

Hacettepe University
Institute of Population Studies
Economic and Social Demography Program

132967

**THE DEMOGRAPHIC CONSEQUENCES OF NOVEMBER 12th
1999 EARTHQUAKE: THE CASE OF KAYNAŞLI**

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Çiğdem ADEMİHAN

M.A. Thesis Submitted in Partial Fulfillment of the Requirements for the M.A.
Degree in Economic and Social Demography

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BESKONATASYON MERKEZİ**

Ankara
September, 2003

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Supervisor: Assoc. Prof. Dr. Turgay ÜNALAN

Ankara
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This is certify that we have read and examined this thesis and in our opinion it fulfills the requirements in the scope and quality of a thesis for the degree of Master of Arts in Economic and Social Demography

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ÖZET

12 KASIM 1999 DEPREMİNİN DEMOGRAFİK SONUÇLARI:

KAYNAŞLI ÖRNEĞİ

Doğal afetler, özellikle depremler çok yönlü etkileri nedeniyle bir çok bilim dalının konusudur. Depremlerin sosyolojik, ekonomik, psikolojik etkileri olduğu bilinmektedir. İnsan yaşamını bir çok alanda derinden etkileyen depremlerin demografik sonuçlarının da olması tartışılmazdır. Bu çalışma, depremin çeşitli demografik değişkenleri nasıl etkilediğine ilişkin bilgi boşluğunu doldurmaya çalışmaktadır.

Düzce ili Kaynaşlı ilçesi 12 Kasım 1999 depreminden insani ve çevresel kayıplar bakımından en çok etkilenen yerdir. Bu çalışmanın temel amacı depremin demografik sonuçlarını Kaynaşlı örneğinde ortaya koymaktır.

Bu çalışmada 1990 ve 2000 nüfus sayımı sonuçları ve Kaynaşlı Sağlık Ocağı ve Dipsizgöl Sağlık Ocağı Hanehalkı Tespit fişi kayıtları ile aynı sağlık ocaklarının doğum ve ölüm kayıtları kullanılmıştır.

Kaynaşlı'nın depremden önceki ve sonraki nüfus bilgileri karşılaştırılarak depremin cinsiyet ve yaş yapısında, ölümlülük ve doğurganlık düzeylerinde, göçte, evlenme ve boşanmalarda yarattığı değişiklikler incelenmiştir.

Çalışmanın sonuçlarına göre, 1999 depremi Kaynaşlı'da doğurganlık ve ölümlülük düzeylerinin yükselmesine neden olmuştur. Bu deprem sebebiyle Kaynaşlı'da geçici nüfus hareketleri meydana gelmiştir. 1999 depreminin Kaynaşlı'nın yaş ve cinsiyet yapısına ve Kaynaşlı'daki evlenme ve boşanmalara belirgin bir etkisi bulunamamıştır. Ancak deprem yaş yapısını, evlenme ve boşanmaları dolaylı olarak etkilemiştir.

Ahahtar Kelimeler: Deprem, Cinsiyet ve Yaş Yapısı, Ölümlülük, Doğurganlık, Göç, Evlenme ve Boşanma

SUMMARY
THE DEMOGRAPHIC CONSEQUENCES OF 12TH NOVEMBER
EARTHQUAKE: THE CASE OF KAYNAŞLI

Natural Disasters, especially earthquakes, are subject of various sciences. It is known there are sociologic, psychological, economic and other effects of earthquake on societies. It can not be discussed that earthquakes which are seriously affecting the human life by different ways, are also occurred demographic effects. This study tried to fill the information gap caused by the lack of information on how earthquakes have affected the various demographic variables.

District of Kaynaşlı of Düzce Province is the most effected area from 12th November Earthquake. The primary objective of this study is to put the demographic consequences of 1999 earthquake on Kaynaşlı Population forward.

In this study, 1990 and 2000 population census result and the registrations of health centers in Kaynaşlı have been used.

It has been investigated that the changes on age and sex structure, mortality and fertility levels, migration and marriages and divorces occurred by 1999 earthquake, comparing population records before and after earthquake.

According to the results of the study, 1999 earthquake had been caused increasing mortality and fertility levels in Kaynaşlı. Because of this earthquake, temporary population movements occurred in Kaynaşlı. No significant effects of the earthquake were found on age and sex structure of Kaynaşlı and marriages and divorces in Kaynaşlı according to the results. But earthquake has indirectly affected age and sex structure and marriages and divorces.

Key Words: Earthquake, Age and Sex Structure, Mortality, Fertility, Migration, Marriage and Divorces

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1. INTRODUCTION

From the beginning of the history, human beings fights against nature and tries to overcome it. It can be said that the events between man and nature are subject of physical sciences, but it should not neglected the reality of the social, phsychohological, economical, demographical effects on societies.

96 percent of land of Turkey is in earthquake region and 99 percent of Turkey population living in these risky areas. Nevertheless, in such a country which carries a high risk of earthquake, there are limited numbers of researches on natural disasters, especially earthquakes, which are carried out by social sciencetists. In demographic literature in Turkey, there is no significant research about demographic consequences of disasters.

The main reason of this study which has been carried out is lack of information and research on the demographic effects of disasters in Turkey. This study tries to determine the demographic results of 12th November earthquake on Kaynaşlı where has the most humanitarian and environmental losses.

The objective of the study is to determine how has 1999 earthquake affected age and sex structure, fertility and mortality levels, migration and marriages and divorces in total population of Kaynaşlı by comparing the data obtained before and after the eartquake.

This study aims to expose the demographic consequences of 12th November 1999 Earthquake in Kaynaşlı population by calculating basic demographic variables. It presents the effects of earthquake on age and sex distribution, sex ratio, dedendency ratio, crude death rate, infant and chid mortality rate, crude birth rate, general fertility rate, household number and married and divorced ratio.

It is believed that this study will open a new window for the further researches on the demographic impacts of disasters. Moreover, the results of this study will guide the social scientists who are interested in demographic effects of disasters.



**T.C. YÜREKÖÇRETİM KURULU
DOKÜMANTASYON MERKEZİ**

2. NATURAL DISASTERS AND EARTHQUAKE

2.1. Natural Disasters

Although disasters are the events which shake the life of society, it is not come to an agreement about the definition of disaster in related literature.

The term 'disaster' is used to describe, ranging from those determined by purely physical events, such as earthquakes and typhoons, to those which are entirely human origin, like wars and industrial accidents. Between these two poles of causation there is a wide spectrum of disaster, for example famines and floods, which are provoked by combinations of physical and human factors (Clarke, 1991).

The Center Research on the Epidemiology of Disaster (CRED) at the University of Louvain, Belgium, has developed a database. The CRED¹ data have been organized to identify so-called "significant" disaster for if (1) number of deaths per event is 100 or more, (2) there is a significant damage of 1 percent or more of total annual GNP, and (3) affected 1 percent or more of the total national population. The relative criteria for damage and affected people indicate more accurately the impacts of disaster on countries with small populations and weak economies and are therefore a better measure of national losses in many less developed countries (Smith, 1998).

1. For more information see <http://www.cred.be>.

According to Burton and Kates (1964; cited in Alexander, 1992) natural hazards are those elements in the physical environment which are harmful to man and caused by forces extraneous to him. Turner (1976; cited in Alexander, 1992) offered a more detailed definition of disaster as an event, concentrated in time and space, which threatens a society or a relatively self-sufficient subdivision of a society with major unwanted consequences as a result of the collapse of precautions which had hitherto been culturally accepted as adequate.

According to World Health Organization's (WHO) (2003) definition, disaster is "any occurrence that causes damage, ecological disruption, loss of human life, deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community".

According to Bertan and Güler's (1997) disaster is "a strong event that turns the society's daily life circle upside down, makes the society weak, and causes the society to fall into difficulties, many deaths, diseases and hurts".

According to the number of 576 Law Regarding Engagement (1999) disaster is conveyed as "an natural event, which is not prevented by affected people, causes physical, economical, social losses for people, such as earthquake, fire, flood, landslide, rockfall, avalanche, storm, natural fallings effects the societies by deducting or stopping the normal life and people activities".

In his article Akdur (2000), has given a place to definition of disaster is that, "these are the events that abolish the usual life of society by breaking ecological balance with human and property losses, pass over the capacity of coping and adaptation of society and force people to need great external aid".

According to Kadioğlu (2003), the natural events occurs in the world are qualified as natural disaster when they affect the human life strongly. Natural disasters are also defined as the natural events that impede the socio-economic and socio-cultural activities of society and to cause the loss of life and property.

Great part of natural disasters related with the weather conditions closely (MMO, 1999). Bryant (1993, cited in MMO, 1999) arranged in a row 31 natural disaster by taking character and effects of them into consideration according to their importance. In respect of this, the most important disasters of three are meteorological disaster.

Table 2.2.1. Characteristics and Effects of Natural Disasters

<i>Importance Row</i>	<i>Disaster</i>	<i>Magnitude</i>	<i>Time of Impact</i>	<i>Total Affected Area</i>	<i>Total Human Losses</i>	<i>Total Economic Losses</i>	<i>Social Impact</i>
1	Aridity	1	1	1	1	1	1
2	Tropical Cyclone	1	2	2	2	2	2
3	Local Floods	2	2	2	1	1	1
4	Earthquake	1	5	1	2	1	1
5	Volcano	1	4	4	2	2	2
6	Mid-latitude storm	1	3	2	2	2	2
7	Tsunami	2	4	1	2	2	2
8	Forest and Brushwood Fires	3	3	3	3	3	3
9	Soil Swell	5	1	1	5	4	5
10	The Changes of Sea Levels	5	1	1	5	3	5

Source: Bryant, 1993

In the pointing and sequence of importance, the measure is changing from 1 (the biggest or the most important) to 5 (the smallest or least important).

According to Alexander's (1992) classification, there are six different schools of thought about disaster studies. The first approach to the natural hazard is the geographical one. In this approach, social science methods are used and the special emphasis is given to temporal distribution of risk, impact and vulnerability. The second one is the anthropological approach which focuses on the role of disasters in guiding the socio-economic evolution of populations, in dispersing them and in causing the destruction of civilizations. The special emphasis of this approach is on disadvantaged groups in underdeveloped societies (Alexander, 1992). In this classification, the third approach is the sociological one. Vulnerability and impacts are considered in terms of patterns of human behavior and effects of disaster upon community.

The development studies approach, as the fourth school of thought, considers problems of providing aid and relief of the third world countries. This approach addresses questions of refugee management, health care and the avoidance of starvation. Since the impact of disaster is more devastating in developing countries, it is not surprising that the fact of poverty increases human vulnerability to natural hazards.

The fifth approach focuses on the management of mass casualties, the treatment of severe physical trauma and the epidemiological surveillance of communicable disease which is a new field of disaster medicine and epidemiology. The last approach is the technical approach which prevails among natural and physical scientist. Here, emphasis is given to seismology, volcanology, geomorphology and other predominantly geophysical approaches to disasters.

In his article, Alexander (1992) has emphasized that the fundamental principle underlying these approaches is that the key to the adequate development and teaching of disaster studies lies in making them interdisciplinary.

In a publication edited by Quarantelli (1998), there are various articles defining what disaster is, written by researchers from different disciplines and societies.

The events which alert the natural disaster are not extraordinary, the fissures and ruins cause from disasters are not either. In the example of flood and hurricane, it always rains and always blows. These events are extremely natural events. Against these events, if physical structure of social environment is not strong (scientific), it is normally falling down. Structure of thought of social environment is not strong it is also normally falling down (Akdur, 2000).

Demographers have tended to accept a fairly simple definition of what constitutes a demographic crisis or disaster. An excess of deaths or illness over normal expectations in a restricted time-space framework is usually enough to denote a population crisis.

For demographers the crucial variables in this equation are the size of the population affected, the actual excess mortality rate, and the duration of the crisis (Hollingsworth, 1979; cited in Curson, 1989).

In contrast to demographers, geographers and other social scientists working with the natural hazards framework have tended to define disasters more with environmental and behavioral terms. Disasters are high magnitude events in physical and demographic terms compared to some normal period of human experience (Curson, 1989).

According to Curson (1989), to obtain a satisfactory definition some measure of magnitude be employed. This must be related to population at risk and to some index of the normal demographic experience of that population. It must be also included the various elements that stem from disasters such as the physical effects of immediate impact, demographic effects (short or long term), psychological effects, social disruption, economic effects, political effects, etc. The definition must also include some of the less easily measurable elements of disaster such as stress, fear, hysteria and panic (Curson, 1989).

2.2. Earthquake

The movements happening because of the fissures and ruins in underground shake the ground that are called earthquake. Earthquake makes itself felt with a rising shake, continued very short time, humming noise and uproar voice coming from ground. After and before major earthquakes also happens earthquakes. The earthquakes which occur before the major earthquake are called “vanguard earthquake”, occur after the major earthquake are called “rearguard earthquake”. Rearguard earthquakes continue for a long time and settles down the layers of underground which has been cracked as result of major earthquakes. There are earthquake risky areas in the world. Cracked regions before, big underground gaps, lands of salt resource are among these risky areas (Akşit et al., 1999c).

The magnitude and intensity of earthquake are two different concepts. The magnitude of earthquake is related with the energy occurs in the centre of earthquake and it is measured with *Richter scale* changing between 1 and 9. The intensity of earthquake is related with the effects of earthquake on ground (fissures and ruins), is measured *Mercalli Scale* changing between 1-12 (Akdur, 2000).

Earthquakes can be various according to the reasons. The earthquakes results of the movements of earth crust layers are generally called *Tectonic Earthquakes*. The 90 percent of earthquakes in the world are tectonic earthquakes. The earthquakes which are occurred in Turkey in this group generally. The second type earthquake is *Volcanic Earthquake*. They occur after volcano eruption, it is known that these earthquakes occur because of the gasses from chemical and phsycal events which is happened during the melted material in the depths go out of the face of earths. These are local because of related with volcanos. The earthquakes occurred in Japan and Italy is in this group. There is no active volcano in Turkey, so these types of eartquakes are not occurred (Earthquake Research Centre, 2003).

Another type of earthquake is *Collapse Eartqukes*. They occur as a result of the gaps of underground (caves), galleries in the coal mines, the gaps from melted salt and gibs land and to collapse the ceiling block. They are local, with low energy and do not give much damage. It is also known big landslides and meteors cause small shakes. Last type of earthquake is Depth Sea Eartqukes. After these type of earthquakes, occures big waves from sea to beach which to cause great damages. These waves are called *Tsunami*. In Japan where have seen a lot of sea earthquake, 30.000 people are killed in tsunami (Earthquake Research Centre, 2003).

From the beginning of this century to the end of the 1990's there have been an estimated 1.52 million officially reported deaths from earthquakes. Almost half these totals have occurred in China, which also suffered the most devastating single event in the 1976 Tangshan earthquake which resulted in 242.000 deaths. (Coburn and Spence, 1992, cited in Blaikie et al., 2000).

Turkey is in *Mediterranean, Alp, Himalaya Earthquake Zone* and it is given place with countries like Portugal, Spain, Italy, Greece, and Iran in *Mediterranean Earthquake Zone* which has been part of big zone. 15 percent of earthquakes which has occurred in the world are in this region. In Turkey there are four main earthquake zones. The first is the *North Anatolia Fault Zone* which covers North part of Turkey from east to west and its total length is 1600 km. This zone has called attention with it is more active (Şahin, 1991).

The second zone is the *West Anatolia Fault Zone* which covers west part of Turkey and reaching toward Mediterranean Sea. The third zone is *East Anatolia Fault Zone* which is reached Turkey from Lebanon and Syria and covers Antakya, Amik plain and reaching toward Bingöl and Karlıova. This zone connects with North Anatolia Fault Zone. As the last there are zones which are called *Local Episantr Zones*. These include Şanlıurfa, Afyon-Akşehir, Çukurlu, Kırşehir, Yerköy, Kayseri and Isparta-Burdur (Şahin, 1991).

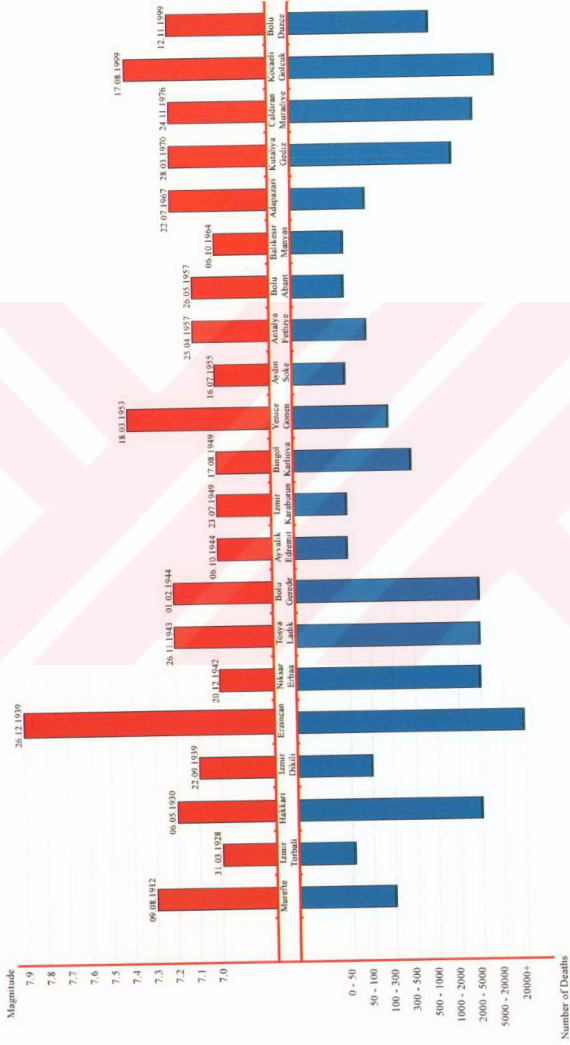
Take the regions above into consideration, great part of population of Turkey is under the earthquake risk and approximately half of them has been lived the first degree of Earthquake risky zones. Table 2.2.1 shows major earthquakes in Turkey since 1912. Figure 2.2.1 presents number of deaths by magnitude of these major earthquakes.

Table 2.2.1. Great Earthquakes in Turkey

<i>Place</i>	<i>Date</i>	<i>Magnitude</i>	<i>Number of Deaths</i>	<i>Number of Injured</i>
TEKİRDAĞ-MÜREFTE	09.08.1912	7.3	216	466
İZMİR-TORBALI	31.03.1928	7.0	50	-
HAKKARİ BORDER	06.05.1930	7.2	2514	-
İZMİR-DİKİLİ	22.09.1939	7.1	60	-
ERZİNCAN CENTER	26.12.1939	7.9	32962	-
TOKAT-NİKSAR-ERBAA	20.12.1942	7.0	3000	-
KASTAMONU-TOSYA/SAMSUN- LADİK	26.11.1943	7.2	2824	-
BOLU-GEREDE	01.02.1944	7.2	3959	-
BALIKESİR-AYVALIK-EDREMİT	06.10.1944	7.0	27	-
İZMİR-KARABURUN	23.07.1949	7.0	1	7
BİNGÖL-KARLIOVA	17.08.1949	7.0	450	-
BALIKESİR-YENİCE-GÖNEN	18.03.1953	7.4	265	366
AYDIN-SÖKE	16.07.1955	7.0	23	-
ANTALYA-FETHİYE	25.04.1957	7.1	67	-
BOLU-ABANT	26.05.1957	7.1	52	100
BALIKESİR-MANYAS	06.10.1964	7.0	23	130
ADAPAZARI CENTER	22.07.1967	7.2	89	235
KÜTAHYA-GEDİZ	28.03.1970	7.2	1086	1260
VAN-ÇALDIRAN-MURADIYE	24.11.1976	7.2	3840	497
KOCAELİ-GÖLCÜK	17.08.1999	7.4	17127	43953
BOLU-DÜZCE	12.11.1999	7.2	845	4948


Source: Şimşek, 2002

Figure 2.2.1. Number of Deaths by Magnitude of Great Earthquakes

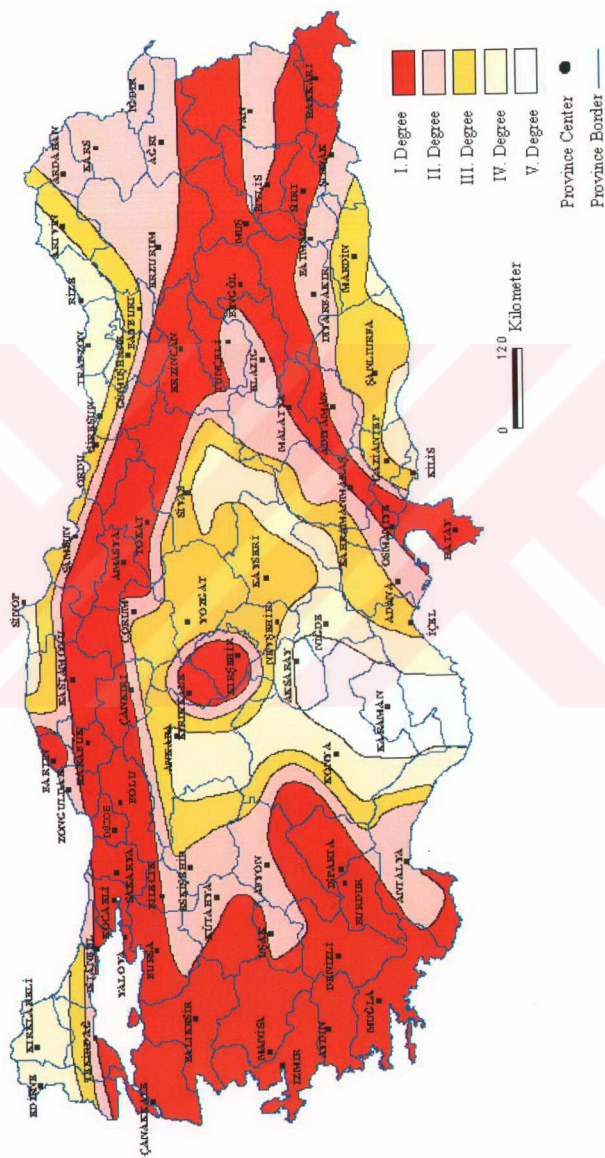


Source: Source: Şimşek (2002).

As mentioned before, 96 percent of land of Turkey is in earthquake region and 99 percent of Turkey population living in these risky areas. Map 2.2.1 shows earthquake regions. Figure 2.2.2. presents population distribution of Turkey according to the map of earthquake regions. As seen in the figure 2.2.2., almost 95 percent of Marmara and Aegan regions are in first degree of earthquake region and population size is rather high. Almost totally Eastern Anatolia Region is in the first and second degree of earthquake region. However, as seen in the figure, population density is rather high in first and second degree of earthquake region. This state emphasizes that disasters, especially earthquakes, are very important as demographical.



Map 2.2.1. The Map of Earthquake Regions, Turkey



Source: Özmen et al.(1997).

Figure 2.2.2. Population Distribution of Turkey (1997)*



Source: Özmen et al. (1997).

* According to The Map of Earthquake Regions

2.3. A Review of Literature on Earthquakes and Their Effects on Population In Turkey

In Turkey, important research is conducted by nature scientists especially geology. The common feature of this research is they evaluate the earthquake is a natural event which results are social (Kasapoğlu ve Ecevit, 2001).

In the field of social sciences, some of studies which are done after earthquakes are summarize above:

In a study published by The Union of Chambers of Turkish Engineers and Architects (TMMOB, 2000), is mentioned about observations in earthquake zone. This study includes damage situation, distribution of aids and needs, opinions about measures before and after earthquake, in the earthquake region.

According to the results of a study which has occurred after 1999 Earthquake in Adapazarı, Gölçük and İzmit city centres, earthquake changed household population of $\frac{1}{4}$ of families. It has seen both families which are leaving from each other and coming together. This study emphasises psychological and related with to take more aid causes by paying attention increasing marriages after the earthquake. 40 percent of research household population migrated to another place from there. Only 13.3 percent of research population plan migrated from (Akkayan et al., 2002).

After the 1999, in a study which is done in Kocaeli province, it is mentioned decreasing number of teacher and student, level of success of university student selection exam (ÖSS), capacity of beds in health sector and 23.5 percent of research population of leaving job. According to results of this study, 57.9 percent of research population was born out of Kocaeli, average household population is 4.8. The 90.9 percent of families have psychological problems related with earthquake, 83.5 percent have social security problems, and 48.8 percent have unemployment (Karataş et al., 2002).

Türkoğlu (2002), in his study which has focused the relationship between earthquake and socio-economic structure of Marmara Region stated that 96 percent of land of Turkey, 99 percent of population and 98 percent of industry of Turkey are under the earthquake risk.

According to Türkoğlu (2002) there is exactly paralel distribution between high earthquake risky areas and population, residences and industrial zones. The first step in this region must have been taken out of being population attraction centre.

Istanbul University Faculty of Economy and Graduates Society conducted a research together on the social and economical effects in Turkey. In this study, it is said that because of the 17th August earthquake, the gross domestic product decreased proportion of 5.6 percent and the gross national product decreased proportion of 6.6 percent unexpectedly. This emphasized that the earthquake will increase public expentidure. According to the findings of this research, the four of each ten families's who lived in earthquake area income have been decreased (Dereli et al., 1999-2000).

When asked about thoughts of their future to 1,100 heads of household in Kocaeli and Sakarya, 47.6 percent of them stated that they can pull themselves together with the aid of state and they do not think migrated from. 39.3 percent of them stated that to do not think migrated from even the satet help themselves or not. According to the researchers reason of not migrating can be expectation to find a job in construction sector. It can be added the idea of to continue of aids such as food, rent and financial which are given bye state when it is thougt that the research is conducted in tent cities. Before the earthquake, concepts of health and presence were in 4.1 percent of ideals although before the earthquake they were not important part of ideals. After the eathquake this proportion has increased to first order 34.4 percent (Dereli et al., 1999-2000).

After one year the 17th August 1999 earthquake Kasapođlu and Ecevit (2001) conducted a research by interviewing 500 households who lived in prefab house in Kocaeli, Sakarya and Düzce provinces. This study aimed that to investigate how attitude changes of peoples' life after earthquake and to state preventive studies for the possible earthquakes.

After the 1992 Erzincan earthquake, in a study which is done by Governor of Erzincan there are some general information about Erzincan, losses causing from earthquakes and it has evaluated the works after and before earthquakes in this study (Çuhadarođlu, 1992).

Çevik (1998) after the 1995 Dinar earthquake has conducted a research by aim of figured out the living style, economy, family life and changes at education of children, types of using aid.

In this study, it is stated that is the factors affected decision to migrate after the earthquake. The 45.6 percent of research population was migrated from Dinar. The main reason of migration is not having a place to stay. 58.6 percent of who was migrated from Dinar has returned after the life turned normal (Çevik, 1998)

After the 1999 Adapazarı earthquake, The Adapazarı Chamber of Commerce and Industry has published the book about the situation of the province before the earthquake, damages causing from earthquake and works related with the earthquake (Mısırlıođlu and Eryılmaz, 2000).

Balta (1998) has focused the effects of disaster on social nets in his master of art study. This study shows that the first answer of society to disasters is temporary displacement.

In addition to the all of these studies, It is found Karancı's (1997; 1999a; 1999b), Karancı and Alkan's (1998), Karancı and Akşit's (2000), Karancı et al's (1996; 1997) researches which are focused psychological. At the same time it is found also Akşit and Karancı's (1999a; 1999b), Akşit et al's (1997; 1999a; 1999b) after Dinar earthquake Rüstemli and Karancı's (1995; 1996; 1999), Rüstemli et al's (1995) 1992 Erzincan earthquake studies.

All of these research shows earthquakes caused sudden and dramatic changes individual and social in the area where they occurred. In this state, it must have considered the social and psychological costs of natural disasters especially earthquakes.



3. DEMOGRAPHY and DISASTERS

Losses causing from natural disaster, certainly have psychological and social results too. According to Kasapoğlu (2000), natural disaster are important as sociological because they shake the order of society. At the same time, natural disasters to cause stopping the life of society suddenly and then cause psychological ,behavioral, mental and emotional symptoms on individual (Tufan, 2000). Within this property, natural disasters are the subject of psychology discipline. Natural Disasters which has been sociological subject by shaking order of society, psychological subject by stopping the life but disaster are cured topic as demographical impact where they occurred.

Many studies have considered the economic and psychological effects of hurricanes, earthquakes, floods, tornadoes and other natural disasters but few have considered their demographic effects (Smith and McCarty, 1996). There is a large, diverse literature on the social, political and economic impact of natural disasters. Many analysts have considered the effects of disasters on income, employment, capital stock, tax revenue and other economic variables. Others have studied institutional and organizational responses to disasters (Oliver-Smith, 1993, Stallings, 1987; cited in Smith and McCarty, 1996), recovery and restoration following disasters (Bates and Peacock, 1987, Haas et al., 1977; cited in Smith and McCarty, 1996), the effects of disaster on divorce rates, crime rates and other social variables, and the psychological, behavioral and mental health consequences of disasters (Friesema et al., 1979, Geipel, 1989; cited in Smith and McCarty, 1996).

Very few studies, however, have considered the demographic consequences of natural disasters (Smith, 1996). Smith and McCarty (1996) stated that the literature offers very little guidance for answering even the most basic demographic questions.

Studies found in disaster and demography literature focuses on migration. The tendency of migration of population affected by earthquakes in many ways is expected to change. At the same time, when 17th August earthquakes is thought, the earthquake region is economically developed can be important factor to stop migration from the region. Simultaneously, it is advanced that people came to region after the earthquake to get aid. Within this property the earthquake region contains both encouraging and discouraging migration factors (Özbay and Yücel, 2001).

In a study conducted after *Hurricane Andrew*, Smith and McCarty (1996) found that “many of the moves caused by hurricane were short-lived, others lasted for many months and some were permanent”. They stated that comprehensive studies of the demographic consequences of natural disaster must take a long range perspective. Smith (1996), in his another study after *Hurricane Andrew*, could not found significant evidence about number of persons per household changed by hurricane.

After the *Loma Prieta Earthquake*, Hoagh (1995) analyzed DLAC (Drivers Licence Address Change) files, but he could not identify a recession effect.

Aguirre (1980) investigated the long term effects of six massive disasters on the marriage systems of impacted communities. The results of this study have indicated the absence of long term effect of disasters.

In their study Mizutani and Nakano (1989), investigated that the impact of natural disasters on the death and population increase rates of Japan population and they have done explanation with such factors are: locality (regionality of natural and social characteristics), time (human behaviour at the time of impact), period (secular change in socio-economic factors), type of natural event directly causing damages and hazard experience.

According to results of this study, the degree of human life loss landslide disaster in rural areas is about three times higher than that in urban areas.

Bahr (1989) studied the consequences of the 1972 earthquake on the urban structure and population distributions of Managua. At least 50.000 people lost their homes in the earthquake and more still left the city temporary for the fear of further tremors. Most of the families who fled from the city found temporary lodgings with friends or relatives in the vicinity after the earthquake. In the beginning of 1973, they had begun to return and in the middle of 1973, the city's population had risen. Population density of Managua is changing by regions.

In a study after the Kobe earthquake, the monthly number of females and males at birth in relevant periods around the time of earthquake was assessed. It was founded that male proportion among new born infants has been declined. The results of this study indicated that the male population may have affected, acute stress resulting from earthquake, leading to rapid decrease in sperm motility and associated responses 9 months later in terms of low fertility and low sex ratio among the newborn infants (Fukuda et al., 1998).

After the Armenia earthquake, investigators looked at mortality and morbidity rates. Their study supported the hypothesis that the longer term increased rates of heart disease and other chronic disease morbidity following on earthquake may be related to the intensity of exposure to disaster-related damage and losses (Armenian et al., 1998).

In the light of these all, it is believed that the demographic effects of disasters may change due to type or duration of disaster and short or long term.

4. NOVEMBER 12th 1999 EARTHQUAKE and KAYNAŞLI

4.1. November 12th 1999 Earthquake

Aproximately three months after the 17th August 1999 earthquake, at local time 18:57, on November 12, 1999 a catastrophic earthquake with magnitude 7.2 and maximum intensity X hit the area about 8 km southeast of the center of Düzce Province. The epicentre coordinates and depth of the earthquake were determined as 40.79N and 31.21E, Gireli (Ovapınar) residence, on h=11 km respectively by Earthquake Research Department. The destruction during the Düzce Earthquake was caused by two reasons as faulting and ground shaking. The damages in Düzce and Gölyaka occurred as a result of the amplification of the ground motion caused by thick and water-saturated alluvial deposits. Building destruction in Kaynaşlı Region is due to fault scarps. Besides, liquefaction played an important role in Kaynaşlı region causing destruction especially on the northern parts of Ankara-İstanbul highway where single floored buildings sank into the ground. According to the information taken from General Directorate of Disaster Affairs in this earthquake 26.704 houses and 4.493 offices are heavily, 37.825 houses and 6.859 offices are moderately and 40.944 houses and 5.635 business premises are slightly damaged (Earthquake Research Centre, 2000).

In the table 4.1.1 numbers of deaths and injured distribution by province have been seen. The most damage was in the Kaynaşlı, Düzce and Bolu residences (Earthquake Research Centre, 2000).

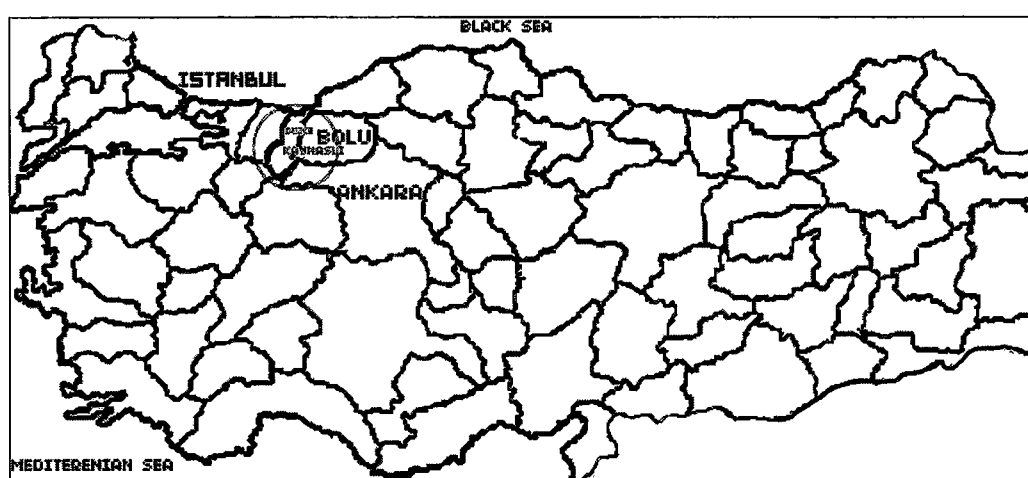
Table 4.1.1. Number of Deaths and Injured after 12th Earthquake

<i>Province</i>	<i>Residence</i>	<i>Number of Death</i>	<i>Number of Injured</i>
Bolu	City Centre	48	354
	City Centre	463	2800
	Beyköy	0	120
	Konuralp	0	408
	Akçakoca	2	96
Düzce	Cumayeri	0	39
	Gölyaka	1	68
	Gümüşova	0	34
	Kaynaşlı	244	544
	Yığılca	0	42
Kocaeli	City Centre	1	27
	Gölcük	0	34
Sakarya	Adapazarı	3	168
Yalova	City Centre	1	25
Zongudak	City Centre	0	189

Source: The Earthquake Research Center, 2000

4.2. History of Kaynaşlı and Geographic Situation

Map 4.2.1. The Map of Turkey



Source: Municipality of Kaynaşlı, 2000

Kaynaşlı established in MS 365, has served silkroad caravans in history. Recent cultural structure of Kaynaşlı came into being after from people which are settled to come from Interior Anatolia Region, east of black sea and Caucasia, after the 14th century (Sub-Government of Kaynaşlı, 2001).

Kaynaşlı District is between Bolu (36 km) and Düzce (15km) provinces in the foot of Bolu Mountain on Ankara İstanbul highway. The surface of Kaynaşlı is 518 square kilometers. Its' highest point arrives 1.577 metres (Sub-Government of Kaynaşlı, 2001).

Hills surrounding Kaynaşlı east, north and south are covered with the Blacksea plants. Because Kaynaşlı has been established in alluvium plain going as far as the foot of Bolu Mountain, it is rich in the points of stream and land productivity. Kaynaşlı is in the north-western Blacksea Climate Region (Municipality of Kaynaşlı, 2000).

4.3. General Information about Kaynaşlı

After the 12th November earthquake Düzce which has many losses and its' center has almost been ruined completely, has been obtained the status of province on 9th December 1999 by the government to mitigate earthquake damages and to get the aid faster and more easily. This situation produces the result of obtaining the status of district to Kaynaşlı where is a municipality since 1968. According to the 2000 population census results, the population of district centre is 9.439, villages is 12.200 and totally 21.639. There are seven quarters and twenty villages in Kaynaşlı (Sub-Government of Kaynaşlı, 2001).

After getting the status of district all district directorates starts work with sub-government but main officers have not been appointed yet and officers bound by contract or volunteers works there.

The means of subsistences of Kaynaşlı people are traditionally farming, animal husbandry and forest product. The economy of Kaynaşlı has revived with the opening of E-5 highway (now D-100) in 1958. Together with the rest foundations and factories established in the edge of the highway, transport, hazelnut, wood hand arts, forest and field tourism have priority in Kaynaşlı economy. This situation encourages the migration from villages to the city, industry areas and foreign countries. Migrating household have a regular relation with their villages (Sub-Government of Kaynaşlı, 2001).

4.4. The Effects of November 12th 1999 Earthquake on Kaynaşlı

The November 12th 1999 Earthquake extremely affected Düzce Center and Kaynaşlı districts. The 72 percent of the houses in Kaynaşlı were heavily damaged by this earthquake. In Düzce province, most of the losses of lives and properties have occurred in Kaynaşlı. As a result of the earthquake 244 people killed in this district by earthquake (Earthquake Research Centre, 2000).

According to the report of Sub-Government of Kaynaşlı (2001) 312 people killed in 12th November 1999 earthquake. 90¹ percent of public buildings, 702 percent of residences, 703 percent of small premises and touristic foundations are collapsed and four fabrics in districts are heavily damaged.

-
1. In earthquake, main and other buildings of Municipality, Patrol of Gendarmerie, Mail-Telegraph-Telephone Organization, service buildings of Organizations of Electricity and Wood, Highschool and Primary School of Kaynaşlı, Residences of Workers Municipality and Health Center, totally are collapsed
 2. In district center 1.033 residences are collapsed, 132 residences are moderately, 292 residences are slightly damaged. In villages 358 residences are collapsed, 195 residences are moderately, 609 residences are slightly damaged.
 3. In district center, 277 business premises are collapsed, 24 business premises are moderately, 25 business premises slightly damaged.

Taking the losses into consideration, a crisis management centre in Kaynaşlı was established. From the time of the earthquake occurred to 2000 year, settling in tents and after 2000 year settling in prefabs have been materialized. Prefab settling have been reduce slowly (Sub-Government of Kaynaşlı, 2002a).

After the earthquake in Kaynaşlı, 1.141 of 1.514 families deserved shelter aid and have built their houses in cash. Families who have their houses slightly damage has taken repair payment. Ministry of Public Works and Settelements have started to build permanent residences but these residences have not been completed in year 2002 (Sub-Government of Kaynaşlı, 2002a).

After the earthquake, to revive the economy, cows for milk, open-air system fattening, encourage product baid plants and slage, improve beekeeping projects and to facilitate return normal life, open-primary school centres for women, service quality training for waiters and bellboys, developing communication skills training for officers, presentation of pre-school education and community centre projects have been done together with district sources and cooperation with other foundations, not getting share from general budget (Sub-Government of Kaynaşlı, 2002b).

5. IMPORTANCE OF STUDY and BASIC QUESTIONS

5.1. Importance of Study

When it has approached to natural disasters in the angle of social sciences, the important thing is to investigate relationship between physical environment and social structure and to make suggestion about measures before (Karancı, 1999b).

There are similarities between faults and societies. The organization which is not strong can be collapsed. Policy makers and executors have to inform and prepare the society for disasters, have to make cooperation with the nature and social scientist to mitigate damages. At the same time the studies in the field of natural disaster had exceeding the borders of the one by one disciplines for a long time and it has been occurred an obligation of studies must be interdisciplinary (Kasapoğlu, 2001).

It is important, in a country which has a high risk of earthquake like Turkey, to understand how earthquakes affect demographic structure in order to contribute to (1) national politics of preparing for disaster and mitigate disaster hazards, (2) to determine the measures to be taken before and after the earthquake and, (3) to identify the qualities and priorities of investments.

It is coincided the economic and social consequences of earthquake when we look at the literature of social sciences, but demographic effects of earthquake has remained behind. At the same time, it is also believed that the study which has investigated the demographic consequences of earthquake will support the demographic literature.

5.2. Basic Questions of Study

In this study, specifically, these questions will be tried to be answered in reference to 1999 earthquake in Kaynaşlı.

- Has the earthquake affected the age and sex structure of the population?
- Has the earthquake affected the level of mortality?
- Has the earthquake affected the level of fertility?
- Has the earthquake affected the population movements?
- Has the earthquake affected proportion of marital status in Kaynaşlı ?

6. METHODOLOGY

6.1. Data Sources

In this study the effects of 12th November 1999 Earthquake on the demographic variables have been tried to be examined by comparing the demographic situation before and after the earthquake. Analyzing effects of the earthquake is required informatons about before and after the earthquake. Population Census includes only years 1990 and 2000 although it gives these informations. Besides, it could not be obtained information in detail from 1990 population census because of Kaynaşlı was become district on 1999. Another data source is health center records. These are enabled to compare and to do detailed analyses because these records had been recorded annually and regularly.

6.1.1. Population Censuses

Population Censuses have been carried out by State Statistics Institute since 1927 in Turkey. In this study, 1990 and 2000 census results were used. Because of the administrative unit change after the earthquake, 1990 census show Kaynaşlı as a “sub-district” in Düzce district of Bolu province. In 2000 census, on the other hand, it is a district of Düzce province. Between 1990 and 2000 censuses, the numbers of villages increased in the district. Four villages were divided and four new villages were established. (These are Altunköy, Çamlıca, Fındıklı and Hacıazizler villages).

During the administrative unit changing, no villages were added from other districts and no villages were separated from Kaynaşlı. Therefore, there are no problems while comparing two censuses, with respect to administrative units.

2000 population census results had been especially used while giving Turkey and regional values. Health center records had been analyzed in detail in order to put demographic effects on population forward.

6.1.2. Health Center Registration

In 12th November earthquake, almost all of the public buildings collapsed and most of their registrations damaged. In this study, it would be possible to use registrations of municipality and District Directorate of Population.

Municipality buildings were heavily damaged in earthquake and District Directorate of Population established after the earthquake, therefore it has not got any records prior to earthquake. But Kaynaşlı Health Center has not suffered from earthquake and the registrations for both before and after the earthquake are available.

The data set of Kaynaşlı Health Center has been compiled by means of *Fixing Household Forms* (FHF) kept in personal computer condition. These forms are anticipated to be used all health centers in Turkey by the Ministry of Health. Fixing Household Forms are the documents that include date of birth, sex, marital status, occupation and education level, place of residence, residence conditions, death and change of residence information for population living in served area. These forms are filled once in a year, generally in May, by nurses and midwives, for all the houses in the area. In Kaynaşlı there are two health centers, one of them is Kaynaşlı Health Centre, and the other one is Dipsizgöl Health Center.

The information about number of deaths and births has been obtained by Form 23 (First Step Foundation of Health Monthly Work Notification) which is also anticipated to be used by Ministry of Health. These forms are filled at the end of the year and include birth and death registrations.

Registrations of FHF and Form 23 have been obtained from Kaynaşlı Centre and Dipsizgöl Health Centers for years 1998 and 2002 in electronic format. In this format, FHF's by years had been edited in excel program. In Kaynaşlı Health Center, forms were filled for centre quarters and villages of Çakırsayvan, Çamoluk, Çatalçam, Darıyeri Bakacak, Darıyeri Hasanbey, Darıyeri Mengencik, Darıyeri Yörükler, Fındıklı, Sarıçökek, Saz, Tavak, and Üçköprü. In Dipsizgöl Health Center forms were filled for villages of Dipsizgöl, Çamlıca, Altunköy, Bıçkıyanı, Hacıazizler, Muratbey, Yeniyurt, and Yeşiltepe since 1999. Only for year 1998, data set do not include Dipsizgöl Health Center's villages.

6.2. Analysis of Variables and Other Measures

In this study, the demographic consequences of 12th November 1999 earthquake on Kaynaşlı Population (age and sex structure, mortality and fertility levels, migration, married and divorced ratios) had been investigated. Data set of year 1999 and years after 1999 have been compared to explore the effects of earthquake. Population Census results have also been used in addition to health centers registrations in order to give some general and regional information.

Age and sex structure of Kaynaşlı had been analyzed using population pyramids, sex ratios and dependency ratios (dependency ratio, young dependency ratio, elderly dependency ratio) and deaths by years had been investigated. In age pyramids, percentages of every age group had been calculated percentage dividing by total population. While calculating dependency ratios, population of ages between 15 and 64 is accepted as economically active persons and population of ages between 0 and 14 and population of age upper 65 are accepted as economically inactive persons.

Mortality level of Kaynaşlı has been analyzed by calculating crude death rate, infant mortality rate, child mortality rate and under five mortality rates. The data of infant deaths, does not give information about in which year these infants were born. With the assumption of these infant deaths including the infants who was born in one year ago, infant mortality rates had calculated as conventional.

The number of people who killed in 1999 earthquake is different according to different sources (General Directorate of Disaster Affairs, Sub-Government of Kaynaşlı). The registration of health centers as the number person who was died in 1999 had been used in this study.

Fertility level of Kaynaşlı has been analyzed using crude birth rate and general fertility rate. Age specific rates and total fertility rate could not be calculated because there are no data on births by five year age groups.

When mortality and fertility levels had been investigated, the data on infant and child deaths and births at 1999 had been recorded at the end of the year, after the earthquake. In order to see the situation before earthquake, the year 1998 data is analyzed although it is missing.

Migration in Kaynaşlı had been investigated using the number of household between years 1999 and 2002 and population growth rates. In order to estimate the net migration rate, an indirect estimation method had been used. This method is called “national growth rate method” and according to the method, for a geographic division, a rate of growth greater than the total rate is interpreted as net in-migration, and a rate less than the total rate as net out-migration (Shyrock et al., 1976), but there is another method (residual method) to indirect estimates (Shyrock et al., 1976). Residual method requires total population for two consecutive years, numbers of birth and death. In this study, total population of Kaynaşlı had been recorded at half of the year and numbers of birth and death at the end of year in used data set. Because of this, this method had not been used.

Marriages and divorces in Kaynaşlı had been investigated using proportion of married and divorced in adult population. The adult population is accepted as population of age 15 or more. The number of marriages and divorces is not available consequently crude marriage and crude divorce rate could not have been calculated.

Demographic formulae used in this study are presented above:

Sex Ratio	: $P_{\text{males}} / P_{\text{females}} * 100$
Dependency Ratio	: $P_{0-14} + P_{65+} / P_{15-64} * 100$
Young Dependency Ratio	: $P_{0-14} / P_{15-64} * 100$
Elderly Dependency Ratio	: $P_{65+} / P_{15-64} * 100$
Crude Death Rate	: Deaths in a year / Population at mid-year * 1000
Infant Mortality Rate	: Deaths under 1 in year / Live births * 1000
Child Mortality Rate	: Deaths aged 1-4 in year / Live births * 1000
Under Five Mortality Rate	: Deaths aged under 5 in year / Live births * 1000
Crude Birth Rate	: Births in a year / Population at mid-year * 1000
General Fertility Rate	: Births in year / $P_{\text{females } 15-49} * 1000$
Estimated Net Migration Rate	: District population growth rate- Total province growth rate
Married Ratio	: $P_{\text{married}} / P_{15+} * 100$
Divorced Ratio	: $P_{\text{divorced}} / P_{15+} * 100$

6.3. Data Quality

In this study, 2000 population census results and health center records had been investigated. The health center records especially had been analyzed while explaining the 1999 earthquake effects. The findings presented in this thesis may have been affected from errors and missings inherent in the records.

The population of Kaynaşlı is different in two data sources in year 2000. It can be said that the registration of health centers does not include total population but this situation may also be resulting from population census errors.

In fact, it would be better to analyze the years before earthquake for instance for every year since 1990, but the data set was not available because of there were no registration for years before 1999 of Dipsizgöl Health Center and also population censuses were recorded only for year 1990 and 2000. On the other hand, as Düzce become a province on 3rd December 1999, the historical overview is not given in the results of 2000 census of population. Under these circumstances, detailed analyses had been done using health center records in order to compare before and after the earthquake and these records enable to do detailed analyses. 2000 population census results are especially used giving values of Turkey and Düzce.

Analysis tables indicate that there are some data problems especially in health center records relation to births and deaths. But there are no data source relation to births and deaths except health center records. Mortality and fertility level had been analyzed using these records. This situation may have been accepted as a limitation of this study.

Health center records do not give any information about the causes of the events and it does not include specific information, for example, how many deaths were occurred, or how many people migrated from Kaynaşlı because of the earthquake. This problem is discussed more in Chapter 8.

Finally, in this study, true infant mortality rate, age specific fertility rates, total fertility rates, migration rates, married and divorced ratios could not be calculated because the health center records do not include the times of births and deaths occurred, the number of age specific births, the number of out or in migrants, number of marriages and divorces. But instead of these variables, conventional infant mortality rates, general fertility rates, percentage distribution of households, estimated net migration rates, married and divorced ratios have been presented.

However, it is believed that variables present a lot of clues about the demographic effects of earthquake in Kaynaşlı.



7. THE IMPACT OF 1999 EARTHQUAKE ON POPULATION of KAYNAŞLI

7.1. Age and Sex Structure

The various ways of describing age and sex distributions using population pyramids, the sex ratio and dependency ratios are considered. In this study, the data of age and sex from health center records between years 1999 and 2002 had been analyzed using population pyramids, sex ratio and dependency ratio. In addition to these, percentage distribution of population by age group and sex is presented. The data of year 1999 had been recorded before earthquake.

7.1.1. Age and Sex Distribution of Kaynaşlı Population

The distribution of Kaynaşlı population by age and sex is presented by the table of percentage distribution of Kaynaşlı population by age and sex and age pyramids.

Population pyramids are useful way of graphically presenting on age and sex distribution. It is conventional to use single-year or five-year age groups. In this study, the percentages had been calculated using the total population of both sexes combined and five year age group. Table 7.1.1. show the age and sex distributions of household population by years. Significant change of age and sex distribution has not seen after the year 1999 when was occurred the earthquake on.

Figures 7.1.1, 7.1.2, 7.1.3, 7.1.4. show age pyramids had been drawn by year for Kaynaşlı. According to the figures and table 7.1.1, it can be said that there are not any significant or important effect of earthquake on age and sex distribution. Almost half of the population of Kaynaşlı is in the under age 24 age groups as seen in age pyramids. This age structure indicates fertility level is high in Kaynaşlı. In Düzce, half of the population is younger than 27 years of age (SIS, 2002) as similar to Kaynaşlı.

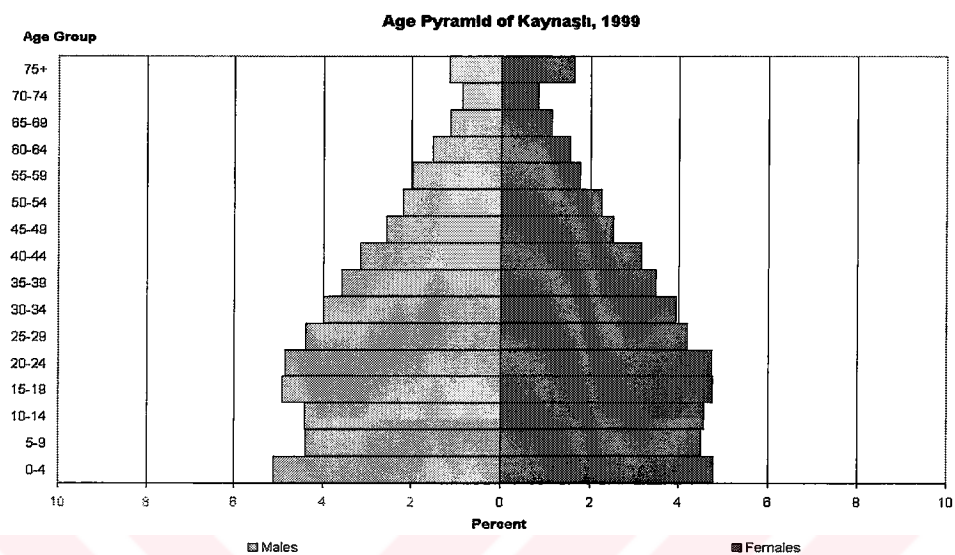


Table 7.1.1. Percentage Distribution of Household Population by Age Groups and sex, Kaynaşlı

Age Group	1999			2000			2001			2002		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
0-4	5,3	5,0	10,3	4,9	4,7	9,6	4,5	4,4	8,9	4,4	4,4	8,8
5-9	4,3	4,4	8,7	4,5	4,3	8,8	4,4	4,5	8,9	4,5	4,5	9,0
10-14	4,4	4,5	8,9	4,6	4,5	9,1	4,3	4,5	8,8	4,4	4,7	9,1
15-19	5,0	4,9	9,9	4,7	4,7	9,4	4,8	4,9	9,7	4,5	4,7	9,2
20-24	4,8	4,7	9,5	4,9	5,0	9,9	5,5	5,4	10,9	5,5	5,4	10,9
25-29	4,4	4,2	8,6	4,4	4,0	8,4	4,4	4,4	8,8	4,6	4,6	9,2
30-34	4,0	4,0	8,0	4,0	3,8	7,8	3,9	3,9	7,8	4,1	3,9	8,0
35-39	3,5	3,5	7,0	3,4	3,4	6,8	3,8	3,5	7,3	3,8	3,4	7,2
40-44	3,3	3,1	6,4	3,4	3,3	6,7	3,2	3,2	6,4	3,4	3,3	6,7
45-49	2,5	2,5	5,0	2,7	2,7	5,4	2,9	2,8	5,7	2,8	2,6	5,4
50-54	2,2	2,2	4,4	2,5	2,3	4,8	2,0	2,2	4,2	2,2	2,1	4,3
55-59	2,0	1,7	3,7	2,0	1,9	3,9	1,4	1,7	3,1	1,4	1,4	2,8
60-64	1,5	1,5	3,0	1,5	1,7	3,2	1,5	1,4	2,9	1,4	1,5	2,9
65-69	1,1	1,1	2,2	1,1	1,1	2,2	1,4	1,4	2,8	1,1	1,4	2,5
70-74	0,8	0,9	1,7	0,8	0,8	1,6	0,9	1,1	2	0,9	1,1	2,0
75+	1,1	1,6	2,7	1,0	1,4	2,4	0,9	0,9	1,8	0,9	1,1	2,0
Total	50,2	49,8	100	50,4	49,6	100	49,8	50,2	100	49,9	50,1	100
Number	9.660	9.561	19.221	10.208	10.041	20.249	10.006	10.072	20.078	10.530	10.570	21.100

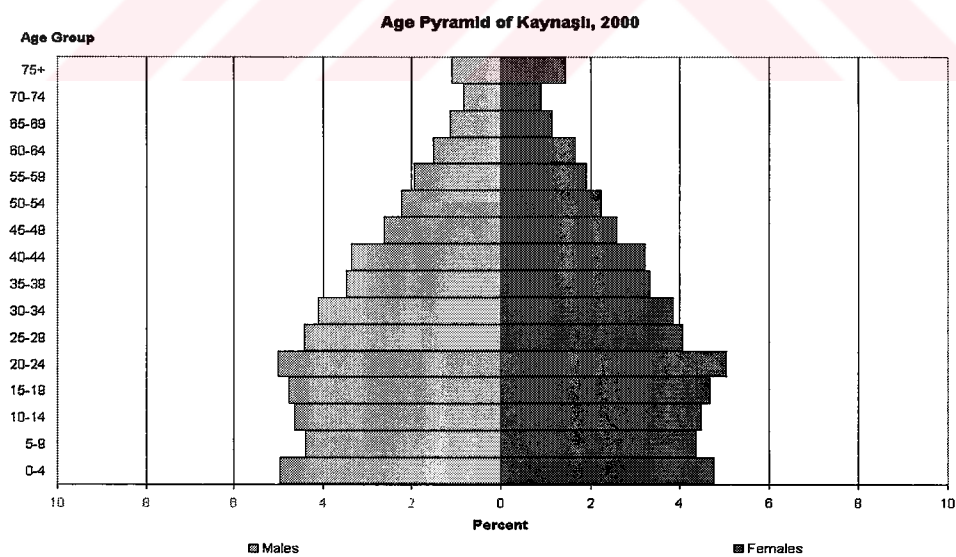
Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2002

Figure 7.1.1. Age Pyramid of Kaynaşlı, 1999



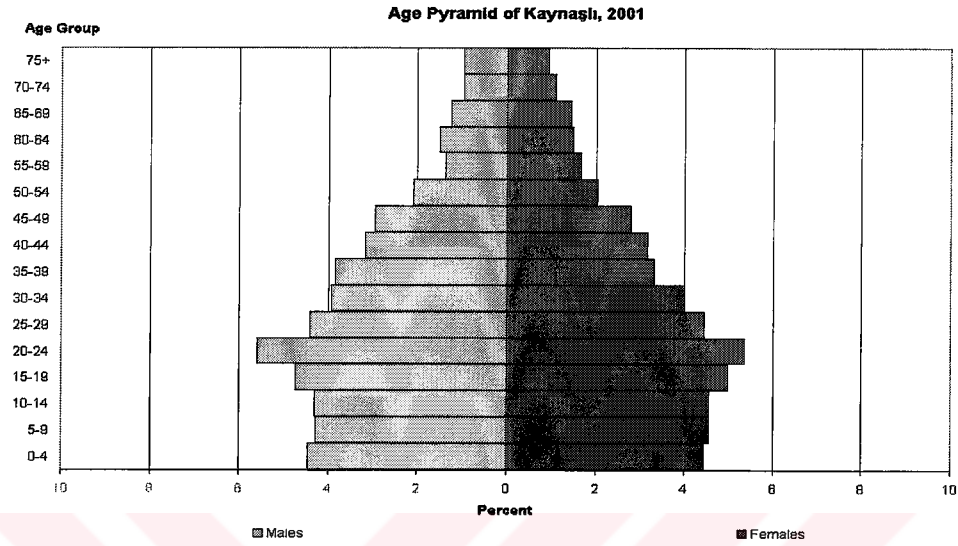
Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Figure 7.1.2. Age Pyramid of Kaynaşlı, 2000



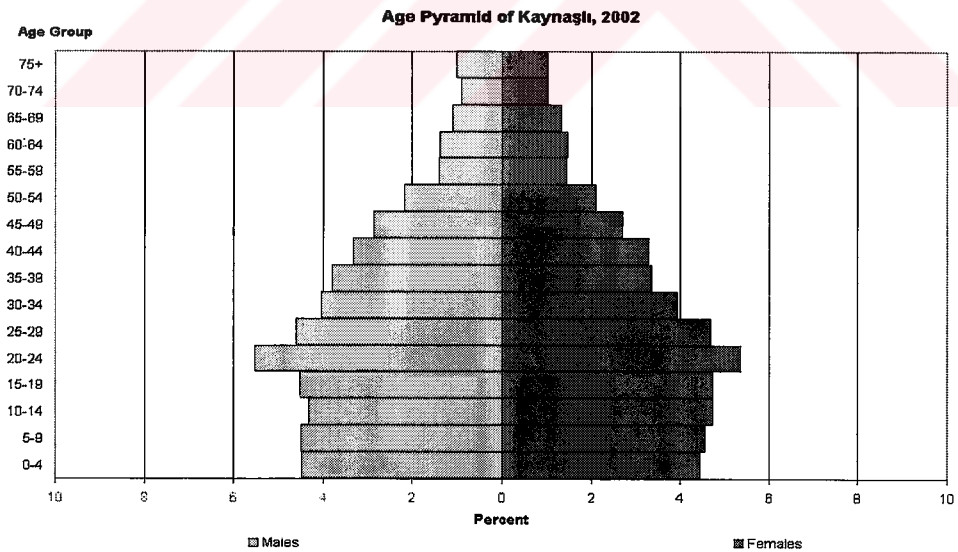
Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Figure 7.1.3. Age Pyramid of Kaynaşlı, 2001



Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Figure 7.1.4. Age Pyramid of Kaynaşlı, 2002



Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

7.1.2. Sex Ratio in Kaynaşlı Population

Sex ratio is expressed as the number of males per hundred females. In this study, sex ratios by years had been calculated using the data on age and sex from the records of health center and sex ratios had been also calculated using the results of 1990 and 2000 population censuses. Sex ratios had been calculated number of male dividing by number of female. It is expected in a population that, if especially the demographic events like death do not have a different structure by sex, the female and male populations have approximately the same size. In year 2000, there were 103 males for 100 females in Turkey (SIS, 2003).

Table 7.1.2. Sex Ratio of Kaynaşlı Population

Years	Male Population	Female Population	Total Population	Sex Ratio
	%	%		%
1999	50.2	49.8	19.221	101.0
2000	50.4	49.6	20.249	101.6
2001	49.8	50.2	20.078	99.3
2002	49.9	50.1	21.100	99.6

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Table 7.1.3. Sex Ratio of Kaynaşlı

Years	Male Population	Female Population	Total Population	Sex Ratio
	%	%		%
1990	49.3	50.7	18.308	97.1
2000	52.1	47.9	21.639	108.9

Source: 1990 and 2000 Population Census Results (SIS, 1992; SIS, 2002)

Table 7.1.2. shows sex ratio of Kaynaşlı population according to the health center records. As seen in the table, number of male per hundred female

decreased as small proportion (2,3) after year 2000. This state can be explained by both the males who leaving from Kaynaşlı causing from education or military service and the male deaths are more than female deaths in earthquake. Between years 1999 and 2000 sex ratio increased as relatively small proportion of 0,6. The reason of this state can be the males who coming to (officers, workers etc.) Kaynaşlı after the earthquake.

Table 7.1.3. shows sex ratio of Kaynaşlı according to population census results. Between years 1990 and 2000 sex ratio has increased in opposition to the table 7.1.2. Table 7.1.3. shows ten year process and Kaynaşlı has become a district on 1999. So many officers, workers, person has come to Kaynaşlı and more females than males could be left from Kaynaşlı causing from factors such as marriage or education in ten years.

The situation of sex ratio after 1999 is more important to see the effects of earthquake. Because of this, explaining the table 7.1.2. is suitable. Table 7.1.2. shows relatively small decrease of sex ratio from year 1999 to 2002. In this state, 1999 earthquake has not effect to sex ratio significantly.

7.1.3. Dependency Ratio in Kaynaşlı Population

Dependency ratio is the ratio of economically active persons to economically inactive persons in a population (Newell, 1998). In this study, population of ages between 15 and 64 is accepted as economically active persons and also population of ages between 1 and 4 and population of upper age 65 are accepted as economically inactive persons. These ratios had been calculated economically inactive population dividing by economically active population.

Table 7.1.4. Dependency Ratio in Kaynaşlı Population

Age Group	1999	2000	2001	2002
	%	%	%	%
15-	27.7	27.5	26.6	27
15-64	65.6	66	66.8	66.6
65+	6.7	6.5	6.6	6.4
Total	100	100	100	100
Dependency Ratio	52.6	51.7	49.6	50.0

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

As seen in the table 7.1.4., dependency ratio is 52,6 per hundred in 1999 and it has decreased to 50 per hundred in 2002. This decrease shows increasing the number of economically active person in total population. It is known that the new officers, workers and people who coming to Kaynaşlı after 1999, according to informations taken from sub-government workers. This state explains the decreasing dependency ratio. Therefore this decrease could be occurred from decreasing fertility and increasing deaths in inactive age groups. Young dependency and elderly dependency ratios are presented following:

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Table 7.1.5. Young Dependency Ratio in Kaynaşlı Population

Age Group	1999	2000	2001	20002
	%	%	%	%
15-	27.7	27.5	26.6	27
15-64	65.6	66	66.8	66.6
65+	6.7	6.5	6.6	6.4
Total	100	100	100	100
Young Dependency Ratio	42.7	41.8	40.6	41.4

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Table 7.1.6. Elderly Dependency Ratio in Kaynaşlı Population

Age Group	1999	2000	2001	20002
	%	%	%	%
15-	27.7	27.5	26.6	27
15-64	65.6	66	66.8	66.6
65+	6.7	6.5	6.6	6.4
Total	100	100	100	100
Elderly Dependency Ratio	11.1	10.6	10.4	10.2

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Young dependency ratio (YDR) is defined as the number of persons at “0-14” age group per hundred person at “15-64” age group and it is 46.3 in Turkey. Elderly dependency ratio (EDR) is defined as the number of persons at “65 and over” age group per hundred person at “15-64” age group and it is 8.8 in Turkey (SIS,2003). In Kaynaşlı, in four years period (1999-2002), YDR and EDR have not significantly change. But small decreases of these ratios can be interpreted as increase of economically active population or decrease of child and elderly population causing from decreasing fertility and increasing mortality.

According to these results, 1999 earthquake has not affected to dependency ratios of Kaynaşlı directly. These changes on dependency ratios concern process of become district especially.

7.2. Mortality Level

In this chapter, Crude Death Rates (CDR), True Infant Mortality Rates (IMR), Child Mortality Rates (CMR), and Under five Mortality Rates and number of deaths by sex of Kaynaşlı population is given for years 1998 to 2002 with aim of to determine the effects of earthquake on mortality levels in Kaynaşlı.

Number of deaths, numbers of infant, child and under five deaths, number of births and mid year population data from health center records had been used in order to calculate these rates.

The numbers of births and deaths had been recorded after the earthquake while data on mid-year population had been recorded before the earthquake. With the aim of to comparison, the data of year 1998 was added to analyze tables although it is missing.

7.2.1. Deaths by Sex of Kaynaşlı Population

Table 7.2.1. Deaths by Sex in Kaynaşlı Population

Year	Total Deaths	Male Deaths	%	Female Deaths	%
1999	311	221	71	90	29
2000	48	26	54	22	46
2001	45	24	53	21	47
2002	90	60	67	30	33

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Table 7.2.1. shows deaths by sex. The deaths in 1999 are more than the other years. It is the result of earthquake. In the earthquake, males were killed more. The number of deaths in 1999 earthquake is 244 according to informations of General Directorate of Disaster Affairs and according to the report of Sub-Government of Kaynaşlı it is 312. In this study health centers records had been used. In these records the number of deaths is 311 in 1999 as seen in the table 7.2.1.

If the 1999 earthquake occurred on the time when people in sleep, taking most of built collapsed causing from earthquake into consideration, deaths would be much more. Time of the earthquake decreased the number of deaths. According to workers of sub-government and municipality, the most of deaths were caused from collapsing of two café. It can be explained that why is male deaths more than female deaths if it is thought the most of males has got the culture of pass of their times generally.

7.2.2. Crude Death Rates of Kaynaşlı

Crude death rate is the simplest measure of mortality. It shows the number of people who are at risk of dying, the rate is the total number of deaths in a given time period divided by the person years lived. The crude death rate of Turkey is 4.55 per thousand in 1998 (SIS, 2001). In this study, crude death rates had been calculated number of deaths by years dividing by mid-year population.

Table 7.2.2. Crude Death Rates of Kaynaşlı Population

<i>Year</i>	Number of Deaths	Mid Year Population	Crude Death Rate ‰
1998	59	15430	3.82
1999	311	19.221	16.18
2000	48	20.249	2.27*
2001	45	20.078	2.24*
2002	90	21.100	4.26*

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

* Rates are low probably due to underreporting.

1999 earthquake has affected the crude death rate significantly. Table 7.2.2 shows the most of deaths are occurred in 1999 and the highest crude death rate is in 1999. Kaynaşlı is the most affected area from 1999 earthquake as human losses. In this state, it is natural the crude death rate is high in year 1999 when was earthquake occurred.

7.2.3. Infant and Child Mortality Rates of Kaynaşlı

Infant mortality rate is expressed the probability of dying in the first year of life (ages between 0-1). In this study, these rates had been calculated the number of infant deaths dividing by the number of births for years 1998 to 2002.

Child mortality rate is expressed the probability of dying between the first and fifth birthday and had been calculated the number of child deaths (ages between 1-4) dividing by the population of ages between 1 and 4.

Under five mortality rate is expressed the probability of dying before the fifth birthday and had been calculated the number of ages under five deaths (ages between 1-4) dividing by the population of ages under five.

Table 7.2.3. Infant and Child Mortality Rate of Kaynaşlı Population (% o)

Year	Infant Mortality Rate	Child Mortality Rate	Under 5 Mortality Rate
1998	3.3	3.3	6.6
1999	10.1	47.2	57.4
2000	2.8	0	2.8
2001	14.6	2.4	17.1
2002	2.6	0	2.6

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003.

The level of early age child mortality is important indicator of development level and health conditions of a society. According to the results of 2000 census of population (SIS, 2003), the infant mortality rate is 43 per thousand for Turkey. In the Black Sea Region, infant mortality rate of Düzce Province (50 per thousand) is higher than other provinces. Düzce is the one of the most affected area from 1999 earthquake. In this state, life and health conditions after earthquake contributed to this increase of infant mortality for Düzce.

Table 7.2.3. shows infant and child mortality rates for Kaynaşlı. Child mortality and under five mortality rates had taken highest values by other years. This state can be explained by increasing child deaths causing from earthquake. Infant mortality rate is 10.13 per thousand in 1999 and it has increased in 2001. After the earthquake, in Kaynaşlı, life had continued in tents and prefabricated residences long time¹. In this state, it can be said that the life conditions after the earthquake has affected negatively to the mother and child health and increased infant deaths.

1. Prefabric settlement has been still continuing in some areas in Kaynaşlı, in 2003.

As seen in the tables 7.2.2. and 7.2.3., the death rates which increase from the effects of earthquake, these rates had increased again in two or three years period. The reason of this situation can be missings in record of the health center. Unfortunately, there is no other data source to calculate the death rates. In this state, if death records are accepted as complete and accurate, than it can be said that 1999 earthquake has affected to the mortality level of Kaynaşlı by both causing to deaths and life conditions after the earthquake.

Table 7.2.4. Infant and Child Mortality Rates for Selected Province (‰)

Province	İnfant Mortality Rate	Child Mortality Rate
Düzce	50	10
Bolu	38	6
Zonguldak	45	8
Karabük	38	6
Bartın	42	7
İstanbul	39	6
Kocaeli	42	8
Sakarya	42	7
Yalova	43	8

Source: 2000 Population Census Results (SIS, 2003)

Infant and child mortality rates of Düzce province are in the first row both in Western Blacksea Region and among affected other provinces from 1999 earthquakes. This situation can be a result from 12th November 1999 earthquake. It is believed that the life conditions after the earthquake is affected to child health and increased deaths. Therefore, 1999 earthquake may cause to increase of early age mortality level causing to deaths.

Mizutani and Nakano (1989) in their study, have stated factors such as locality (regionality of natural and social characteristics), time (human behaviour at the time of impact), period (secular change in socio-economic factors), type of natural event have affect mortality levels directly.

In Kaynaşlı, situations like that, the time of earthquake caused increasing mortality and most of males was in cafes as a cultural habits and died there caused increasing male deaths supports this opinion of Mizutani and Nakano (1989).

Under the results concerning the mortality of this study, “The conscious level of society on disaster” can be added as another factor to the factors of Mizutani and Nakano (1989).

The conscious level of society on disaster includes such factors as buildings are safety and controlled or not, information level of society about disaster, necessary measures was taken before the earthquake or not, situation of given importance and priority for the topics relating to disaster by policy makers and appliers.

The most of the buildings in Kaynaşlı collapsed in 12th November 1999 earthquake. In fact, the cause of deaths is collapsing buildings, not the earthquake. If the buildings have been constructed strong and society had been prepared for disasters, damage would not be heavy, deaths would not be much either.

7.3. Fertility Level

Crude birth rate is expressed the number of births per thousand person and general fertility rate is expressed the number of births per thousand women in the reproductive age groups (15-49). In this chapter, crude birth rates (CBR) and general fertility rates (GFR) between 1998 and 2002 years.

The data on the number of births, mid year population and the women population ages between 15 and 49 had been used in order to calculate these rates. The numbers of births had been recorded after the earthquake while data on mid year and women populations had been recorded before the earthquake. Therefore, with the aim of to comparison, the data on year 1998 had been analyzed although it is missing. Crude birth rate is 12.4 per thousand and general fertility rate is 94 per thousand for Turkey (Toros, 1999).

Table 7.3.1. Crude Birth Rate and General Fertility Rate of Kaynaşlı Population (‰)

Year	Women Age 15-49	Total Population	Crude Birth Rate	General Fertility Rate
1998	4391	15430	19.63	69.00
1999	5141	19.221	15.39	57.57
2000	5410	20.249	17.18	64.32
2001	5631	20.078	20.37	72.63
2002	5913	21.100	17.77	63.41

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

As seen in table 7.3.1, crude birth rate and general fertility rates increased in years 2000 and 2001 while in year 2002 decreased. This situation can be relating to the accuracy of data set as seen mortality rates before. If data set is accepted as accurate and complete, then both CBR and GFR have increased from 1999 to 2002.

This situation can be explained by two ways, (1) people who want to give birth to memory of relatives who were killed in earthquake and (2) families who awared of the life can stooping every moment have been realized postponed wants of child.

Table 7.3.2. Total Fertility Rates for Selected Province (‰)

Province	Total Fertilty Rate
Düzce	2.18
Bolu	1.93
Zonguldak	1.93
Karabük	1.99
Bartın	2.11
İstanbul	1.97
Kocaeli	2.13
Sakarya	2.23
Yalova	1.93

Source: 2000 Population Census Results (SIS, 2003)

The total fertility rate is 2.5 in Turkey (SIS, 2003). In Düzce, while a woman at “15-49” age group in the province center bears 2.10 children, a woman at the same age group in district centers bears 1.74 and a woman in villages bears 2.41 children (SIS, 2002) This number is 2.18 in Düzce province total. When total fertility rate of Düzce among provinces in Western Blacksea Region and effected provinces from 1999 earthquakes is examined, Düzce is in the second row. This situation can be explained the effects of 12th November 1999 earthquake as like Kaynaşlı.

7.4. Migration

There are some practical difficulties in measuring migration. Whereas the number of times a person may migrate in his life time is much less strictly limited than deaths and births. The data which are available on migration are much less complete as records of all moves than data available on mortality and fertility (Hinde, 1998).

In this study, household numbers by years and percentage distribution household as city and villages is given and population censuses results had been investigated as city, village and total population and population growth rates in ten year with the aim of to determine the earthquake effects on migration in Kaynaşlı. Net Migration rate of Kaynaşlı by other districts of Düzce Province is estimated using an indirect method.

The changes of household numbers and annual growth rate of population are important to expose the effects of 1999 earthquake on migration in Kaynaşlı.

Table 7.4.1. Number of Household of Kaynaşlı

Year	Total	%	District Center	%	Villages
1999	3916	39	1530	61	2386
2000	3992	38	1520	62	2472
2001	4215	38	1631	62	2584
2002	4248	38	1617	62	2631

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Table 7.4.1. shows the number of households in Kaynaşlı. As seen in the table, the number of household has permanently increased. This state indicates that new families immigrated to Kaynaşlı. At the same time, extended families may have been separated and new households may have been consisted.

The increase of number of household in 2001 is more conspicuous than other years. After 1999 Kaynaşlı has become a district, and parallel to this, to work public foundations in district, new families have settled in Kaynaşlı. Furthermore, people have come to Kaynaşlı to work in construction sector, rest facilities and fabrics. These are affective in this increase.

After 1999, the increase of number of household in villages shows the families has returned their villages temporary or permanently after the earthquake. The increase of number of households in district center after 2000, can be explained both families who just settled and families who live in village migrated to district center to benefit from earthquake aid.

According to informations of the Sub-Government of Kaynaşlı (2001), the number of familiy migrated to abroad and also have property in villages is 376 and the number of household settled to villages in last five years is 181.

Table 7.4.2. shows total, city and village annual population growth rates for Düzce ant its districts. In Düzce which is in Blacksea Region total annual growth rate is 3.65, annual city population growth rate is 21.48, village population growth rate is -10.94 (SIS, 2002).

Blacksea Region takes place on the last among other regions as both city and village population growth rates. Düzce and Kaynaşlı are very close to Marmara Region geographically, so the growth rate of Marmara Region has been given. Total annual population growth rate of Marmara Region take place in the fist row (26.69), village population growth rate (21.00) is in also first row and city (28.26) is in fourth.

According to the table 7.4.2., population of Kaynaşlı is the fourth among seven districts (except center district) in 1990; it is the second in 2000. Kaynaşlı is the unique district increasing both village and city population among others in ten years. It can be said that this shows 1999 earthquake is not reason of migration from Kaynaşlı. This state also indicates potential of migrated to Kaynaşlı.

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Table 7.4.2. City and Village Population, Annual Growth Rate of Population by Districts, Düzce

Districts	1990			2000			Annual Growth Rate of Population %		
	Total	City	Village	Total	City	Village	Total	City	Village
Total	273679	105834	167845	314266	130632	183634	13.82	21.05	8.99
Center	138560	65209	73351	156690	56649	103041	14.19	-14.07	33.98
Akçakoca	32839	13582	19257	43895	25560	18335	29.01	63.21	-4.90
Cumayeri	11963	5193	6770	13348	7334	5914	10.95	35.87	-13.51
Çilimli	15427	3717	11710	16849	7147	9702	8.81	65.36	-18.81
Gölyaka	19775	4265	15510	19612	8572	11040	-0.83	69.79	-33.99
Gümüşova	14536	5051	9485	18043	12103	5940	21.61	87.36	-46.79
Kaynaşlı	18308	5878	12430	21639	9439	12200	16.71	47.35	-1.87
Yığılca	22271	2939	19332	21190	3728	17462	-4.97	23.77	-10.17

Source: 2000 Population Census (SIS, 2002).

Table 7.4.3. Indirect Estimation of Net Migration Rates of Districts of Düzce Province (‰)

District	Annual Population Growth Rate	Estimated Net Migration
	Total	Rate
Total Düzce	13.82	
Center	14.19	0.37
Akçakoca	29.01	15.19
Cumayeri	10.95	-2.87
Çilimli	8.81	-5.01
Gölyaka	-0.83	-14.65
Gümüşova	21.61	7.79
Kaynaşlı	16.71	2.89
Yığılca	4.97	-18.79

Source: 2000 Population Census Results (SIS, 2002)

In order to estimate net migration rates of Kaynaşlı, an indirect estimation method had been used. This method is called *national growth rate method* (Shyrock et al., 1976). According to this method, for a geographic division, a rate of growth greater than the total rate is interpreted as net in-migration, and a rate less than the total rate as net out-migration (Shyrock et al., 1976). As seen in the table, Kaynaşlı is the third among other districts of Düzce by estimated net migration rate. This result is confirmed that persons migrated from to Kaynaşlı like tables 7.4.1. and 7.4.2

After natural disasters it can be expected the population migrated from area. Tables 7.4.1. 7.4.2 and 7.4.3 show that there is migration to Kaynaşlı in contrast to migration from. The reasons of this situation can be summarized such as:

In natural sources and economical conditions respect, Kaynaşlı is in a rich geography. The society of Kaynaşlı has abilities and knowledge to use these natural sources in addition. Although, they are afraid of a new earthquake and lose their home and work places, they have not migrated from Kaynaşlı. Because of rich natural sources obtained to subsist themselves.

In addition, many families have succeeded to maintain their livings owing to earthquake aid. Kaynaşlı has become district and entered development process. This situation also facilitates to live in Kaynaşlı.

Finally with all of these reasons, it can be said that people have not migrated from Kaynaşlı because of the idea of they can establish their future easier than other places in Kaynaşlı.

As result, 1999 earthquake was not the reason of Migration to other places from Kaynaşlı. The results about migration of this study support the findings following; Balta's (1998) "the first answer of societies to disaster is temporary displacement", Smith and McCarty's (1996) "the most of the movements are temporary after disaster", Bahr's (1989) "affected people from earthquake left the area temporary".

Furthermore, results also support these results: Akkayan et al.'s (2002) "most of the research population do not think to migrate from there", Dereli et al.'s (1999-2000) "almost half of people who migrated has returned".

Mizutani and Nakano (1989) have stated the factors such as locality, time, period, type of natural event are affect the population growth after disaster directly.

In the light of these findings, if natural disasters happen in a region which is economically developed, is rich as natural sources and have good life conditions, it does not cause migration from area but can increase migration to caused from such factors as , the earthquake aid, the high probability of to find job in construction sector.

7.5. Marriages and Divorces

In this chapter, it is given marriage and divorce ratio with the aim of to determine the effects of 1999 earthquake on marriage and divorces. Percentage distribution of married people and divorced people in total population is presented. These ratios had been calculated the percentages numbers of married and divorced person dividing by adult population (age upper 15).

Married population has the highest proportion at Turkey. The proportion of married population is 60 % in the province centers, 59 % in the district centers and 62% in the villages (SIS, 2003). Married population ahs the highest proportion in Düzce Province, while the proportion of the married population is 59% in the district center, this proportion increases to 64% in the villages (SIS, 2002). The proportion of the divorced population is quite low for Düzce (SIS, 2002). Proportions of marital status in Kaynaşlı are similar to Turkey and Düzce province.

Table7.5.1. Proportion Married and Divorced in Kaynaşlı

Year	Population Age 15+	Marrige Ratio %	Divorce Ratio %
1999	13892	67.82	0.09
2000	14664	69.43	0.12
2001	14751	62.90	0.18
2002	15411	63.09	0.16

Source: Kaynaşlı Center and Dipsizgöl Health Center Registrations, 2003

Table 7.5.1. presents married and divorced ratios. In year 2000 the proportion of married in adult population is high among other years.

The increase of marriage ratio in 2000 can be explained the idea of saving economic burden resulted from traditional marriage concepts in life conditions after the earthquake in Kaynaşlı. During the interviews with workers of Sub-Government of Kaynaşlı, the young men married eloping girls have been called attention. This information supports the idea above about the increase in marriages. In the table 7.5.1., the decrease of marriage ratio in year 2000 has been noticed. One reason of is the increase of divorce ratios seen in the table. Adult married population can be moved from Kaynaşlı is can be another reason.

When it is looked at the divorce ratios in Kaynaşlı, it is seen that values are relatively low. In Kaynaşlı's cultural structure, if it is thought that divorces are not mey positively, it is very natural that divorce ratio is low. But this ratio has increase from 0.09 % to 0.16 % between 1999 and 2000 although Kaynaşlı's cultural structure. This can be explained that some people have awared the value of their lifes and decided to end their unhappy marriages. Therewith during the interviews with workers of Sub-Government of Kaynaşlı, it has been learned that the problems of families have been increased after the earthquake because of the effects of earthquake on psychology of people and life conditions. These problems may have been increased family incompatibilities; consequently divorces may have increased yet. This state shows 1999 earthquake has affected divorced ratio indirectly.

In publications related with divorce statistics (SIS, 2000), crude divorced rates had been given. Unfortunately divorced ratios calculated in this thesis are not comparable this statistics.

Lastly, according to table 7.5.1., 1999 earthquake has not occurred major changes on married and divorced proportion in Kaynaşlı population. But the earthquake has indirectly affected to married and divorced ratio due to psychology of people, rhought concepts and life conditions.

1999
1999

8.CONCLUSION

8.1. Discussion on Findings

Findings of the studies on communities stricken by the disasters show that there are many affects of a disaster. These studies put the families and societies are affected by losses occurring with regard to homes, income and have suffered from population movements. But in these studies there are not enough analyses on demographic effects of disasters.

This study is conducted to reflect the demographic consequences of 12th November 1999 earthquake in Kaynaşlı. But unfortunately, it could not be reached strong results about the effects of the earthquake.

First of all, results of study will not be beneficial to define priorities or politics on disasters. It could not be separated the earthquake effects from others such as administrative unit changing, life conditions ets. due to approach of study and data sources used.

In this study, health center records and 2000 population census results had been used. These data sources do not give information about how many events such as migration or death causing from the earthquake directly. In addition, data quality had been appeared as a problem while analyzing health center records. On the other hand, population census results had been used while giving regional and Turkey values because it could not be reached to the data of Kaynaşlı in 1990 population census. In this state, especially health center records had been analyzed in detail to expose the demographic consequences of earthquake in Kaynaşlı and interpretations had been made as these data sources are complete and accurate.

Because of these all, it would be better using another population not effected from any disaster (control population) to compare. But unfortunately there are not enough time to use control population.

These all limitations had been made hard to reach strong clues but also this study will show the way to the other studies in future.

Findings of the study are summarized below:

1999 earthquake has not affected the age and sex structure of Kaynaşlı significantly. The cause of relatively small changes is related with the changing of administrative unit in Kaynaşlı and development of the district.

In this study, it has been found that 1999 earthquake has affected on the level of mortality. Crude death rate, infant and child mortality rates have taken the highest values in 1999. Early age mortality level of Düzce province is in the first row among both provinces in Western Blacksea Region and other provinces affected from 1999 earthquakes. Namely, 12th November 1999 earthquake have caused an increase of mortality level by both causing deaths and changing life conditions. Opinions taken part in the literature are in the aspect that during the earthquake people; behaviour and locality, social properties affect the level of mortality (Mizutani and Nakano, 1989). For example, occurred the earthquake at 18:52 has increased the number of deaths in Kaynaşlı.

Mizutani and Nakano (1989) have stated some factors affecting mortality levels such as time, locality, and type of event. It has been pointed out that “the conscious level of society on disasters” is a factor affecting the mortality level directly. The conscious level of society basicly express if necessary measures whether related with the people and buildings have been taken before the earthquake or not.

1999 earthquake has caused increase in crude birth rate and general fertility rate indicators. At the same time total fertility rate of Düzce province is in the second row among both provinces in Western Blacksea region and other provinces affected from 1999 earthquakes. It is believed that changes on attitudes relating to birth causing from earthquake have been decreased fertility level after the earthquake.

According to the findings of this study, the earthquake has not caused a migration from Kaynaşlı, after the 1999 earthquake, a part of families have temporary settled in their villages and than they have returned the district center.

Between 1990 and 2000, the population growth rate of Kaynaşlı has gone up from the fourth row to second one among the districts of Düzce Province. Kaynaşlı is the unique district which city population has been increasing together with the village population, so the population movements after the earthquake, is limited with district center and villages and temporary. Estimated net migration rate also indicates that there were no out-migration from Kaynaşlı.

In this study the results about the migration, supported Balta's (1998) opinion that "the first answer of society to disasters is temporary displacement, Smith and McCarty's (1996) opinion that "most of the population movements after the earthquake are temporary", Bahr's (1989)opinion that "people affected by the earthquake leave the area temporary findings".

Furthermore, the results of this study is similar to results of research conducted by Akkayan et al.'s (2002) "most of the research population do not think of migrate" and Dereli et al.'s (1999-2000) "most of the migrated people have returned".

In addition to these, the results concerning the migration in Kaynaşlı have supported that Mizutani and Nakano's (1989) opinion about such factors as locality (regionality of natural and social characteristics), time (human behavior at the time of impact), period (secular change in socio-economic factors), and type of natural event are affective in the population growth after disasters.

In this situation, these results can be generalized as if the disaster occurs in a place which is rich about natural sources, suitable in the aspect of life conditions and economically developed, it is not occur heavy damages, are not cause to migration from the area besides effects of such factor as earthquake aid, probability of to find job in construction sector are increase the migration to area.

The results concerning marriages and divorces of this study, put forward that 1999 earthquake does not have direct effect on marriage and divorce in Kaynaşlı. It is similar to results of Aguirre's (1980) study. But according to relatively small changes in ratios of married an divorced population, it can be said that the earthquake has indirectly affected the marriages and divorces causing the psychologic structure, concepts of thought and behavior and life conditions.

8.2. Line of Future Research

There is a peculiar and distressing gap in the area of disaster research in Turkey although the country where is occurred natural disasters, especially earthquakes and floods frequently. This thesis tries to fill in this gap in its own limitations. However it is known that this is not enough since more disaster research are needed. But on the basis of this study, it is possible to suggest some future lines of demographic researches.

In order to see that demographic consequences of disaster, to investigate the all demographic variables are much scattered. It can be beneficiary to choose one of the demographic variables for example fertility or migration and to investigate it in detail. Besides, it would be better using control group (another population not effected from any disaster) to reduce effects of data quality problems.

The second suggestion is researches as such presented one can be conducted not only for earthquakes but also, for floods, etc. In addition to this, there is a need for long-term studies after natural disasters. It would be suitable to conduct another researches in different times, different places, using the health center registrations and it would be repeating the study in the same population such as the present one in Kaynaşlı after ten years, for example.

Different faces of disaster have been focused on by researchers of individual disciplines often with the deliberate avoidance of other aspects of the process, psychologist have concentrated on trauma, preparedness and hazard perception, geographers on spatio-temporal distribution of risk, sociologist on the effects of disaster on a community, demographers on the demographic variables. The demographic studies on disaster must be interdisciplinary is another suggestion.

It would be constituted standardized record system for natural disaster. This will be facilitating future studies on consequences of disasters. This system can be record deaths, displacements etc. only affected by earthquake.

Finally, in the field of disaster studies, census results and other records are insufficient to put demographic consequences of disasters forward. It must be conducted qualitative and quantitative surveys in the field, in Turkey. These surveys are also important sociologically, psychologically and etc.



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