
35-39	100	110.9	141.8	162.7	149.0	145.0
40-44	100	109.7	135.5	165.8	185.9	172.2
45-49	100	106.6	119.3	142.6	169.8	189.0
50-54	100	120.5	150.1	165.8	194.8	229.5
55-59	100	106.9	157.8	192.9	211.5	246.6
60-64	100	147.9	192.6	275.8	332.9	364.2
65-69	100	80.0	166.3	211.8	298.4	358.3
70-74	100	125.5	86.9	172.1	217.2	303.8
75-79	100	103.7	232.4	164.0	319.6	401.2
80-84	100	131.2	129.7	281.7	201.3	389.3
85-89	100	123.0	225.8	221.6	471.8	339.7
90-94	100	165.1	281.3	505.2	498.2	1046.4
95-99	100	117.0	256.6	421.1	744.3	737.9
100+	100	220.8	602.8	1287.2	2230.3	3877.2
Total	**100**	**111.7**	**135.7**	**155.2**	**169.6**	**181.5**

Population forecast, Astana, 2008-2030, medium variant, males, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	62 974	76 491	107 062	128 800	130 831	128 089
15-59	228 172	247 121	282 057	308 265	336 724	363 070
60+	20 664	24 678	33 998	46 969	61 241	74 835
Total	**311 810**	**348 289**	**423 117**	**484 035**	**528 796**	**565 993**
Relative structure (in per cent)						
0-14	20.2	22.0	25.3	26.6	24.7	22.6
15-59	73.2	71.0	66.7	63.7	63.7	64.1
60+	6.6	7.1	8.0	9.7	11.6	13.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	121.5	170.0	204.5	207.8	203.4
15-59	100	108.3	123.6	135.1	147.6	159.1
60+	100	119.4	164.5	227.3	296.4	362.1
Total	**100**	**111.7**	**135.7**	**155.2**	**169.6**	**181.5**

Population forecast, Astana, 2008-2030, low variant, females, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 447	7 587	7 387	6 764	6 203	6 209
1-4	20 125	27 113	31 124	29 165	26 482	25 410
5-9	15 730	19 363	35 881	39 186	36 780	33 819
10-14	16 473	17 164	21 342	35 951	38 642	36 487
15-19	18 859	19 203	20 119	23 470	35 602	37 801
20-24	29 112	27 535	26 657	26 745	28 299	37 553
25-29	38 799	39 938	34 712	33 301	31 774	32 839
30-34	34 761	39 742	44 019	39183	37 079	35 877
35-39	30 681	33 511	41 533	44 754	40 174	38 411
40-44	26 391	28 804	35 170	41 906	44 442	40 432
45-49	24 672	26 461	30 265	35 730	41 385	43 689
50-54	18 785	21 846	27 098	30 409	35 154	40 255
55-59	14 396	15 962	21 920	26 580	29 510	33 822
60-64	8 700	12 073	15 623	21 001	25 223	27 910
65-69	8 047	6 064	11 324	14 492	19 430	23 259
70-74	6 847	8 678	5 828	10 538	13 319	17 751
75-79	3 530	3 597	7 474	5 120	9 162	11 515
80-84	2 679	3 166	2 933	5 864	4 069	7 204
85-89	988	1 284	2 159	2 037	3 962	2 769
90-94	339	433	721	1 178	1 138	2 168
95-99	116	124	183	302	492	483
100+	24	29	42	63	104	169
Total	**327 501**	**359 675**	**423 512**	**473 738**	**508 427**	**535 833**
Index (2008=100%)						
0	100	101.9	99.2	90.8	83.3	83.4
1-4	100	134.7	154.7	144.9	131.6	126.3
5-9	100	123.1	228.1	249.1	233.8	215.0
10-14	100	104.2	129.6	218.2	234.6	221.5
15-19	100	101.8	106.7	124.4	188.8	200.4
20-24	100	94.6	91.6	91.9	97.2	129.0
25-29	100	102.9	89.5	85.8	81.9	84.6
30-34	100	114.3	126.6	112.7	106.7	103.2
35-39	100	109.2	135.4	145.9	130.9	125.2
40-44	100	109.1	133.3	158.8	168.4	153.2
45-49	100	107.2	122.7	144.8	167.7	177.1
50-54	100	116.3	144.3	161.9	187.1	214.3
55-59	100	110.9	152.3	184.6	205.0	234.9
60-64	100	138.8	179.6	241.4	289.9	320.8
65-69	100	75.4	140.7	180.1	241.5	289.0
70-74	100	126.7	85.1	153.9	194.5	259.3
75-79	100	101.9	211.7	145.0	259.6	326.2
80-84	100	118.2	109.5	218.9	151.9	268.9
85-89	100	129.9	218.5	206.1	401.0	280.3
90-94	100	127.8	212.7	347.5	335.8	639.6
95-99	100	107.1	158.0	260.3	424.2	416.7
100+	100	121.1	176.7	263.7	433.7	705.8
Total	**100**	**109.8**	**129.3**	**144.7**	**155.2**	**163.6**

Population forecast, Astana, 2008-2030, low variant, females, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	59 775	71 226	95 734	111 066	108 107	101 925
15-59	236 456	253 001	281 491	302 078	323 419	340 679
60+	31 270	35 448	46 287	60 594	76 900	93 230
Total	**327 501**	**359 675**	**423 512**	**473 738**	**508 427**	**535 833**
Relative structure (in per cent)						
0-14	18.3	19.8	22.6	23.4	21.3	19.0
15-59	72.2	70.3	66.5	63.8	63.6	63.6
60+	9.5	9.9	10.9	12.8	15.1	17.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	119.2	160.2	185.8	180.9	170.5
15-59	100	107.0	119.0	127.8	136.8	144.1
60+	100	113.4	148.0	193.8	245.9	298.1
Total	**100**	**109.8**	**129.3**	**144.7**	**155.2**	**163.6**

Population forecast, Astana, 2008-2030, low variant, males, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 682	8 055	7 840	7 175	6 577	6 582
1-4	21 067	28 500	33 066	30 985	28 127	26 994
5-9	16 774	20 390	37 229	40 860	38 389	35 298
10-14	17 451	18 155	22 162	36 731	39 669	37 489
15-19	19 155	19 645	20 605	23 737	35 474	37 780
20-24	28 658	26 781	25 372	25 469	26 802	35 580
25-29	38 289	39 572	34 162	32 434	30 987	31 967
30-34	33 275	37 711	43 934	39 062	36 769	35 589
35-39	29 324	31 976	39 975	45 154	40 505	38 586
40-44	25 441	27 522	33 337	40 230	44 584	40 532
45-49	24 192	25 503	28 014	33 058	38 907	42 850
50-54	17 132	20 463	25 050	27 312	31 769	37 053
55-59	12 706	13 449	19 611	23 614	25 640	29 623
60-64	6 729	9 841	12 699	18 043	21 491	23 269
65-69	5 407	4 276	8 813	11 169	15 719	18 612
70-74	4 531	5 659	3 830	7 562	9 445	13 201
75-79	1 993	2 053	4 567	3 148	6 136	7 623
80-84	1 248	1 612	1 619	3 510	2 449	4 731
85-89	520	629	1 164	1 181	2 516	1 768
90-94	157	257	432	784	800	1 685
95-99	68	78	172	279	499	511
100+	11	24	64	138	238	417
Total	**311 810**	**342 152**	**403 717**	**451 637**	**483 492**	**507 739**
Index (2008=100%)						
0	100	104.9	102.1	93.4	85.6	85.7
1-4	100	135.3	157.0	147.1	133.5	128.1
5-9	100	121.6	221.9	243.6	228.9	210.4
10-14	100	104.0	127.0	210.5	227.3	214.8
15-19	100	102.6	107.6	123.9	185.2	197.2
20-24	100	93.5	88.5	88.9	93.5	124.2
25-29	100	103.4	89.2	84.7	80.9	83.5
30-34	100	113.3	132.0	117.4	110.5	107.0
35-39	100	109.0	136.3	154.0	138.1	131.6
40-44	100	108.2	131.0	158.1	175.2	159.3
45-49	100	105.4	115.8	136.6	160.8	177.1
50-54	100	119.4	146.2	159.4	185.4	216.3
55-59	100	105.8	154.3	185.9	201.8	233.1
60-64	100	146.3	188.7	268.1	319.4	345.8
65-69	100	79.1	163.0	206.6	290.7	344.2
70-74	100	124.9	84.5	166.9	208.5	291.3
75-79	100	103.0	229.1	157.9	307.9	382.5
80-84	100	129.2	129.8	281.3	196.2	379.1
85-89	100	121.0	223.8	227.0	483.8	340.0
90-94	100	164.0	275.1	499.6	509.3	1073.0
95-99	100	115.0	252.4	409.8	733.6	751.0
100+	100	216.0	582.7	1253.2	2161.8	3792.9
Total	**100**	**109.7**	**129.5**	**144.8**	**155.1**	**162.8**

Population forecast, Astana, 2008-2030, low variant, males, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	62 974	75 101	100 296	115 752	112 762	106 363
15-59	228 172	242 622	270 061	290 071	311 438	329 561
60+	20 664	24 430	33 359	45 814	59 292	71 816
Total	**311 810**	**342 152**	**403 717**	**451 637**	**483 492**	**507 739**
Relative structure (in per cent)						
0-14	20.2	21.9	24.8	25.6	23.3	20.9
15-59	73.2	70.9	66.9	64.2	64.4	64.9
60+	6.6	7.1	8.3	10.1	12.3	14.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	119.3	159.3	183.8	179.1	168.9
15-59	100	106.3	118.4	127.1	136.5	144.4
60+	100	118.2	161.4	221.7	286.9	347.5
Total	**100**	**109.7**	**129.5**	**144.8**	**155.1**	**162.8**

Population forecast, Astana, 2008-2030, high variant, females, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 447	7 985	8 762	9 039	9 011	9 683
1-4	20 125	27 590	35 133	36 803	36 683	37 979
5-9	15 730	19 723	37 851	45 203	46 404	46 268
10-14	16 473	17 433	22 740	38 793	44 853	45 925
15-19	18 859	19 617	21 746	26 109	39 303	44 393
20-24	29 112	28 399	30 117	31 251	33 301	43 401
25-29	38 799	40 525	39 007	39 773	38 865	40 308
30-34	34 761	40 062	47 336	45 777	44 902	44 203
35-39	30 681	33 953	43 719	49 691	47 394	46 681
40-44	26 391	29 158	37 069	45 397	49 954	47 960
45-49	24 672	26 743	31 769	38 690	45 541	49 644
50-54	18 785	22 047	28 232	32 679	38 511	44 675
55-59	14 396	16 091	22 695	28 247	32 024	37 316
60-64	8 700	12 152	16 087	22 086	27 046	30 519
65-69	8 047	6 116	11 606	15 186	20 621	25 167
70-74	6 847	8 736	6 050	11 036	14 299	19 289
75-79	3 530	3 621	7 660	5 443	9 734	12 533
80-84	2 679	3 183	3 022	6 090	4 396	7 752
85-89	988	1 294	2 216	2 139	4 131	3 008
90-94	339	437	747	1 233	1 211	2 280
95-99	116	126	192	324	533	533
100+	24	29	45	71	121	201
Total	**327 501**	**365 018**	**453 799**	**531 060**	**588 836**	**639 718**
Index (2008=100%)						
0	100	107.2	117.7	121.4	121.0	130.0
1-4	100	137.1	174.6	182.9	182.3	188.7
5-9	100	125.4	240.6	287.4	295.0	294.1
10-14	100	105.8	138.0	235.5	272.3	278.8
15-19	100	104.0	115.3	138.4	208.4	235.4
20-24	100	97.6	103.5	107.3	114.4	149.1
25-29	100	104.4	100.5	102.5	100.2	103.9
30-34	100	115.2	136.2	131.7	129.2	127.2
35-39	100	110.7	142.5	162.0	154.5	152.1
40-44	100	110.5	140.5	172.0	189.3	181.7
45-49	100	108.4	128.8	156.8	184.6	201.2
50-54	100	117.4	150.3	174.0	205.0	237.8
55-59	100	111.8	157.6	196.2	222.4	259.2
60-64	100	139.7	184.9	253.9	310.9	350.8
65-69	100	76.0	144.2	188.7	256.3	312.8
70-74	100	127.6	88.4	161.2	208.8	281.7
75-79	100	102.6	217.0	154.2	275.8	355.0
80-84	100	118.8	112.8	227.3	164.1	289.4
85-89	100	131.0	224.3	216.5	418.1	304.5
90-94	100	129.0	220.3	363.7	357.1	672.6
95-99	100	108.3	165.3	279.2	459.8	459.5
100+	100	122.6	188.0	294.2	503.2	836.4
Total	**100**	**111.5**	**138.6**	**162.2**	**179.8**	**195.3**

Population forecast, Astana, 2008-2030, high variant, females, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	59 775	72 730	104 486	129 838	136 951	139 856
15-59	236 456	256 594	301 688	337 614	369 793	398 580
60+	31 270	35 694	47 625	63 608	82 092	101 282
Total	**327 501**	**365 018**	**453 799**	**531 060**	**588 836**	**639 718**
Relative structure (in per cent)						
0-14	18.3	19.9	23.0	24.4	23.3	21.9
15-59	72.2	70.3	66.5	63.6	62.8	62.3
60+	9.5	9.8	10.5	12.0	13.9	15.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	121.7	174.8	217.2	229.1	234.0
15-59	100	108.5	127.6	142.8	156.4	168.6
60+	100	114.1	152.3	203.4	262.5	323.9
Total	**100**	**111.5**	**138.6**	**162.2**	**179.8**	**195.3**

Population forecast, Astana, 2008-2030, high variant, males, abridged age structure (as of 31.12. of a given year)

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0	7 682	8 489	9 311	9 592	9 560	10 271
1-4	21 067	29 020	37 450	39 148	38 889	40 253
5-9	16 774	20 602	39 332	47 306	48 315	48 061
10-14	17 451	18 403	23 401	39 715	46 129	47 022
15-19	19 155	20 077	22 311	26 268	39 160	44 366
20-24	28 658	27 503	28 555	29 699	31 230	40 932
25-29	38 289	40 565	38 317	38 637	37 535	38 684
30-34	33 275	38 515	47 730	45 522	44 148	43 269
35-39	29 324	32 533	42 761	50 511	47 502	46 389
40-44	25 441	27 919	35 310	44 170	50 322	47 740
45-49	24 192	25 795	29 476	35 959	43 312	48 870
50-54	17 132	20 650	26 121	29 445	34 977	41 629
55-59	12 706	13 590	20 352	25 240	28 067	33 068
60-64	6 729	9 964	13 240	19 216	23 450	26 008
65-69	5 407	4 332	9 201	11 993	17 084	20 748
70-74	4 531	5 692	4 012	8 101	10 442	14 778
75-79	1 993	2 069	4 690	3 393	6 710	8 614
80-84	1 248	1 640	1 677	3 685	2 711	5 311
85-89	520	640	1 215	1 248	2 676	1 984
90-94	157	259	447	828	852	1 802
95-99	68	80	177	293	532	550
100+	11	24	68	146	254	450
Total	**311810**	**348361**	**435155**	**510114**	**563857**	**610799**
Index (2008=100%)						
0	100	110.5	121.2	124.9	124.5	133.7
1-4	100	137.8	177.8	185.8	184.6	191.1
5-9	100	122.8	234.5	282.0	288.0	286.5
10-14	100	105.5	134.1	227.6	264.3	269.5
15-19	100	104.8	116.5	137.1	204.4	231.6
20-24	100	96.0	99.6	103.6	109.0	142.8
25-29	100	105.9	100.1	100.9	98.0	101.0
30-34	100	115.7	143.4	136.8	132.7	130.0
35-39	100	110.9	145.8	172.3	162.0	158.2
40-44	100	109.7	138.8	173.6	197.8	187.7
45-49	100	106.6	121.8	148.6	179.0	202.0
50-54	100	120.5	152.5	171.9	204.2	243.0
55-59	100	107.0	160.2	198.6	220.9	260.3
60-64	100	148.1	196.8	285.6	348.5	386.5
65-69	100	80.1	170.2	221.8	316.0	383.7
70-74	100	125.6	88.6	178.8	230.4	326.2
75-79	100	103.8	235.3	170.2	336.7	432.2
80-84	100	131.4	134.4	295.3	217.2	425.5
85-89	100	123.1	233.7	240.1	514.5	381.5
90-94	100	165.1	284.6	527.2	542.7	1147.5
95-99	100	117.1	260.9	431.2	781.8	808.3
100+	100	220.9	617.0	1330.8	2310.9	4087.6
Total	**100**	**111.7**	**139.6**	**163.6**	**180.8**	**195.9**

Population forecast, Astana, 2008-2030, high variant, males, age groups

Age	2008	2010	2015	2020	2025	2030
Absolute numbers						
0-14	62 974	76 513	109 494	135 761	142 894	145 608
15-59	228 172	247 147	290 933	325 449	356 253	384 947
60+	20 664	24 701	34 728	48 904	64 710	80 244
Total	**311 810**	**348 361**	**435 155**	**510 114**	**563 857**	**610 799**
Relative structure (in per cent)						
0-14	20.2	22.0	25.2	26.6	25.3	23.8
15-59	73.2	70.9	66.9	63.8	63.2	63.0
60+	6.6	7.1	8.0	9.6	11.5	13.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Index (2008=100%)						
0-14	100	121.5	173.9	215.6	226.9	231.2
15-59	100	108.3	127.5	142.6	156.1	168.7
60+	100	119.5	168.1	236.7	313.2	388.3
Total	**100**	**111.7**	**139.6**	**163.6**	**180.8**	**195.9**