Master Thesis in Geoinformatics

Preferred residential neighbourhoods of the elderly population in the city of Norrköping

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ABSTRACT

The population of Sweden is ageing as in almost every European country. Improved medical progresses and treatment options lead to a decreasing mortality at older ages, increasing life expectancy and an advanced health of the elderly. Due to these improvements and the so-called ‘baby-boomers’, a great number of persons born in the 1940s that will reach retirement age the coming years, their total number will increase strongly in the near future all over Sweden. To enable these elderly to live a normal, active and independent life as long as possible activities, services and special housing with improved accessibility and meeting places for elderly has to be provided. Thus, for local authorities it is essential to know the actual and favoured living conditions as well as environments of elderly. This study aims therefore to investigate the characteristic of preferred residential neighbourhoods of the elderly in the city of Norrköping. The demographic, social and crime situation was examined for the districts of the city using several methods from both Statistics and GIS. Statistical methods included classifications, indexes or indicators and bivariate correlations. A model was developed to combine demographic and social data to characterise districts. Besides conducting advanced spatial analysis GIS-software was used as a visualisation tool. Choropleth mapping and Kernel density estimations were used to illustrate distribution of elderly and crime. Preliminary global statistical tests were used to verify clustering in the crime data set. An accessibility analysis was conducted with the help of the network analyst tool. Results indicate that districts experiencing the highest total numbers and proportion of elderly are very distributed throughout the city of Norrköping. They are, with some exceptions, characterised by lower social status. Four districts of the city show considerable evidences of demographic ageing, experiencing a population pyramid formed like an urn. Beside districts where elderly constitute a bigger proportion of the population, they tend to live in districts characterised by a relatively high proportion of young adults aged between 20 and 29. Crime analyses have shown crime clusters in different parts of the city. A high proportion of elderly faces a high crime level in the districts Gamla staden, Nordantill and Hageby. However, it has been proved that only some hot spots of crime within these areas contribute to the high crime level. Districts such as Skarphagen, Såpkullen, Smedby and Linö, all (except Såpkullen) situated on the outskirts of the city, hold high or middle elderly and a low crime level. Accessibility analyses have shown that elderly aged over 80 do not live significant closer to health centres and the public transport stops compared to the age groups 20 – 65 and inhabitants aged between 65 and 79.

KEY WORDS

Demographic ageing, Elderly population, Age structure types, Social structure types, GIS (Geographical Information Systems), Interpolation, Choropleth mapping, Accessibility analysis, Crime mapping
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1 INTRODUCTION

The Elderly are the oldest citizens in our society and the issue of the elderly has become increasingly important in recent times. It has been discussed in areas such as medicine, demography as well as social or behavioural science. Improvements of medical progresses and consequential improved treatment options lead to decreasing mortality at older ages and a rise of life expectancies. Therefore older people are not only much healthier than previous generations of old people, they mostly also have many years of life ahead to look forward to. Older people in good health can fill their remaining years with activities such as doing sports or travelling and lead an active and independent life as most are well off. Other fields of interest are the social situation of the older population or crime against elderly and following consequences for their daily life. Studies examining crime and abuse against elderly concluded that violence and assault against older people are mainly caused by family members and nursing staff. Other crime against older people outside the own apartment has been declared as a problem of fear of crime (Jönson 2003). It is known that older people are afraid of crime and even adapt their behaviour in terms of not going out at night or avoiding certain areas in a city. In the field of demography the increase of older people and linked population ageing, also referred to as demographic ageing, was and is a much discussed issue. Unfortunately the older people increasingly become a social problem and they are frequently linked to different kinds of trouble:

- As they are affected by poverty.
- As they suffer from victimization (Jönson 2003).
- As they put pressure on the welfare state, because they show increasing need for medical and social services and set higher requirements on care resources.
- As they put pressure on the public finances because their proportion in the population constantly rises and consequently expenditures for pensions increases (SALAR 2007).

But one should not forget that old people just leave 30 to 40 years of work behind and it is due to them that people in Sweden have a high quality of life today. The group of older people historically constitutes only a small proportion of the population, but grew considerably and with a proportion of 17 percent today is almost as big as the age group of children and youth. Because older people will constitute the largest population growth for the next 30 years a considerable increase of the need for care is expected.

Even if local authorities have several years to plan and adjust to this situation, it will be one of the biggest challenges to organise the care of the elderly in present and future. To enable old people to manage without care longer and to live healthier, they should take part in physical, social, cultural or other activities. Furthermore to help and enable older people to live a normal, active and independent life as long as possible adapted or special housing for older people has to be provided. Houses or flats for older people have to guarantee improved accessibility and should help socialising by integrating meeting
places. These criteria have to be considered while planning, building or remodelling housing for older people. Therefore, for local authorities it is essential to know the actual and favoured living conditions as well as environments of elderly.

Against the background of a prospective considerable increase of pensioners in the municipality of Norrköping, local authorities probably have to plan new housing for older people to meet future demands. Investigating the characterisation of preferred residential environments of elderly can therefore help to optimize planning and improve policies regarding older people. Thus, this study aims to investigate the residential neighbourhood of older people at a sub-national level from an analytical point of view. The study area is the city of Norrköping, a former industrial city in the county of Östergötland. This work can be seen as an attempt of a multidisciplinary approach combining several important aspects from demography, crime and social science as well as GIS. The following four key questions will be analysed and tried to answer:

- From a spatial point of view the questions ‘where in the city of Norrköping do older people live’ and ‘how has the number of elderly in certain areas developed’ will be investigated. This study will not be able to answer why older people live in certain areas, but suggest some possible influencing factors. Another important age group – the inhabitants aged between 55 and 65, as they are the future pensioners - will be examined as well. The demographical situation in the city of Norrköping will be the major issue presented.
- In what social environments do older people live in the city of Norrköping?
- What is the crime level experienced in preferred residential areas of older people?
- Do older people live closer to (for them) important facilities like health centres or the public transport?
2 THEORETICAL BACKGROUND AND CURRENT DEVELOPMENTS

2.1 Demography

2.1.1 Focus in science and theoretical background

FOCUS AND RESEARCH QUESTIONS

In brief, demography is the science studying the size, structure and distribution of populations as well as their spatial and temporal change. In the 20th century the demographic ageing, also called population ageing, is probably the most distinctive demographic change. Demographic ageing is characterized by an incremental transformation of the population. Thereby the age pyramid of a population, used to display the age structure, transforms from a bottom-heavy pyramid to a so called urn-shaped pyramid with a small base and a relative broad upper part of the pyramid. The last mentioned pyramid type can also be called onion shape and is caused through several interrelated processes. The length of the transformation process varies from country to country, usually from one to two decades.

The term demographic transition is used to describe the change between the lower and upper part of the age pyramid and therefore the alteration of the demographic balance between young and old. The demographic transition was examined by many scientists and political controversy and awareness also turned toward this issue over much of the 20th century. Since the beginning of the 1980s and intensified since the 1990s a renewed interest regarding the matter of population ageing and menacing aspects emerged. The generated worldwide awareness and conducted debates mainly concentrated on items named ‘depopulation’, ‘population decline’ or ‘ageing’. The United Nations published important statements (e.g. 1992, 2002) about population ageing and consequent follow-ups. The reports contain topics where it is assumed that ageing causes difficult unforeseeable challenges (Foss and Juvkam 2005). In many countries the main focus of demography researchers changed to the central issue of the public pay-as-you-go pension systems around the mid-1990s due to the impending retirement of the baby boom generation (born in the 1940s) (Gillion et. al 2000). Topics like pensions, public finances and future labour supply were frequently part of debates and discussions. However, it has seldom been proved that the knowledge about contemporary as well as future demographic evolution had an influence on policies or behaviour. Current discussions and debates are most likely related to other features of social change and society than to demography (Foss and Juvkam 2005).
THEORETICAL BACKGROUND – THE MODEL OF DEMOGRAPHIC TRANSITION

The so called ‘Demographic transition’ is a demographic model describing the change of the total population in an area using birth- and death rates development. Today the demographic transition model is also known as ‘vital- revolution’ describing the transition of the population from a pre-modern to a modern society through several steps (Foss and Juvkam 2005).

The idea of demographic transition was first presented by W.S Thompson in the year 1929. But it should take another 16 years till F.W. Notestsein presented for the first time ever an explanation of the model. The suggested relationship between socioeconomic development and population change was novel. According to Notestein a socio-economic change in term of an evolution starts from a traditional (non industrial and usually agrarian) society and ends in a modern (industrial, urban) society causing first a decline in death rates followed by a decline of birth rates. Notestein called this process - which is linked with Western- style economic development - ‘modernisation’. As a result a society faces a static population or low natural increase (Barrett 1996).

Based on this assumption, Notestein presented a four- stage model which can be seen in figure one.

![Figure 1: The Demographic Transition Model](image)

Source: Barrett, H.R. (1996), page 50

The period of stage one is characterised by high birth and death rates which results in a stable but low population. Traditional agricultural societies are classified in this stage. Through modernisation (access to enhanced hygiene and medical care) the decline of death rates starts in stage two of the model.

The death rate drop and the continual high birth rates cause a rapid population growth with its peak at the end of this stage. In stage three birth rates start to decline slowing down the population growth. Stage four of the model is characterized by low birth and death rates caused by further economic development. The outcome is a stable, high
population that lives in an industrial urban society. In addition to these four stages a fifth stage can be identified. There a declining population results from continual low birth rates but raising death rates (Barrett 1996).

The model of the demographic transition reflects and seems to verify the experience of many countries very well and is therefore used as a description model for the development of the population. The length of the process is stated being between two centuries and a few decades. The following figure gives some examples of countries with a different process of the demographic transition.

Figure 2: Schematic representation of the length of the demographic transition in different industrialised countries
Remark: Countries represented are (clockwise – start top left): England/ Wales; the Netherlands; Germany; Japan; Sweden and Denmark
Source: Bähr (1992); page 251
2.1.2 Demographic Situation in Europe and Sweden

DEMOGRAPHIC TREND IN THE EU

In the year 2005 the European Union (EU) counted about 75 million people aged above 65 which correspond to 17 percent of the whole population. When the ten new member states joined the EU in the year 2004 the EU’s population grew younger. Nevertheless this will be only a short- term change and the population in the countries of the EU will grow older in future. Calculations estimate a doubling of the population aged over 65 in the EU25 between 1995 and 2050. Beside the fact that the Europeans will live longer, they will face reduced fertility rates as well. In almost all EU member states, except Malta and Cyprus, the birth rates lie under the replacement level of 2.1 children per woman. In the year 2003 the natural population growth (only birth- and death- rates; no migration) was 0.04 in Europe with a fertility rate in average 1.4 children per woman. From this it follows that a population growth in many EU countries will only be achievable through immigration (SALAR 2007).

Whereas Germany (19 percent), Italy (19 percent) and Greece (18 percent) held the highest percentage of inhabitants aged over 65 in the year 2005, Ireland (11 percent), Cyprus and Slovakia (both 12 percent) had the lowest percentages (SALAR 2007). In the EU the biggest proportion of inhabitants aged over 80 can be found in Sweden (Eurostat 2006).

THE DEMOGRAPHIC TRANSITION AS A DESCRIPTIVE MODEL FOR SWEDEN

Sweden is known for its excellent demographic records including births, deaths and marriages. For this reason Sweden is often used to illustrate the accuracy of the model of transition which was introduced previously (Barrett 1996).

Presenting the Swedish birth and death rates over time – as is shown in the following figure three - similarities with the demographic transition model are clearly visible (Barrett 1996). (In the figure the curves of birth and death rates appear smoothed, because a mean of 10 years is used to calculate the rates. However, the general trend is visible.)

![Birth and Death rates of Sweden 1751-2000](image)

Figure 3: Birth and Death rates of Sweden 1751-2000; mean of 10 years intervals
Data Source: Statistisk årsbok för Sverige; Statistical Yearbook of Sweden 2007
In Sweden the years from 1750 to 1800 can be seen as stage one of the demographic transition model. Both the death and birth rates fluctuated at a high level. After the year 1800 the death rates started to fall indicating stage two of the model. It took another 70 years until the birth rates began to decline constantly (around 1870) and the third stage of the transition model had been initiated (Barrett 1996). Stage two and three with the enduring change from high to low mortality and fertility was most distinctive in New Zealand, Australia, North America, Japan and Europe (Foss and Juvkam 2005). In the 1970s the decline of birth and death rates had slowed down. Both rates fluctuated at a low level displaying stage four of the model (Barrett 1996). The last 30 years of the development of the birth and death rates can be seen in more detail in the figure below.

![Birth and Death rates of Sweden 1975-2005](image)

Figure 4: Birth and Death rates of Sweden 1975-2005
Data source: Statistisk årsbok för Sverige; Statistical Yearbook of Sweden 2007

During the period 1981 – 1984 the birth and death rates were almost equal or at least very close together. The following increase of birth rates (ca. 1988 – 1993) is also called the ‘baby boom’ of the early 1990s. In the year 1997 death rates exceeded the birth rates for the first time with 10.55 to 10.23, which would fit to the description of phase five of the demographic transition model. For the five-year period from 1997 to 2001 the death rates remained higher than the birth rates, before the birth rates started to increase and exceed the death rates again (Barrett 1996).
DEMOGRAPHIC AGEING IN SWEDEN
The decline of mortality and fertility, described in the demographic transition model, are stated as most important processes linked with demographic ageing (Foss and Juvkam 2005). Therefore, the mortality decline will be described in detail firstly, followed by a representation of the fertility drop.

a) Mortality decline
The decrease of mortality usually implies the beginning of the transition and takes place at stage two of the model of demographic transition. In Sweden the mortality rates began to fall around 1800. First the infant mortality, which is also used as an indicator to describe the economical and social development of a country, declined. Since the middle of the 18th century infant mortality decreased by 98 percent. While around 1750 every fifth child died within the first year, in the year 1997 only 3 girls and 4 boys of 1000 life births passed away during the first year (Statistics Sweden 1999).

As is visible in the following figure (in the very top) the infant mortality declined strongly from 1875. Around 1910 a rapid decline of mortality of people aged between 15 and 34 becomes apparent (figure 4 in the middle). In the middle of the 20th century mortality of people aged over 35 also began to fall (lower figures), even though the decline was not so pronounced compared to younger age groups. Through a general improvement of life conditions, medical progress and better sanitation a mortality decline at all ages took place. The background of these declines was mainly the fall of mortality caused by infectious diseases (Statistics Sweden 1999).
The drop of mortality at higher ages tends to influence the development of the relative size of older age groups compared to younger age groups. In other words the decreasing mortality increases the size of a specific age group but gradually more the size of older age groups (Foss and Juvkam 2005). With ongoing medical progress and consequential improved treatment options the causes of death changed during the last decades. Today most causes of death are cancer and cardiovascular diseases (Statistics Sweden 1999).

Associated with declining mortality is the longer life expectancy. Since 1759, and especially in the 20th century, average life expectancy increased dramatically, although much of the rise can be explained by the above described reduced infant mortality (SALAR 2007).

In the year 2005 the average life expectancy at birth was 78 years for men and 83 years for women (SALAR 2007). Life expectancy more than doubled consequently in less than
200 years, as shown in the figure 6 below. Women always had a higher life expectancy than men, but from 1950 life expectancy of both sex diverged reaching a peak in 1986 with 6 years difference in the life expectancy of women and men. After this life expectancy of women and men moved back into the same direction and came closer together again, but even so men did not catch up with the life expectancy of women.

Figure 6: Development of the life expectancy at birth by mean of 10 and 5 years intervals (left side) and year per year (right side) in Sweden
Remark: Notice that y-axis does not start at zero.
Data source: Statistics Sweden (Statistiska centralbyrå) online query

Against the background of a growing proportion of pensioners the remaining life expectancy of individuals aged over 65 is of special interest. The ‘remaining life expectancy’ shows how many years a today 65 year old person can still expect to live on average (Statistics Sweden 1999). Figure 7 indicates a noticeable increase of the remaining life expectancy since 1750 and particularly since the 1940s for persons aged 65. In older age the life expectancy and therefore mortality reduction is most outstanding for women recognisable by the diverging women and men remaining life expectancy. The main reason for this rise of life expectancy is the significantly improved health of elderly (SALAR 2007).

Figure 7: Development of the life expectancy at age 65 by means of 10 and 5 year intervals in Sweden
Data source: Statistics Sweden (Statistiska centralbyrå) online query
According to today’s life expectancy and mortality levels women reaching retirement age at 65 can expect to live another 21 years, which means up to the age of 86 (see figure 8). Men of the same age have a remaining life expectancy of 17 years, which corresponds to an age of 82. Individuals going into retirement today therefore hopefully have many years to look forward to (SALAR 2007).

<table>
<thead>
<tr>
<th>Year</th>
<th>Average life expectancy at birth</th>
<th>Average remaining life expectancy at age 65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>1900</td>
<td>51</td>
<td>54</td>
</tr>
<tr>
<td>1925</td>
<td>61</td>
<td>63</td>
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<td>78</td>
</tr>
<tr>
<td>2005</td>
<td>78</td>
<td>83</td>
</tr>
</tbody>
</table>

Figure 8: Average life expectancy and average remaining life expectancy, broken down by sex
Source: (CoE), Statistics Sweden 2006, Medellivslängd och återstående medellivslängd (average life expectancy and average remaining life expectancy)

b) Fertility decline
The drop in fertility, starting at stage three of the demographic transition model, is said to be the main parameter of the extent and timing of population ageing. Especially the drastic fertility decline, which in most western countries occurred from the mid-1960s to the mid 1970s, was the reason for renewed interest in demographic ageing and population decline or stagnation. The peculiarity of this recent fertility decline is the drop of the total fertility rate (TFR) below the replacement level of 2.1. Sweden fell below this level in 1968 (Foss and Juvkam 2005). After a longer period below replacement level the TFR reached a fertility rate around 2.1 in the so called “baby boom time” around 1990. This bump in the development of the fertility rate can be seen in the following figure 9. In the year 2005 the TFR was about 1.8 (Statistisk årsbok för Sverige 2007).

Figure 9: Development of the TFR of Sweden from 1978 to 2005
Data source: Statistisk årsbok för Sverige 1994, 2007; Statistical Yearbook of Sweden 1994 (for the years 1978 to 1990) and 2007 (from the year 1991)
Migration can have a significant impact on the development of the mortality and fertility rate. The big waves of overseas out migration to a large extend influenced the demographic structure and ageing bias in some European countries in the beginning of the 20th century (Backer 1965).

All three factors – migration, fertility and mortality – are considered to be difficult to predict to some extent. Even at national levels the prediction of future demographic development is therefore difficult. At territorial level, such as municipality or community, additional factors like the internal migration further impede population prognoses (Foss and Juvkam 2005).

THE EXTENT OF DEMOGRAPHIC AGEING IN SWEDEN

There is no doubt that Sweden’s population is aging. The mean age increased from 23 years in 1750 to 39 years in 1998 and the proportion of people aged over 65 rose from 6 to 17 percent during the same period. The decline in fertility and mortality, which has been described above, are stated as the most important reasons for this development (Statistics Sweden 1999). A population is said to be ‘young’ if the median age lies below 20 years and ‘old’ if the median age of a population lies over 30 years (Shryrock and Siegel, 1973). Based on this definition Sweden’s population was young till 1750 and grew old in the 1960s (Statistics Sweden 1999).

The relative size of the ‘broad functional age groups’ (age 0-19; 20-64 and 65+) as well as their development and hence following implications are of recurrent political concern (Foss and Juvkam 2005). The older age group (aged over 65), that historically constitute only a small proportion of the population, has grown considerably during the last 250 years (Statistics Sweden 1999). As is visible in figure 10 below the group ‘children and young people’ (here aged 0-15) experienced a contrary development during the same period.

![Figure 10: Proportion of children and elderly on the total population, 1750-2000](source: Statistics Sweden (1999), page 52)
In the 18th and 19th century the proportion of old people in the population was only five percent. The child – elderly relation was one to six which means that for each older person six children were countable (Statistics Sweden 1999).

Since 1880 the age group of old people grew considerably and today constitutes 17 percent of the population (about 1.6 million people) (SALAR 2007), approximately the same proportion as ‘children and youth’ with 18 percent. A moderate increase of the very old (aged over 80) has been noticeable since the 1950s. During a long period this age group represented just one percent of the population, but rose to two percent in 1950 and up to over five percent in 1998 (Statistics Sweden 1999).

In the 1990s Sweden experienced a ‘demographic respiration break’. The proportion of old people temporary stopped increasing and the proportion of children and youth stopped to decrease (Statistics Sweden 1999).

DEMOGRAPHIC SITUATION IN SWEDEN IN THE YEAR 2006

During the process of the demographic transition the sex and age structure of the population will necessarily change. The term ‘population structure’ describes the sex and age composition of the population and can be represented visually by a so called ‘population pyramid’ (Barrett 1996).

Figure 11 shows the age pyramid of Sweden for the year 2006. Clearly visible are three demographic waves. Demographic waves occur naturally whereas baby boom years will contribute to higher birth-rates 20 to 30 years later because the born cohort will reach the age of giving birth to the next generation. A first bump is visible for the age groups 55-59 and 60-64. These people are born in the 1940s and are also called “the baby boomers” (40- talisterna) (Statistics Sweden 1999). The second bump occurs at the ages 35 to 45. These are born in the 1960s and to a great extent the children of the baby boomers. A third bump can be seen for people aged between 10 and 19, also called the baby boomers of the 1990s.

The figure shows also an obvious jump of the portion between the age groups 60-64 and 65-69. This jump implies a significant increase of the persons reaching retirement age in the following years.
In Sweden’s population sex differences emerge as well. Whereas up to the age of 64 a surplus of men can be detected, a surplus of women becomes obvious from the age of 65. This surplus of women becomes even more striking with increasing age and especially at the very high age of over 80. In the year 1998 women constituted 65 percent of the proportion of people aged over 80 compared to 60 percent in 1990. In the year 1998 the proportion of women aged over 90 was 75 percent (Statistics Sweden 1999). The substantial differences between the proportion of men and women in the upper part of the age pyramid can be explained by the higher life expectancy of women.

THE FUTURE DEMOGRAPHIC TREND IN SWEDEN

To sum up the previous sections, the population of Sweden lives longer and also healthier for hopefully a larger part of the retirement phase (SALAR 2007). This means that most people can fill their remaining years with activities and lead an active and independent life. Most old people can continue to live in their own homes. Compared to other countries in the world Sweden invests more of its gross domestic product (GDP) in older citizens (Swedish Institute 2007). Sources even mention Sweden as one of the best countries where to grow old in (SALAR 2007).

Calculations have shown that Sweden will have 9.3 million inhabitants in the year 2025. This number will be almost the same for the coming 25 years (SCB:s befolkningsprognos 1999). An expected further mortality decrease together with a not particularly high fertility rate will cause a curbing of the population growth (Statistics Sweden 1999).

Figure 12 illustrates the population growth in Sweden until 2050 and starting in 2005. As shown the largest population growth for the next 30 years is expected for the older age
group (aged over 65). Around 2035 the two age groups not of working age (0-19 and 65+) contribute to the majority of the population growth (SALAR 2007).

Figure 12: Population of Sweden, 2005-2050, Change in comparison with 2005, thousand of people
Source: Swedish Association of Local Authorities and Regions 2007, page 9

Based on this different growth the proportion of the age groups in the population will change considerably. Figure 13 gives an overview of the three main age groups and their development from 1950 as well as predicted values until 2050. Sweden already experienced a substantial increase of the elderly until the beginning of the 1990s. However a new “elderly- boom” is expected which will peak in the 30s of the 21st century. The reason is the big bump of those born in the 1940s and 1960s that will reach retirement age. The elderly will therefore constitute an obviously bigger proportion of the population than today. It is assumed that in some years of the 2030s the pensioners represent one fourth of the country’s whole population. This corresponds to a remarkable increase of 8 percent compared to today’s proportion of old people of 17 percent. Estimates further show that from the 2030s Sweden will have more old people than children and youth. The proportion of children and youth (0-19) as well as persons of working age (20-64) will increase as is visible in the figure (green dotted and blue dashed line). Thus the support burden will increase substantially (Statistics Sweden 1999).
The decrease of the youngest age group (0-19) is caused by a continual under replacement level fertility rate. It is assumed that the fertility rate will be higher than the present, which is very low, but will probably never reach the former high levels. Calculations forecast a stabilization of the TFR at an average of about 1.8 children per women (Statistics Sweden 1999).

Usually the oldest age segment of the elderly (aged over 80) will have the greatest impact on the need for social and medical services, because physical and psychological needs that come along with higher ages increases. Therefore the development of the population aged over 80 is most interesting for local authorities. The number of persons aged over 80 rose since the middle of the 20th century. In the coming 15 years the ‘young elderly’ aged between 65 and 79 will contribute to the largest proportion of the population growth. This implies that from the 2020s this rise will shift to the ‘aged elderly’ (aged over 80) group (SALAR 2007) with unavoidable consequences for the need of social and medical care. In the year 2006 the proportion of the very oldest aged over 80 was 5.3 percent (Swedish Institute 2007). In the year 2050 nearly one tenth of the population will be aged over 80. The increasing proportion of ‘aged elderly’ will set higher requirements on care resources (Statistics Sweden 1999). From the researchers point of view the families of the oldest citizens will therefore be increasingly obligated to care for them (Swedish Institute 2007). The predicted rise of the numbers of people aged over 80 in the 2030s (shown in figure 14) gives some years to plan and prepare for this challenge (SALAR 2007).
In addition to all stated facts of the future elderly development the temporal line seems to be very disadvantageous in Sweden. When around 2020 to 2030 those born in the 1940s reach the age of 80 and therefore show increasing care needs, people born in the 1960s will reach retirement age. This implies a rise of the pension costs as well as a decrease of the percentage of gainfully employed people (SALAR 2007). Furthermore the Swedish society experiences a shift in values. Due to increased health many old people lead an active life, which involves travelling or doing sports. In addition, many old people are well off today. This partly changes the consumer behaviour and old people are more discerning about the services and products they buy (Swedish Institute 2007). Therefore it is important and necessary to take advantage of the resources Swedish society has in people aged over 65 (SALAR 2007).
2.1.3 Possible implications of demographic ageing

There are several political, economical and demographic concerns regarding the implications of the demographic change to a post-transitional ageing society. This includes deleterious effects on economic prospects and social cohesion (Cincotta et al. 2003) that are caused by a declining workforce and high proportions of elderly. Especially the relative size of the broad functional age groups (0-19; 20-64; 65+) and their development prompt two main concerns. First, in order to stay economically and functionally “sustainable” a society needs a particular proportion of people within active working age or in other words an economically active age span. Second, the numerical relationship between old people and children/youth within a population raises concerns because it is “the basis for society’s preoccupation with demographic ageing”. However, the size of the age groups varies over time and differs remarkably between societies (Foss and Juvkam 2005).

Ageing as a phenomenon, the territorial patterns of ageing as well as associated changes in the age structure of a population have a high potential to address a range of public policy aspects and development issues. Foss and Juvkam mentioned in their report “Patterns of Demographic Ageing and Related Aspects in the Nordic Peripheries” a number of correlates and tentative consequences of demographic ageing (Foss and Juvkam 2005). These are, amongst others, the following:

- Transport and infrastructure
- Natural growth potential, reproduction capacity
- Mechanism of territorial population re-distribution
- Labour supply and the composition of the labour force
- The allocation of labour and public resources among age-related purposes and activities
- Capacity of service provision in general, distribution of the supply of services of different orders
- Local government expenditure
- Housing markets and living arrangements

The development in these areas is complex and not foreseeable, which makes reactions or planning to these issues more complicated. Other consequences of the demographic development are more related to social aspects and cause considerable changes in the population and lifestyle. The reduction of the family size and the decrease in average household size, both an implication of a decline in fertility and rising longevity, should be mentioned here. Furthermore, the family life cycle changes and the child-bearing phase became shorter. These consequences are caused by an interaction of several factors of change, which vary in importance between periods and among countries or even regions.
Foss and Juvkam mention, among others, the following socio-demographic implication (Foss and Juvkam 2005):

- An increase in the levels of divorce and separation
- A reduction in the proportion of households with children
- A rapid decline in the number and proportion if households with many children
- Much faster growth in the number of households than in population size
- Rapid growth in the number and proportion of one-person households
- A growing share of old people in the population
- More young people as well as more elderly people are living alone
- A rise in the proportion of women among elderly people living alone

Especially the last mentioned points stand out as policy-relevant issues. However, their extent and importance depends on the country, region and even period. Some factors also hold possible challenges for territorial sector policies; for example, the supply of kindergartens, the housing policies or the allocation of services for the elderly (Foss and Juvkam 2005).

The industrialised countries have unlike the developing countries substantial capacities to adjust to population decline and ageing. Some European countries facing growing proportions of old people already realised adjustments. Actions like the acceptance of more immigrants, encouraging women in the labour force, the extending of the retirement age or the replacement of low-skill jobs with technology are implemented in many countries to cope with a shrinking workforce.

The uncertainty concerning the issue of demographic ageing and population decline arises from the fact that these phenomena are uncertain terrain. It is a development that countries never faced before and are therefore just starting to grapple with. All states to some extent have to meet demographic challenges like a large and increasing proportion of old people and a shrinking workforce if they experience population stability or even population decline (Cincotta et al. 2003).
2.1.4 The care system – medical & social aspects

THE SWEDISH CARE SYSTEM FROM AN INTERNATIONAL PERSPECTIVE

Since demographic development generates great pressure on the social welfare systems, issues such as healthcare, pensions and care of the elderly ranked high on the European agenda in the 1990s. Several EU documents stated a common challenge in the growing proportion of people aged over 65. A number of dimensions, for example the pressure on public finances and pension systems, the growing demand for social and medical services and the decline of the relative size of the working age population, are described. The following two main objectives for social and medical services were declared: financially sustainable and high-quality care and access to social and medical services for everyone regardless of wealth or income (SALAR 2007).

From an international perspective more publicly financed care is provided in Sweden than in any other country. Comparing the gross domestic product (GDP) spent on care in the year 2005 Sweden tops the list published by the OECD with 2.8 percent. Outside the Nordic region only few countries have publicly financed care of the elderly. Other systems are based on insurance solutions, volunteer organizations, funding from old people themselves or support from their family members (SALAR 2007).

DEVELOPMENT AND POLICY OF THE SWEDISH CARE SYSTEM

The Swedish care system and especially the care of elderly changed greatly during the last three decades. Public expenditures on care of the elderly rose by 60 percent during the period from 1980 to 2005. On the other hand a decrease of care recipients of 40 percent was recorded for the same period. In the year 2005 245,000 people lived in a nursing home or old people’s home or obtained home help services compared to 400,000 in the year 1980. This implies that the costs per recipient have more than doubled which could be explained by a more extensive care need of today’s recipients. The decline in the number of care recipients could partly be the result of a decreasing need for help of people aged over 80 (SALAR 2007).

For a society with an ageing population one of the biggest challenges is the organisation of the care of the older citizens in present and future. To ensure Social and Medical Services for elderly the Swedish government adopted a national development plan.

The plan contains commitments within the following six different areas (SALAR 2007):

1 Medical and Social Services (vård och omsorg) for most sick people
2 Safety in the flat
3 Public/ Social care
4 National equivalence and local development
5 Preventative work
6 Staff/ personnel
The primary objective of the Swedish elderly policy is to facilitate for old people to live independently as long as possible maintaining a high quality of life. In case older people need social or health care they are entitled to make demands of help. The care of old people is mainly financed from tax revenue and allotted in “accordance with demographic principles”. Therefore, the Swedish parliament (Riksdag) formulated the following four aims of a national policy for the elderly. “Older people are to:

- be able to lead active lives and have influence on society and their own everyday lives;
- be able to grow old in security and retain their independence;
- be treated with respect; and
- have access to good health and social care services” (Regeringskansliet 2007).

FACTORS AFFECTING THE DEMAND OF SERVICES

The well-being of older people as well as their demand for social and medical services depends on many factors. The Swedish Association of Local Authorities and Regions stated in the report ‘Care of the Elderly’ the following four most important factors (SALAR 2007):

1) Personal finances
2) Health and lifestyle
3) Housing standard
4) Living arrangements – alone or as part of a couple
5) Family and/ or social network

In the following some of the above mentioned points are described in more detail.

1) Personal finances

The financial situation of old people depends mainly on the length of their working life and the income they had during this time. The biggest differences in the income level of pensioners can be found between couples and singles. In the year 2005 a national survey called Senior 2005 was conducted. One of the main findings was that singles aged between 65 – 69 have an income that is approximately 20 percent under what is considered a “reasonable standard of living” (according to the national norm for financial aid – SALAR 2007). Mostly women are more affected than men. Reason is the lower number of working years due to childbirth and part- or short- time work when the children were small. Consequently, women had lower wages than men which reduces their pension. The same concerns elderly who came to Sweden later during their working years (SALAR 2007).

2) Health and lifestyle

The National Board of Health and Welfare declared that between 1988/89 and 2002 the Swedish pensioner’s subjective assessments of their own health changed little. Especially men narrate improved health (National Board of Health and Welfare 2004). A so called health index also indicates a marginal trend towards better health for men. The need for services among older people decreased in 2002 despite rising numbers of old people.
With the retirement a new phase of life with many changes starts. Recent retired persons have to reorganise their life, because changes like decreased or even disappeared contacts with colleagues changes the social network. Furthermore the ‘new won’ time has to be filled adequately. Pensioners who take part in physical, social, cultural or other activities are healthier and happier and go without care longer. Therefore, the lifestyle of elderly, especially eating, smoking, exercise and alcohol habits is very significant for health. The Swedish Association of Local Authorities and Regions mention as key factors for the health of old people: physical and social activity, social contacts and the living situation (SALAR 2007). Furthermore, several studies have shown that the risk of illness, functional disabilities and premature mortality can be reduced through a high activity level (social, cultural and physical) among seniors (Ingemar Norling 2004).

5) Family and/ or social network

For many old people their children and partner play the most important role in respect of social contacts (SALAR 2007). The National Board of Health and Welfare’s published results of the report Living conditions of the elderly, 1988 – 2002 (Äldres levnadsförhållanden 1988 – 2002) where over half of the elderly have children and a partner. Furthermore 50 percent of the interviewed persons revealed that their children live within a 10-km radius and over 50 percent visit their children at least once a week (National Board of Health and Welfare 2004).

A much discussed topic is the loneliness among elderly. It has to be mentioned that not only older people are affected by loneliness and being older does not necessarily involve loneliness. The existence of other people to spend time with is the simple but also necessary condition for avoiding loneliness (SALAR 2007). Meeting places in different kinds of housing for old people can help to minimise this issue (Videnscenter på Äldreområdet 2006).

The following chapter will specially respond to the issue of housing standard and the role of the community.

THE ELDERLY – COMMUNITY SUPPORT AND SERVICES

To enable functionally impaired and elderly a normal and independent life is the aim of community care. This means that old people should be enabled to stay in their own homes as long as possible. To ensure this, various types of housing as well as different forms of support; for example, social and medical care via home help, transportation service or meals on wheels is available. To facilitate for old people to continue a normal and independent life suitable and available housing is needed. This means that elderly should be able to go out and spend time in the neighbourhood independently even if they have memory problems, are hearing or visually impaired or have difficulties with stairs. Therefore, the residential area or the blocks and even flats should be designed appropriately. The move to special housing becomes necessary when elderly need 24
hours care. In order to move to special housing the local authorities’ social services have to make a formal decision (SALAR 2007).

In general three kinds of housing for elderly can be distinguished: a) regular housing, b) Senior housing and c) special housing.

a) Regular housing

For old people living in regular housing a good home is especially important. Criteria like practical, spacious bathrooms and lifts guarantee good accessibility and make the flat suitable and adapted to the elderly. In Sweden 94 percent of the elderly (aged over 65) live in regular housing. With increasing age the proportion of elderly living in special housing rises. The National Board of Health and Welfare stated a proportion of over 16 percent of persons aged above 80 living permanently in special housing in 2006. New technical solutions (which make daily activities in the home easier) and renovation as well as alteration of buildings into more accessible and practical housing will make it even easier in the future to stay in regular housing. Nevertheless some old people will have to move to new dwellings when they grow older. Figure 15 indicates that 37 percent of old people aged over 75 and 59 percent of those aged between 65 and 75 live in semi-detached or detached houses. This situation can be problematic as people grow older. It becomes increasingly harder to manage every day task as for example cleaning, clearing snow or taking care of the garden. Even stairs between floors can become a barrier if old people get problems with their hips or knees. It is therefore assumed that the need for available flats and housing with social activities or common services, which Senior housing can offer, will increase (SALAR 2007).

<table>
<thead>
<tr>
<th>Type of housing</th>
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<th>50–64</th>
<th>65–74</th>
<th>75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>House, regardless of ownership</td>
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<td>63.8</td>
<td>59.0</td>
<td>37.2</td>
</tr>
<tr>
<td>Tenant-owned flat</td>
<td>12.6</td>
<td>13.0</td>
<td>16.5</td>
<td>18.7</td>
</tr>
<tr>
<td>Rental flat</td>
<td>29.6</td>
<td>22.2</td>
<td>23.4</td>
<td>42.0</td>
</tr>
<tr>
<td>All</td>
<td>98.6</td>
<td>99</td>
<td>98.9</td>
<td>97.9</td>
</tr>
</tbody>
</table>

Source: Statistics Sweden 2006, *Hushållens ekonomi (Household Finances)*

Figure 15: Population, by age and type of housing in 2004 (as a percentage of the age group)

Source: Swedish Association of Local Authorities and Regions 2007, page 23

b) Senior housing

Senior housing is usually offered to people aged above 55. This housing type is a regular flat that guarantees good accessibility. Additional features such as added security through a janitor or facilities for common activities makes this type of housing especially interesting for people who currently reside in old, less accessible flats or have problems managing a house of their own. By the time older people currently living in houses want to move the demand for Senior housing may increase. The number of flats in Senior housing in Sweden increased by 62 percent from 12,000 in the year 2000 to...
approximately 19,500 in 2005. Many local authorities (in total 147) plan to build or have built more Senior housing as confirmed by National Housing Board’s market survey from 2006. New Senior housing can be established through new production, remodelling or conversion of service flats. For old people it is important to know that residents of Senior housing receive social and medical services (if needed) on the same terms as people living in regular housing (SALAR 2007).

Old people living in regular housing or Senior housing can request social and medical services such as meals on wheels, home adoptions, transport service, personal safety alarms, help with simple practical tasks, technical devices, home medical services and home help with the complements short term housing and day activities.

Home adoptions means that people can apply for grants to the local authority. These grants are used for measures or improvement in the flat so that disabled persons can use their home more efficient. There exist no upper limit for these grants and they will be assigned regardless of the applicant’s income. As is visible in figure 16 the amount of grants approved increased constantly since 1975. Consequently costs of local authorities increased as well. In the year 2005 64,700 grants were approved which corresponds to an average of seven housing adoption grants per thousand residents (SALAR 2007).

Figure 4  Grants approved per year 1975–2005

![Graph showing grants approved per year 1975–2005](source)

Source: National Housing Board 2006

Figure 16: Grants approved per year 1975 – 2005
Source: Swedish Association of Local Authorities and Regions 2007, page 27
Local authorities provide home care to old people or people who are unable to cope with the activities of daily living. This enables even severely ill people or those with need for medical services to stay in their own homes up until the end of their lives. Home care includes social and medical services that are offered round the clock (SALAR 2007). Since 1998 the numbers of old people obtaining home care services increased by seven percent. Whereas the proportion of young elderly obtaining home care has declined the proportion of the aged elderly (age over 80) increased by 16 percent (National Board of health and Welfare 2006 – 1). Figure 17 illustrates how granted home care services rose with increasing age of the recipients.

Figure 17: Percentage of the population in regular housing who had been granted home care as of 1 October 2005
Source: Swedish Association of Local Authorities and Regions 2007, page 29

As complements to home care services day activities and short- term housing/ short- term care are provided. Day activities make it easier for old people to continue residing in regular housing and can be also offered as a complement to special housing. Short- term housing/ short term care can be seen as an intermediate stage between special housing, regular housing and medical care. Short- term care and short- term housing are used, among others, for nursing after a hospital stay or rehabilitation and often in or connected to special housing (SALAR 2007). The number of persons in short- term care/ housing decreased with about 400 people from 9,100 in 2004 to 8,700 in the year 2005 (National Board of Health and Welfare 2006 – 2).
c) Special housing

Special housing is intended for people who require particular support and has to be established according to the Social Services Act. This special type of housing has staff available round the clock for nursing and services. The demand for special housing depends on several factors such as the amount of support home care and medical services in regular housing, the availability of short-term care, short-term housing and daily activities and the design of the home. In the year 2005 around 7 percent of the elderly aged over 65 lived permanently in special housing which corresponds to 100,400 persons (SALAR 2007).

Compared to 2004 the number declined by 4,400 persons or four percent (National Board of Health and Welfare 2006). Figure 18 shows the percentage of the population living permanently in special housing. 80 percent of the persons living in special housing were aged over 80 (SALAR 2007).

![Figure 18: Percentage of the population permanently living in special housing as of 1 October 2005](source)

COMMUNITY PLANNING FOR THE ELDERLY

Community planning and local authorities have to follow the Planning and Building Act and guarantee accessibility in the public environment for persons impaired or with physical disabilities (SALAR 2007). This regulation is based on the fact that the mental and physical health can be improved while increasing physical activity (Norling 2004) and spending time outside. Furthermore stress can be reduced and well-being increased through contact with nature. Therefore, to make it easier for old people to reside in their own homes and manage daily life independently good transport and
proximity to public services as well as commercial services have to be guaranteed. A number of Sweden’s local authorities have started to arrange residential areas for old people or plan improvements on houses suitable for them. In order to meet old people’s demand for suitable housing communities should carefully select suitable neighbourhoods for accessibility adaptation and renovation.

The following figure gives an overview of the community care of the elderly in Sweden for the year 2005:

![Figure 19: Community care of the elderly in 2005](Source: Swedish Association of Local Authorities and Regions 2007, page 21)
2.2 Economical situation and Housing market in Sweden

In this section the economic situation of Sweden is going to be presented at a glance. Since the economy and the housing market are interacting and shouldn’t be seen separately the situation of the Swedish Housing Market is going to be introduced in brief afterwards.

2.2.1 Economical situation of Sweden

The Swedish economy has recovered from a deep economic crises spread all over Europe in the beginning of the 1990s. This is the effect of regulatory reforms conducted in the early 1990s which were, with respect to today’s GDP growth and productivity, effective and successful. The reforms of the early 1990s improved the macro policy framework. However the recovery process started earlier and was stronger in Sweden compared with other European countries.

In the year 2006 the annual GDP is expected being over 4 percent, growing steadily in recent years. In addition low unemployment rates and a stable inflation contribute to the brilliant macroeconomic performance of Sweden (OECD 2007). Since the mid-1990s Sweden has one of the lowest average inflation rates in the whole of Europe. Additionally the real wage of persons regularly employed increased with about 3.5 percent since 1998 as a result of a new initiated stability-oriented wage formation framework (Savage 2007).

It seems that many parts of the society can benefit from the new forward-looking policy framework. It is certain that Sweden, with a structural budget surplus of about 2 percent of GDP, will be able to meet future challenges - like the demographic change – better than many other OECD countries (OECD 2007).

In spite of everything mentioned before Sweden still has problems. One of the main issues Sweden is most concerned with are the exclusion generated in the 1990s, immigrant’s unemployment and the administrative burden on enterprises (OECD 2007). The development of the unemployment rate and exclusion in the labour market can be seen in the following figure.
As is visible the unemployment rates haven’t passed through such a successful recovering process like the GDP (OECD 2007). Especially young immigrants are affected by unemployment. The unemployment rate in this population group is about 30 percent. Factors such as high benefit levels, strict labour market regulations and the high starting wages are some barriers making it difficult for immigrants to gain a foothold on the job market (Savage 2007). Moreover Sweden has a comparatively high sickness and disability rate (OEESD 2007).

Faced with this problem the new Swedish government (that took office in October 2006) presented reforms aiming to eliminate exclusion by reducing the volume of active labour market programmes and replacement rates. Furthermore social charges for targeted sectors and groups are going to be disposed (OECD 2007).

Entrepreneurship is another problem for Sweden. The Swedish level of entrepreneurship is one of the lowest compared with other European countries. This situation is a consequence of the employment protection legislation applied in Sweden. Swedish companies following a last-in-first-out rule which implies that a persons leaving a job has to give up a lot of security to start an own business (Savage 2007). To address this problem the OECD report suggests a renewed regulatory reform to reduce the administrative burden on enterprises (OECD 2007).
2.2.2 The Swedish Housing Market

In the year 2006 the Swedish Housing Market - in contrast to the overall economy – still appears distorted, characterized by an unachievable match of demand and supply.

The following figure shows the development of the housing market situation in all 290 municipalities of Sweden in terms of shortage (= Brist), balance (= Balans) or surplus (= Överskott) of housing. Clearly visible is the maximum of a shortage of housing (brown line) in the late 1980s followed by an abrupt decline of the number of municipalities with a shortage of housing and increase of municipalities with surplus and vacancy of housing (light blue line) (Boverket 2007).

![Figure 21: Housing market situation in Sweden from 1983 to 2006](source: Boverket 2007, Bostadsmarknaden 2006 – 2007, page 19)

Like the economy, the housing market suffered from the mentioned deep crisis in the beginning of the 1990s. In that time the real housing prices fell by 30 percent, but rose constantly till today, making the years of the last decade to the longest unbroken upturn. This development was not only traceable in Sweden but also in other European countries (Hüfner, Lundsgaard 2007). With the rise of the real housing prices Sweden registered an increasing number of municipalities with a shortage of housing (Boverket 2007).

Even if this development of increasing house prices bode well the housing market masks structural problems in Sweden. These problems are first and foremost visible in the rental market (Hüfner, Lundsgaard 2007) and described in more detail below after a short description of the structure of the Swedish housing market.

STRUCTURE OF THE SWEDISH HOUSING MARKET

The Swedish housing market differs from the housing markets of comparable countries. Here only countries with owner-occupied housing - mostly single family houses - can be compared. As is visible in the following figure tenure can be divided into private rental, public rental, tenant co-operative and owner-occupation (OECD 2007). Tenant cooperatives are describable by the Swedish term “Bostadsrätt”. A bostadsrätt can be bought and sold on the market so to that extent the apartment is owned. Nevertheless rent
has to be paid for the maintenance, loan repayment and so forth. A *bostadsrätt* can be row housing, semi-detached and even ordinary single family houses. Tenant co-operatives represent the segment of owner occupied apartments.

### Table 1: Structure of the housing market by tenure

<table>
<thead>
<tr>
<th>Year</th>
<th>Private Rental</th>
<th>Public Rental</th>
<th>Tenant-owner / Co-operative</th>
<th>Owner-Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>52</td>
<td>6</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>1960</td>
<td>43</td>
<td>14</td>
<td>9</td>
<td>34</td>
</tr>
<tr>
<td>1970</td>
<td>30</td>
<td>23</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>1980</td>
<td>21</td>
<td>24</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>1990</td>
<td>20</td>
<td>25</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>2000</td>
<td>24</td>
<td>23</td>
<td>15</td>
<td>38</td>
</tr>
<tr>
<td>2005</td>
<td>23</td>
<td>22</td>
<td>17</td>
<td>38</td>
</tr>
<tr>
<td>Denmark</td>
<td>17</td>
<td>20</td>
<td>11</td>
<td>52</td>
</tr>
<tr>
<td>Finland</td>
<td>15</td>
<td>17</td>
<td>10</td>
<td>58</td>
</tr>
<tr>
<td>Norway</td>
<td>18</td>
<td>5</td>
<td>16</td>
<td>61</td>
</tr>
<tr>
<td>Other Europeans</td>
<td>19</td>
<td>13</td>
<td>8</td>
<td>60</td>
</tr>
</tbody>
</table>

1. Includes employer-provided housing for countries other than Sweden.

Note: The last census in Sweden was done in 1990. Data for 2005 represent unpublished calculations by Statistics Sweden. Data are 2004 for the other Nordic countries and 2001 for the other Europeans average.

Table 1: Structure of the housing market by tenure
Source: The Swedish housing market, OECD Economics department working paper no 559, page 13

The biggest tenure category is with 38 percent owner-occupation which compared to other countries is considerably small. Together with the tenant-owners (17 percent) the effective owner-occupation is about 55 percent in Sweden. This is still lower than a number of other Nordic countries (Finland 68 percent, Norway 77 percent) and European countries (68 percent). The fastest growing tenure is the tenant co-operative housing. This may be the result of the conversion from rental flats to tenant co-operative housing and the tax system. But the fact that the Swedish law does not allow the ownership of an apartment explains the importance of this tenure. The rental sector – which is going to be described in more detail in the following section – is larger than in other European countries. With 22 percent Sweden has the highest share of public housing among European as well as the Nordic countries only overtopped by the Netherlands (Hüfner, Lundsgaard 2007).
THE RENTAL MARKET

In the rental market of Sweden the lease costs are regulated and depend on the costs in the public sector, which means that the rents do not reflect the actual market prices. This situation is also referred to as rent-setting framework. It leads to lease costs levels which are almost equal across the whole country and thus in some urban areas is far below the real market level which causes long queues for rental flats in these areas (OECD 2007). Other areas in turn suffer from vacancies (Hüfner, Lundsgaard 2007). In other words the supply of housing is not located where it is needed and where the demand can be found. This situation can reduce the welfare and labour mobility (OECD 2007). Furthermore a price response to demand and supply is prevented. As a result of all this many Swedish inhabitants have to realign to the owner-occupied or tenant co-operative segment, where they have to deal with rapidly increasing prices (Hüfner, Lundsgaard 2007). Many are therefore excluded from their preferred housing tenure (OECD 2007). Another effect of the rent control is that people are driven into the black market where the rental flats are converted into tenant-owned apartments. This in turn causes a low construction level of rental flats. For this reason - among other things – the OECD calls for the rectification of the rent controls (Savage 2007).

The municipalities in Sweden have only few incentives to offer land for residential construction and there is just a weak competition in the construction sector (also caused by cumbersome planning regulations) (OECD 2007), which makes the supply of new dwellings even more difficult. Furthermore it seems that investments made do not take place where they are needed. On the fiscal side an indirect grant to housing is offered by real estate taxes below the neutral levels (Hüfner, Lundsgaard 2007).

Especially tight is the situation in Stockholm where eight percent of the population is queuing and waiting for an apartment. The average waiting time for such apartments is ten years. Mostly people which are ‘well-connected’ can jump the queue. This fact privileges insider as well as already privileged people (Savage 2007).

OWNER- OCCUPATION – HOUSE PRICES

As shortly stated at the beginning of this chapter a constant growth of house prices has taken place in Sweden since 1996. On average the prices have grown with about 8.5 percent per year. The increase may be explained through rising incomes and lower interest rates. Nevertheless, the house price increase since early 2006, stated as being 13 percent, elevate concerns. According to calculations of the OECD the latest increase indicates a growing (even if small) overvaluation. From an international point of view Sweden still has the lowest real house prices compared to all other OECD countries. Since the mid 1990s all countries denote a constant and steep increase as it can be seen in figure 22 below.
A growing residential investment came along with the higher house prices. Since the beginning of the year 2004 the investment has been growing by double-digit rates. The construction firms are now facing the problem of a lack of qualified labour. The fact turns out to be the main hindrance to expansion which may only be compensated with workers from abroad. At this point it is certainly helpful that Sweden has no special restrictions especially on worker mobility from the new EU member states (OECD 2007).

**FUTURE DEMAND AND CONCLUSION**

For the question of future housing demand the two age groups 19-24 and 65–74 are of particular interest. The younger age group (19–24) is entering the housing market and establishes their own housing without leaving another flat (move out from parents). The older group aged between 65 and 74 are the new pensioners that can ask for different housing forms if they do not want to live or have the ability to manage their detached house. During the next years both groups will increase substantially. However more of the young will live in the areas of bigger cities whereas in small municipalities more elderly than young people will live. This influences the demand in the local housing market (Boverket 2007).

Today’s very ‘strong and steady’ Swedish economy has developed better than most other European countries which may be due to the good response to the crises in the early 1990s. Nevertheless, Savage mentioned that the rental housing market needs deregulations and changes have to be done for the employment rules to stop the exclusion of immigrants and other groups (Savage 2007).
2.3 Crime

In many countries, including Sweden, old people as well as people of other ages are concerned about the problem of crime (Tornstam 1981, 2001). Below the crime situation and development in Sweden is discussed followed by a short introduction of the ‘crime and elderly’ problem area. Subsequent the use of GIS within the police and for crime analysis is discussed.

2.3.1 Sweden: Crime overview and development

Nowadays the crime level in Sweden is on the average level in comparison with many other European countries (Ministry of Justice 2005). Sweden, like many other western European countries and Scandinavia, has experienced a considerable increase in crime rates since the end of World War II (Von Hofer 2005). The number of reported crimes registered by the police increased by approximately 500 percent during the period from 1950 to 1990 (Ministry of Justice 2005). The number of offences increased in almost all of the categories except in the category of burglaries (including residential burglaries) during the period of 1975 to 2005 (Criminal statistics 2005). This increase can be interpreted as a sign of the development into a ‘dangerous society’.

Changes in the lifestyles and the improvements in the standard of living have led to a rapid increase of reported crimes (Ministry of Justice 2005). In addition, drug abuse, influences from abroad and organized crime entering Sweden during this period can be seen as causes of the increase in crime rates (Jönson 2003). In the 1990s the crime rates stabilized and remained relatively constant. While theft crimes, which mainly influenced the crime trend of the last years, have declined, violent offences and sex crimes has risen since 1990. Assault offences increased during the short period from 1990 to 1995 by 34 per cent. During 1990 and 2005 sex crimes increased about twelve per cent up to 11,700 incidents in 2005. The increase in violent crimes (assault and sex offences) was explained by changes in drinking habits (Criminal statistics 2005) or an increase in reporting of violent and sexual offences against women (and children) due to increasing equality between women and men (Von Hofer 2005). It has been speculated that this might in part be explained by higher levels of awareness and lower levels of tolerance among Scandinavian women when it comes to setting limits for the forms of cross- gender encounters that are considered socially acceptable (HEUNI 1999:132f, 163, 349, 432). During the last years violent and sex crimes became more visible in Sweden (Von Hofer 2005). However, 3,800 reported rape offences make this category with a plus of 44 per cent to one with the highest increases (Criminal statistics 2005). Sweden has during the last couple of years seen a growing number of crimes in certain inner city areas (Ministry of Justice 2005).
The reported offences were with 1,242,000 incidents in the year 2005 one percent lower compared to the numbers of 2004. Comparing the figures of the year 2005 with the year 2004 violence offences increased by eight per cent, whereas theft offences (accounts for 51 per cent of total number of reported offences) fell by three percent. In 2005 the number of reported robberies increased by nine percent to 9,400 compared to the figure for 2004 (Criminal statistics 2005). With such crime numbers Sweden is close to the European average (Von Hofer 2005). The international crime victims surveys indicate that fear of crime is comparatively low in Finland and Sweden and that people do not feel the need to take special precautions against the possibility of crime to any great extent (Von Hofer 115th International Training Course Visiting Experts’ Papers).

2.3.2 Crime and Elderly

Due to a modern welfare state a large number of old people can go into retirement with financial security and in good health. On the other hand the old age or old people increasingly become a social problem (Jönson & Magnusson 2001). They are linked to different kinds of trouble, as for example poverty, need of care or victimization, or even made invisible (Jönson 2003). This picture of the old age as troublesome fits perfectly to the “description of old people as vulnerable victims of crime” (Midwinter 1991).

Conducted studies concerning old people and crime have focused more on individual aspects such as experience of victimization or fear among the elderly (Jönson 2002) than on crime itself. The weak interest for the topic of crime against old people among officials has been interpreted from pensioners’ parties and representatives of pensioners’ organizations as evidence that the problem is not taken seriously (Jönson 1998, 2000, 2002a). Officials and researchers in turn argued that images of old people as ‘natural victims of rational criminals’ prevalent by media generates fear of crime among the old people, which is a greater problem than crime itself (SOU 1990:92, Balvig 1990, Lindquist & Duke 1982). It has to be said that this argumentation has been questioned and old people referred to as irrational victims of their own fear (Jönson 2004).

In the literature mainly three approaches regarding the elderly – crime problem are discussed. Firstly, the hidden problems of abuse and crime against elderly within the family should be given more attention. In turn seniors’ organizations complain about moral decay and crime waves that make old people to prisoners in their own homes (Jönson 2002a). This second approach focuses on violence and crime as a whole. The fear of crime among old people refers to a third and partly competing version of the problem crime against the elderly. The fear/ victimization paradox – describing the fact that old people are most fearful of crime but less likely to be victimized (Lindquist & Duke 1982) – appeared as well in government writings and criminology of the Nordic countries (SOU 1990:92). The real cause of this problem is said to be the isolation and vulnerability among elderly than crime itself (Jönson 2003). In international criminology
this fear/ victimization paradox has been contested and questioned (Ferarro, LaGrange 1987, Pain 1995).

Nevertheless a campaign was initiated from the Swedish Association for Victim Support in the year 2002 to deal with abuse and crime as a problem for the old. Up to this time prevention work aimed at elderly was almost unheard. One reason might be the above described circumstances that fear rather than crime was identified as the real problem for elderly people. Jönson argues in his article “Constructing Crime against the Elderly in Swedish Crime Prevention Campaigns” (2003) that fear motivates to educate, which in turn may reduce victimization. Crime prevention for seniors was established with the goal to create confidence among the elderly, decrease the fear, reduce the victimization and to increase the awareness of the crime threat (Jönson 2003).

2.3.3 Crime – police and GIS

GIS is a powerful tool with huge possibilities for geographic analysis. The Swedish police use GIS for follow-up, planning, priority and operating work. Even if the development of the GIS-systems is ongoing the possibilities of GIS are still not used completely. The information about crime, victims, perpetrator and accidents can be registered with high geographic accuracy. If the data are categorized as being sensible they are not allowed to be shown in public with the same precision. All investigations and researches about crime are therefore subjected to the personal integrity protection.

Hobit is the new information system of the Swedish police and used for crime investigations and reporting. The system includes all types of crime with information about the place of crime, place of accidents, crime victims and offenders. Today it is only usable for a large quantity of crimes, even if the possibilities to do detailed geographic analysis have increased with this new system. The Hobit-system is able to map and analyze geographic patterns of crimes; accidents and other reported incidents. Furthermore it is possible to follow the spread of f.ex. drug crimes and to identify vulnerable places and environments (GIS för folkhälsan 2007).

Even if the Police seem to have the opportunity to do spatial analysis of crime, by the review of Crime journals I could not find any crime analysis done for Sweden with the use of GIS. The advantages of using GIS for crime mapping and crime analysis techniques are plausible. From helping law enforcement agencies to track crime incidents over the production of density maps which show the overall pattern of crime up to the use of spatial analysis to evaluate crime patterns, improve emergency call response or to optimize resource allocation (Scott, Warmerdam 2005).
3. DATA AND METHODOLOGY

3.1 Data

DATA SOURCES
Digital map data including the administrative boundaries of the levels of nyckelkod 1 to 6 were obtained from the GIS unit (GIS- enheten) of Norrköping municipality. All statistical demographic and social data were obtained at the level of nyckelkod 3 areas that correspond to the in this paper called “districts” or “statistical areas”. For this reason for all figures showing the city of the municipality of Norrköping the “nyckelkod 3” areas are used if nothing else is stated separately. All data used in the demographical and social analysis were obtained from the planning office (Planeringskontoret) of Norrköping municipality. These data again were obtained from Statistics Sweden (Statistics Sweden SCB). Population data in digital form were obtained from the GIS unit in Norrköping and contained the birth year of the inhabitants of a block. Digital map data including the road and public transport network, water bodies, public buildings were obtained from the Department of Computer and Information Science at Linköping university. All data about crime were received from the county police in Östergötland (Länspolisen i Östergötland). Other data sources used in order to write this paper are the internet, books as well as scientific articles.

DATA DESCRIPTION
Population data at the level of nyckelkod 3:
Population data were achieved for the years 1995 to 2006 with age groups of 5 years from age group 0 – 5 up to age group 90 and older. The following age groups were formed: inhabitants aged 0 – 19 being ‘children and youth’, inhabitants aged 20 – 29 being ‘students and young adults’, inhabitants aged 30 – 64 being ‘working population’, inhabitants aged 65 – 79 being ‘young elderly’ and inhabitants of age 80 and older being ‘aged elderly’. Sometimes summarized age groups are called ‘adults’ for persons aged 20 – 64 and ‘elderly’ for persons aged over 65. The stated population of the named year always refers to the 31st of December.

Data used for the social characterisation of Norrköping’s population:
Education and income data were analyzed for the year 2005. When analyzing education data for the population aged over 65 it has to be kept in mind that only some information about the degree held by persons of this age group was known. For all districts 35 to 65 percent of the information about the degree held by the age group members is unknown and therefore missing. Unemployment data were analyzed for March 2006 but related to the population level from 31.12.2005. Family status is presented using data from the year 2004.
Crime data:
Data about crime incidents were obtained as an Excel file for the year 2006. The location of each incident was given as exact XY-coordinates. Based on this exact location crime incidents were brought into a GIS environment for crime analysis. The expression ‘all real crime’ used in this work refers to all reported events where incidents later found not to have been criminal offences were excluded.

Spatial determination:
To be able to present analysis results for the study area – the city of Norrköping - a definition of the city area has to be done. In general I want to differentiate the city from the so called ‘rural region’. As a main delimitation criterion the population density, which is presented in the following figure, was chosen. Additional criteria were the size of the statistical area, the number of inhabitants as well as the main current use.

Clearly visible is the difference between areas of high population density in the centre of the municipality of Norrköping and very low population density around this core.

Figure 23: Population density in Norrköping municipality and city (small figure)
Data source: Statistics Sweden and Norrköping municipality
The following tables give an overview of the attribution of each statistical area to the spatial categories of ‘city’ and ‘rural region’. These two categories are as well called ‘spatial subdivisions’.

<table>
<thead>
<tr>
<th>nyckelkod 3</th>
<th>name</th>
<th>nyckelkod 3</th>
<th>name</th>
<th>nyckelkod 3</th>
<th>name</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>Nordantill</td>
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<td>Oxelbergen</td>
<td>315</td>
<td>Brånnestad</td>
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<td>Marielund</td>
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<td>Lindö</td>
<td>321</td>
<td>Navedstad</td>
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<td>Lagerlund</td>
<td>301</td>
<td>Berget</td>
<td>411</td>
<td>Kneippen</td>
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<td>Herstadsberg</td>
<td>302</td>
<td>Såpkullen</td>
<td>412</td>
<td>Klockaretorpet</td>
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<tr>
<td>121</td>
<td>Haga</td>
<td>303</td>
<td>Söderstaden</td>
<td>421</td>
<td>Ektorp</td>
</tr>
<tr>
<td>122</td>
<td>Enebymo</td>
<td>304</td>
<td>Klingsberg</td>
<td>422</td>
<td>Vilbergen</td>
</tr>
<tr>
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<td>Pryssården</td>
<td>305</td>
<td>Ljura</td>
<td>423</td>
<td>Skarphagen</td>
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<td>Fiskeby</td>
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<td>Hageby</td>
<td>424</td>
<td>Vrinnevi</td>
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<tr>
<td>211</td>
<td>Gamla staden</td>
<td>312</td>
<td>Smedby</td>
<td>888</td>
<td>Industrial areas</td>
</tr>
<tr>
<td>212</td>
<td>Östantill</td>
<td>314</td>
<td>Rambodal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Districts of the city of Norrköping  
Data source: Norrköping municipality, own assignment

<table>
<thead>
<tr>
<th>114 Butängen</th>
<th>116 Saltängen</th>
<th>118 Handelsö</th>
<th>217 Sylten</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 Ingelsta</td>
<td>117 Slottshagen</td>
<td>125 Himmelstalund</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Districts of the industrial areas  
Data source: Norrköping municipality; own assignment

<table>
<thead>
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<th>nyckelkod 3</th>
<th>name</th>
<th>nyckelkod 3</th>
<th>name</th>
<th>nyckelkod 3</th>
<th>name</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>Svärtinge</td>
<td>199</td>
<td>Kolmårdens lb</td>
<td>419</td>
<td>Borg</td>
</tr>
<tr>
<td>129</td>
<td>Eneby landsbygd</td>
<td>218</td>
<td>Risängen</td>
<td>429</td>
<td>Kårtorp</td>
</tr>
<tr>
<td>181</td>
<td>Åby tätort</td>
<td>291</td>
<td>Ljunga</td>
<td>491</td>
<td>Skårblacka</td>
</tr>
<tr>
<td>182</td>
<td>Jursla</td>
<td>292</td>
<td>Östra Husby</td>
<td>492</td>
<td>Kimstad</td>
</tr>
<tr>
<td>183</td>
<td>Simonstorp</td>
<td>293</td>
<td>Arkösund</td>
<td>493</td>
<td>Norsholm</td>
</tr>
<tr>
<td>189</td>
<td>Kvillinge lb</td>
<td>299</td>
<td>Vikbolandets lb</td>
<td>494</td>
<td>Vångå</td>
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<td>191</td>
<td>Strömsfors</td>
<td>319</td>
<td>Styrstad</td>
<td>499</td>
<td>Skärblacka lb</td>
</tr>
<tr>
<td>192</td>
<td>Krokek</td>
<td>329</td>
<td>Tingstad</td>
<td>999</td>
<td>Other areas</td>
</tr>
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<td>193</td>
<td>Kvarsebo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Districts of the rural region of Norrköping municipality  
Data source: Norrköping municipality; own assignment

In the table of city districts the ‘Industrial areas’ are listed as one statistical area, but were merged together from 7 districts. These areas are characterized by a very low population density as well as a low number of inhabitants. They are low-density areas with the purpose of trade, business and services and therefore counted as city districts, but for this reason excluded from all social analysis done for the city.
The ‘Rural region’ also contains villages that can be seen in the density map as very small statistical areas with low up to middle population density. Villages in the municipality of Norrköping are Svärtinge, Åby tätort, Jursla, Simonstorp, Strömsfors, Krokek, Kvarsebo, Ljunga, Östra Husby, Arkösund, Skärblacka, Kimstad, Norsholm and Vånga. The term ‘Rural region’ always means (if not stated differently) the inclusion of the villages.

The highest population densities have Östantill and Nordantill with 14843 and 12028 inhabitants per square kilometre. In principle the statistical areas in the centre of the city of Norrköping have a high population density. A high density population zone from northwest to southeast seems to exist.

The statistical area VRINNEVI received a special status for this study. Vrinnevi defines the south end of the city and is bordered by Hageby in the east, Klingsberg in the north and Vilbergen in the west. Vrinnevi is with only 63 inhabitants (53 aged over 80) sparsely populated. The hospital of Norrköping is located in this district which indicates that Vrinnevi belongs to the city of Norrköping. Nevertheless due to the unusual population structure (see figure 24), which can be explained by a long term care centre located in this area, the statistical area Vrinnevi is excluded from all analysis done in this work except the population analysis. Maps presented in this work always show Vrinnevi as a statistical area of the city (white shaded/ filling colour) to maintain the “look” of the city. It has to be kept in mind that no analysis have been done for Vrinnevi to avoid misinterpretations of the results.

Figure 24: Age structure of the inhabitants of Vrinnevi
Data source: Statistics Sweden

The following maps give an overview of the location of all statistical areas in the city and the rural region:
Figure 25: Statistical areas of the rural region of Norrköping municipality
Data Source: GIS- unit Norrköping

Figure 26: Statistical areas of the city of Norrköping
Data Source: GIS- unit Norrköping
The red rectangle in figure 25 above marks the area to ‘zoom in’ in order to see the statistical areas of the city – presented in figure 26. In order to guarantee a clear understanding some terms used in this paper has to be described in detail.

CITY CENTRE: In this paper the term ‘city centre’ means the area Gamla staden.

AROUND CITY CENTER: Means all districts arranged circularly around Gamla staden, except the Industrial areas. In a narrower sense are these districts (clockwise) Östantill, Söderstaden, Såpkullen, Berget and Nordantill also called the ‘first circle’ around Gamla Staden. The districts Oxelbergen, Ljura, Klingsberg, Ektorp, Kneippen and Marielund are arranged as a ‘second circle’ around Gamla Staden. These districts can be seen in a broader sense as districts around the city centre, but representing districts that are located between the centre and the outskirts.

OUTSKIRTS: Districts belonging to the category of the outskirts are (clockwise on the map): Herstadsberg, Lindö, Smedby, Rambodal, Brännestad, Navestad, Skarphagen, Klockaretorpet, Fiskeby, Pryssgården and Enebymo.

E 22: Figure 27 below shows the main streets and water bodies in the city of Norrköping. The major road ‘E 22’ comes from the south of the city (Söderköpingsvägen) and continues on Söderleden westwards. The part of the road running in south- north direction will be important to keep in mind. Districts will be referred to as being east and westwards of the E22.
3.2 Methodology

The methodology used in this paper is composed of multiple/several methodologies from both Statistics and GIS. The software used to conduct the analyses is statistical software (EXCEL and SPSS 14.1) as well as GIS software (ArcGIS 9.1).

STATISTICAL METHODS

a) Classification methods:
Classification can be defined as categorization of data. It should be kept in mind that no more than seven classification values should be used to symbolize discrete changes otherwise the human viewer has difficulties distinguishing between the small differences in colour (NIJ 2007).

Natural breaks: Using this method the class breaks are defined statistically and the data are separated into quantitative classes. Natural breaks classification method uses the so called Jenks’ Optimization Algorithm to obtain a user-specified number of classes. The threshold values are based on similarities and differences in the data (NIJ 2007). The natural breaks classification method should be used if the data set contains great value variations. In this paper the classification method of natural breaks was used for all data analysis where classification was needed except the classification of the three variables education level – unemployment rate – income to achieve the social structure types (see “District Types” below).

The ‘Equal interval’ classification method allows specifying the number of classes and divides the range of values into equally sized classes (ArcGIS Desktop Help). To achieve equally sized classes the range of one class is calculated by subtracting the minimum value of the dataset from the maximum value contained by the dataset divided by the amount of classes desired (NIJ 2007). In this study the equal interval classification method was used to classify the variables ‘education level’, ‘unemployment rate’ and ‘income’ to achieve the social structure types (see “District Types”).

b) Age bias or representativity index:
Demographic cross sections for different areas can be compared using the ‘regional age bias approach’. With this approach it is possible to show the age structure at a specific point in time in more than one area (Foss and Juvkam 2005). After Sørli the age bias is based on index numbers of regional representativity (Sørli 1995). The regional demographic representativity index measures the population level of an age group in a territory against the level of the same group at another geographical level. Other geographical levels can be the National or European level. In this study the population of the city of Norrköping was used as a geographical reference, and the different district (within the city) age biases were compared with this reference territory. Furthermore the municipality (with its population) was used as reference territory for the comparison with the spatial subdivisions ‘city’ and ‘rural region’ age biases. Index values of less than 100
mean an age group is under-represented, whereas an index value of more than 100 indicate an over-representation of an age group. The value of 100 is a measure of the percentage deviation from the infusion in the geographical reference area (Foss and Juvkam 2005).

In this work cross sections from 1995 to 2006 are going to be compared. The age biases, being cross sections, explain regional demographic causality only to a limited extent. Nevertheless age biases can be pre-eminently used to describe conditions and to develop further questions and hypotheses. However several points should be kept in mind when examining age biases for several points in time. Firstly, the age distribution will change in the territories studied. Secondly, the age distribution will change as well in the reference region for the comparison. This implies that the relative or/and absolute level of aged people can increase in a territory even if the representational indexes for elderly decreases.

The regional age bias takes into account the relative share of a population of a certain age. This implies that a comparison of the actual size of a cohort with another cohort is impossible, but the shares of a cohort can be compared with its share in another geographical territory. This means that for a comparison of regional age biases the changes in the representation of cohorts are of primary interest. In the case that a cohort increases its representation with age an ageing population can be assumed. If so, the younger cohorts could be too small to replace older cohorts completely (Foss and Juvkam 2005).

c) Indicators:

In this work ageing is depicted by indicators as well. In the ESPON project on demographic challenges (cf.http://www.espon.lu/online/documentation/projects/thematic/thematic_75.html) and in the OECD Territorial Database a number of indicators on aspects of demographic structure are listed and employed. The indexes give information about the relative degree of ageing and different age-related aspects. Examples are the so called potential labour force, the ageing labour force or the dependency ratio. These indicators can be compared across regions, times or related to a common reference (e.g. the European average), because they are simple shares (percentage) or ratios (Foss and Juvkam 2005).
The following table provides an overview over the most important indexes:

<table>
<thead>
<tr>
<th>Name of group</th>
<th>Definition</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>The percentage of children and teenagers in the population</td>
<td>Population 0 – 15/ total population*100</td>
</tr>
<tr>
<td>Youth</td>
<td>The percentage of young people in the population</td>
<td>Population 16 – 20/ total population*100</td>
</tr>
<tr>
<td>Labour force potential</td>
<td>The percentage of people of active or working age in the population</td>
<td>Population 20 – 64/ total population*100</td>
</tr>
<tr>
<td>Ageing labour force</td>
<td>The oldest age segment of active or working age as a percentage of the total group</td>
<td>Population 55 – 64/ population 20 – 64*100</td>
</tr>
<tr>
<td>Ageing population</td>
<td>The percentage of elderly people in the population</td>
<td>Population 65+/ total population*100</td>
</tr>
<tr>
<td>Ageing aged</td>
<td>The percentage of old people among the elderly</td>
<td>Population 80+/ population 65+*100</td>
</tr>
<tr>
<td>Labour force potential replacement ratio</td>
<td>The 15-year cohort entering working age in the next 15 years with the 15-year cohort leaving working age during the same period (roughly)</td>
<td>Population 10 – 24/ population 50 – 64*100</td>
</tr>
<tr>
<td>Reproduction potential replacement ratio</td>
<td>The 15-year cohort entering the most reproductive ages in the next 15 years compared with the 15-year cohort leaving the most reproductive ages during the same period (roughly)</td>
<td>Population 5 – 19/ population 20 – 34*100</td>
</tr>
<tr>
<td>Old age supporters ratio</td>
<td>People of active or working age compared with elderly people</td>
<td>Population 20 – 64/ population 65+*100</td>
</tr>
<tr>
<td>Elderly versus children</td>
<td>Elderly people compared with children</td>
<td>People 65+/ people 0 - 15</td>
</tr>
</tbody>
</table>

Table 5: Indexes on aspects of the demographic structure
Source: Foss and Juvkam 2005
Using such indexes implies the possibility of comparing different regions. Indexes used in this paper are: Ageing labour force; Ageing population; Ageing aged and the Old age supporters’ ratio.

d) Bivariate correlation:

In this work bivariate correlation is used to examine how two variables are related to each other. The Bivariate Correlations procedure calculates Pearson's correlation coefficient, Spearman's rho, and Kendall's tau-b with their significance levels. The Pearson’s correlation coefficient, which is used in this paper, should only be used if a linear relationship between variables is assumed. If two variables are related, but the relationship is not linear, another statistic for measuring associations should be used (SPSS Help). The Pearson’s correlation coefficient varies between -1 and 1 indicating a (ideal) strong negative or (ideal) strong positive relation between two variables. Here relationships between variables such as population, education level, unemployment rate and income were explored and stronger correlations (larger than 0.5 and less than -0.5) explained.

e) Procedure to obtain “DISTRICT TYPES”

First, the demographic variable (population) and social variables (education level, unemployment rate, income and family status) were analysed separately for all districts of the city of Norrköping and correlation analysis were undertaken to discover relations between variables (section 5.1 and 5.2). All classifications done in this section used the natural breaks classification method. In a second step an age structure analysis was done by examining the age distribution for a statistical area. Each district was assigned to a specific Age structure type (section 5.1). Thirdly a social structure analysis was performed by combining the three variables education level, unemployment rate and income level generating eight social types. Therefore all three variables were classified into three classes (referred to as ‘low’, ‘middle’ and ‘high’) using the equal interval classification method. After this all statistical areas were assigned to the specific combination of those three classified variables as shown in the following table.
Table 6: Assignment of the social variables to the social structure type
Data source: Norrköping municipality; equal interval classification

In a last step the age structure types and social structure types were combined to obtain the so called “District types”. The procedure can be seen as well schematically in figure 28 below.

![Diagram showing the procedure to obtain “District types”](image)

Figure 28: Procedure to obtain “District types”
Source: Own representation
GIS METHODOLOGY

GIS was to a major extent used as a visualisation tool to explore spatial coherences and the exploration of pattern. To do so, demographic and socioeconomic data - which were given in Excel format - were imported to the GIS and further edited. The GIS tools ‘Union’, ‘Clipping’ and ‘Selecting’ were used for the preparation of the administrative boundaries layer (especially nyckelkod 3), street network layer, water bodies layer and so forth. On screen digitizing of the healthcare centre - locations was used to be able to perform accessibility analysis.

a) Preliminary global statistical tests

To understand what can be expected in a crime map preliminary global statistical tests were executed (Chainey 2005). The goal was to get a first impression about the spatial distribution of the crime incidents and to find evidences for clustering in the dataset. Therefore the calculation of mean centre, Standard deviation distance, Standard deviation ellipses and the calculation of the nearest Neighbour index (NNI) as a test for clustering were performed.

b) Choropleth mapping

Choropleth mapping, also referred to as area symbol, was used for the representation of population/socioeconomic and crime data. Choropleth is a Greek word, where choros means place and pleth can be translated as values. This implies the counts or values of for example population which is located in places such as districts or blocks. Operations like ‘point-in-polygon’ counts or ‘joins based on spatial location’ can be used to achieve choropleth maps (NIJ 2007).

c) Interpolation – Kernel density

Crime incidents and population data, both given as points distributed across the city area, were interpolated to achieve a smooth, continuous surface, representing the density or volume of crime events (Chainey 2005). Interpolation is a method which aggregates points within a search radius. As a result values can be estimated for locations between known sample points (NIJ 2005). The most appreciate method of interpolating crime and population data might be the Quartic Kernel Density Estimation (Chainey et al. 2002, McGuire and Williamson 1999) which is used in this study. For a detailed description of the functioning of this method the publication “Mapping crime – Understanding hot spots” from the U.S. Department of Justice will be a good source.

d) HOT SPOTS of high elderly and crime density – Combination of two interpolation surfaces:
In chapter 5.4 two kernel density estimations will be combined. First, both interpolated surfaces are reclassified into the full colour range of 255 classes in order to obtain an equal value range. Thus the value 1 corresponds to a really low and 255 to an extremely high density of the examined variable. In a second step the sum of two surfaces is calculated. The obtained values of the new surfaces rank thus from 0 to 510. A very high value from for example 500 will therefore mean that both variables taken must be very high. The same applies for very low values. Values in-between hold a great interpretation range: 275 could mean that the first value is with 25 very low and the second with 250 extremely high. But the same value of 275 can be achieved as well with exactly the opposite combination of the two variables. The aim in this work is to show areas where both variables are extremely high in term of ‘risk areas’.

e) Combination of crime and elderly data in choropleth maps

To be able to combine crime data and elderly data the crime and elderly share was calculated and classified into three classes whereas 3 (30) represents the highest share of crime (elderly) and 1 (10) represents the lowest share of crime (elderly). A sum of these attributes (one digit number plus two digit number) results in a two - digit code representing both the elderly and crime share (in categories). To attain clearness special attention is given to high crime and high elderly occurrence areas.

f) Network analyst

Network analyst was used in the accessibility analysis to create service areas for the health care centre (“vårdecentralen”) locations in the city of Norrköping. The number of elderly living within a certain walking or driving distance of these centres was calculated.
4. INTRODUCTION OF THE STUDY AREA

In this section the study area Norrköping city and its administrative unit the municipality of Norrköping is presented. As the municipality was divided into “City” and “Rural region” (see Methodology section) differences between these two spatial categories are going to be explored. After some general information the demographic situation (population distribution and development; age structure; fertility rate) is presented in more detail followed by the description of the social situation (education level, income, family, immigrant background) in the municipality of Norrköping. Next the economical aspects are presented. Lastly housing and municipal expenditures are stated.

4.1 General information about the municipality and city of Norrköping

The municipality of Norrköping (Norrköpings kommun), with a total area of 1,491.61 km², is situated in the northeast of the county of Östergötland. The administrative center and capital of the municipality is the city of Norrköping. The city lies approximately 170 km south of Stockholm. Through the city of Norrköping flows the river Motala ström, which drains into Bråviken, a gulf of the Baltic Sea close to the city. The city was one of Sweden’s major industrial cities 30 to 40 years ago. Since this time the city passed through a structural change to a commerce- and service municipality without a dominating concentration of specific branches of trade. This fast change implied many challenges for the city as well as the municipality. Today Norrköping municipality has an ambition to give its inhabitants good living conditions in all respects, including school, elderly care, culture, environment or traffic (Norrköpingsfakta 2006:6).

Gamla staden is declared as being the historical centre of the city of Norrköping. Further city development took place circularly around this centre particularly in a south and west direction. The areas north- and northeastwards of the centre were already formed by the industry. Clearly visible in the figure below are two district circles, one being Östantill, Söderstaden; Såpkullen, Berget and Nordantill, the second containing the districts Oxelbergen, Ljura, Klingsberg; Ektorp; Kneippen and Marielund. The southern boundary of this circular arrangement is the main road called ‘Söderleden’. A further spreading of the city, mainly planned by the local authorities, basically took place along the main streets in the southeast, southwest and northwest direction. A broadening of the city in the east direction was impeded by the local airport. Areas of further development can be seen mainly in the southeast of the city (Brännestad and Rambodal) as well as the northwestern part of the city (Fiskeby).
4.2 Demographic Situation of Norrköping municipality

4.2.1 Population distribution and development in the municipality

POPULATION DISTRIBUTION

Norrköping’s municipality had a population of 125,463 inhabitants in the year 2006, which is the highest number ever. The population density was about 83 inhabitants per km². With a population of 83,885 inhabitants in the year 2006, the city of Norrköping is listed as Sweden’s eighth largest city (Norrköpingsfakta 2006:6).

The most populated areas in Norrköping municipality are the districts Hageby (7502 inhabitants), Östantill (5844 inhabitants), Nordantill (5733 inhabitants), Haga (5205 inhabitants) and Vikbolandets landsbygd (5171 inhabitants). All above-named statistical areas, except Vibolandets landsbygd are to be found in the city (quod vide figure 30). The least populated statistical areas are Risängen, Vrinnevi and Arkösund, all to be found in the rural region of Norrköping municipality. The distribution of the population shows a clearly visible pattern: the city of Norrköping has high and very highly populated statistical areas. Around the city a belt of statistical areas with very few inhabitants can be found. The remote rural statistical areas show a middle or high total population. As
mentioned before the population density is highest in the city (except industrial areas) and lowest in the rural region decreasing with increasing distance to the city.

Figure 30: Population distribution in Norrköping municipality
Data source: Statistics Sweden and Norrköping municipality

POPULATION DEVELOPMENT IN THE MUNICIPALITY
A longitudinal examination of the population development in the municipality, presented in the graph below, shows a trend towards increasing population since the early 80s (except a break-in at the end of the 90s). The population increase can be explained by a positive in-movement to the municipality and higher birth than death rates caused by an increasing fertility rate in the municipality. Many people moving in come from small municipalities and many of them are young adults that decided to move to the city. Predictions forecast a further population increase for the next years. Calculations have shown that the municipality will pass 126,000 inhabitants at the end of 2009 and scarcely over 129,000 in 2015. New housing areas can involve a further population increase through in-movements to the municipality in the future (Norrköpingsfakta 2006:6, page 9).
Figure 31: Amount of population from 1970 to 2005 with prognosis from 2006 to 2010 and forecast till 2015
Note: Predictions include always some forecast uncertainty. Notice that y-axis doesn’t start at zero.
Source: Norrköpingsfakta 2006:6; page 9

POPULATION DEVELOPMENT IN THE SPATIAL SUBDIVISIONS

The population development varied considerably between the city and the rural region. In the year 1995 the city of Norrköping had 89,078 inhabitants and lost 1568 inhabitants (1.8% of the whole population) till the turn in the year 2000. From this time the population has increased, but still with 88,885 inhabitants in 2006 it does not reach the population level of 1995. Meanwhile the rural region of Norrköping municipality in the second half of the 90s lost only 105 inhabitants (-0.3% of the population). From 1999 the population has steadily grown. In 2006 the rural region counted 36,578 inhabitants. This refers to an increase of 1861 inhabitants and therefore 5.4% compared to 1995. The following graphs show this population change from 1995 to 2006 in the city (left side) and the rural region (right side).

Figure 32: Population development 1995 - 2006 in the city (left side) and the rural region (right side) of Norrköping municipality
Remark: Notice that y-axis does not start at zero.
Data source: Statistics Sweden and Norrköping municipality
4.2.2 The population of Norrköping municipality by age

AGE CURVE AND AGE GROUPS IN THE MUNICIPALITY

The age of inhabitants of the municipality is very important for the municipality’s organization because many activities, for example preschool, school and the care of the elderly are strongly connected to the age of the population. Changes in the age structure of the inhabitants will to a high degree influence the planning of the municipality (Norrköpingsfakta 2006:6, page 11).

The age curve of Norköping’s population (here from the year 2005 – figure 33) clearly shows a bump for persons aged around 59. Those persons are also called the baby boomers, “40- talisterna” because a large number of children were born in the 1940s. The next bump consists of inhabitants aged between 39 and 41. To a great extent this is the children of the baby boomers. Another readily identifiable bump consists of the new so called baby boom around the year 1990. During this time all around Sweden a large number of children were born. As is visible in the figure above, a number of smaller bumps exist, one being young adults at the age around 25 showing that Norrköping is also a youth city which attracts young adults. This is partly the result of the development of the university education in the city of Norrköping. However, also other young adults want to live in Norrköping (Norrköpingsfakta 2006:6, page 11). In the year 2006 24 percent of the municipality’s population was younger than 20 years, 59 percent aged between 20 and 64 and 17 percent were aged 65 and older.

![Graph of population distribution by age](image)

Källa: Statistiska centralbyrån

Figure 33: The population of the municipality of Norrköping divided by age
Source: Norrköpingsfakta 2006:6; page 11

13 percent of the municipality’s population was aged between 55 and 65. To show the retiring population for the next 10 years as a proportion of the whole working population the so called ‘Ageing labour force’ can be calculated. In other words the ageing labour force shows the oldest age segment of the active or working age (55 – 64) as a percentage of the total group (20 – 64). In the year 2006 the ageing labour force of the municipality
of Norrköping was 25 percent, which means that today almost every fourth person working will retire within the next 10 years.

The highest percentage of future retired persons can be found in the rural region. Especially in the east of the municipality a large group of people working will reach retirement age. In the city of Norrköping statistical areas situated marginally of the city show a high percentage of retired inhabitants for the next 10 years.

![Ageing labour force for the municipality of Norrköping](image)

Figure 34: Ageing labour force for the municipality of Norrköping
Data source: Statistics Sweden and Norrköping municipality

To meet the future requirements of the inhabitants of different ages flexible planning from the municipality has to be guaranteed. That applies more than ever if different age groups are strongly represented in a region, as is the case in Norrköping’s municipality. Furthermore it implies that many inhabitants of the municipality retire at the same point of time which influence the personnel support in the municipal organization (Norrköpingsfakta 2006:6, page 11).
AGE CURVE AND AGE GROUPS IN SPATIAL SUBDIVISIONS

The age structure of the population differed considerably between the city and the rural region. Figure 35 below presents the age structure bias from the city and the rural region (additionally divided into spatial categories of villages and rural regions without villages) compared to the municipality average of the share of the specific age groups. Especially eye-catching is the difference in the number of inhabitants aged 20 to 29 and aged over 75. The population aged between 20 and 29 is overrepresented in the city whereas they are extremely underrepresented in the rural region. This fact can be seen by means of the diverging curves representing the population in the city and the rural region. The overrepresentation of young adults in the city of Norrköping can be explained partly due to the university located in the city. The same picture is presented for the population aged over 74. The older the inhabitants the more likely they are to live in the city of Norrköping. This may be explained by increasing care need and the availability of special housing in the city. Furthermore the proximity to important facilities like shopping centres or health centres could play an important role.

Figure 35: Norrköping municipality: Age structure 2006. Spatial subdivisions. Index, Norrköping municipality average = 100
Data source: Statistics Sweden and Norrköping municipality
The differences in the age distribution of the inhabitants of the city and rural regions can be seen as well by examining both half age pyramids (figure 36). In general the half age pyramid of the rural region as well as the age pyramid of Sweden clearly shows the demographic waves for the population aged 55 to 65; 35 to 45 and 10 to 20. The half age pyramid of the city shows evidences of an ageing population instead. A relatively low proportion of 5 percent of children aged zero to ten is seen alongside a relative high proportion of elderly aged over 65. Both figures show a remarkable proportion of inhabitants aged between 55 and 64 (marked red). This will result in a very high number of inhabitants in both the city and the rural region leaving working life and going into retirement within next 10 years.

![Norrköping city 2006](image1)

![Rural area with villages 2006](image2)

Figure 36: Half age pyramids of the city of Norrköping (left side) and the Rural region (right side)

Data source: Statistics Sweden and Norrköping municipality

In the year 2006 22 percent of the city’s inhabitants were aged 0 – 19 compared to 28 percent in the rural region. As is visible in the figure below the rural region has more children compared to the city and the overall average of the municipality. The proportion of working population (age 20 – 64) in the city was with 60 percent somewhat higher than the proportion in the rural region with 58 percent. The elderly as well constituted a higher proportion in the city (18 percent) than in the rural region (14 percent).
The proportion of the city’s inhabitants aged 55 to 65 was about 13 percent in 2006. The corresponding figure for the rural region was somewhat higher, 15 percent. As a result the ageing labour force was with 27 percent higher in the rural region than in the city with 24 percent. This means that in both spatial subdivisions almost one quarter of the whole working population will go into retirement the next ten years. This high number can imply great difficulties for the pensions and local expenditures. During the next ten years persons going into retirement can be replaced by people aged between 15 and 25 in the city of Norrköping (see again figure 36). This age group constitutes a high proportion of the whole population and will be able to ‘take over’ work. After this period a reduced proportion of persons will reach working age and a continuously high proportion of people will reach retirement age which can imply great difficulties for the local employment market.

AGE GROUP DEVELOPMENT IN THE MUNICIPALITY

It is also important to know how the number of persons belonging to specific age groups changed during the last years and to forecast further development. In the municipality of Norrköping the number of persons aged 20 to 64 steadily increased since 1998. A plus of 2677 inhabitants of this age group contributes to an increase of more than 1 percent. In the age group 0 – 19 the municipality recorded a decrease of 567 (-0.8 percent) persons. The age group over 65 also decreased during this period (-442 persons, -0.6 percent). However both age groups increased steadily since the year 2002.

Figure 37: Differences in the share of the three main age groups in 2006 based on the average values of Norrköping municipality (average share Norrköping municipality = 0)
Data source: Statistics Sweden and Norrköping municipality
Calculations predict a further increase of the population aged over 65 till the year 2015. Based on the year 2005 an increase of 21% is expected. This would imply a raise of 4591 persons (25969 elderly in total in 2015) in the age group 65+ in only ten years! While a remarkable increase of the number of persons aged 65 to 79 is forecasted, the number of persons aged over 80 is expected to decrease. In the forecasted time till 2015 an increase of 4933 persons aged between 65 and 79 is expected. This corresponds to a 34 percent rise. The number of persons aged over 80 will decrease by 5 percent (-342 persons) till 2015. However, after 2015/2020 the intense increase of now ‘young elderly’ will shift to ‘aged elderly’, probably raising the need for care and services. Therefore the municipality of Norrköping has some years to plan for this condition and to adjust budget, services and even housing.
AGE GROUP DEVELOPMENT IN SPATIAL SUBDIVISIONS

The development of the three age groups (0 – 19; 20 – 64 and 65+) from 1995 to 2006 proceeded differently in the city and the rural region. Whereas the rural region recorded increases in all three age groups (see figure 40 below) the city lost inhabitants at the age over 65 and fewer than 20. Obvious is the decline of inhabitants aged over 65 in the city of Norrköping since 1995. In fact the number of elderly living in the city decreased by 1076 persons (-6 percent).

![Figure 40: Differences in the development of the age groups in the city, rural region and whole municipality of Norrköping 2006 compared to 1995](image)

Data source: Statistics Sweden and Norrköping municipality

**4.2.3 Fertility rate of Norrköping municipality**

In the period from 2001 to 2006 the fertility rate of Norrköping municipality differed only marginally to Sweden’s average as shown in table 7. In the year 2006 an average of 1.79 child per woman was born which is lower than the Swedish fertility rate of 1.85. Since 2001 the fertility rate has increased resulting in an increase of the natural population movement in Sweden as well as in the municipality of Norrköping.

<table>
<thead>
<tr>
<th>Year</th>
<th>Norrköping</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1.54</td>
<td>1.57</td>
</tr>
<tr>
<td>2002</td>
<td>1.60</td>
<td>1.65</td>
</tr>
<tr>
<td>2003</td>
<td>1.64</td>
<td>1.71</td>
</tr>
<tr>
<td>2004</td>
<td>1.72</td>
<td>1.75</td>
</tr>
<tr>
<td>2005</td>
<td>1.76</td>
<td>1.77</td>
</tr>
<tr>
<td>2006</td>
<td>1.79</td>
<td>1.85</td>
</tr>
</tbody>
</table>

*Note: Total fertility rate.*

Table 7: Fertility rate (Births per women) of Norrköping municipality and Sweden from 2001 to 2006

4.3 Social situation in Norrköping municipality

4.3.1 Education

a) Education level of the population aged 20 - 64

In the municipality of Norrköping 19 percent of the population aged 20 to 64 had a compulsory school degree (or the equivalent), 51 percent finished school at high school level and 29 percent hold a post secondary degree. Comparing education levels differences between the city of Norrköping and the rural region are visible (shown in figure 41). While the population living in the city has a higher share of post secondary education, the rural region has more inhabitants with compulsory school and upper secondary degrees. Nevertheless these differences are small.

![Figure 41: Education by level of degree for population aged 20 – 64 (left side) and population aged over 65 (right side) in 2005](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAoAAAAKpCAYAAAAAj4n5vAAAASUlEQVR423dZ...)

Data source: Statistics Sweden and Norrköping municipality

b) Education level of the population aged over 65

Investigating the education of the population aged 65 and older 47 percent have the equivalent of compulsory school, 38 percent an upper secondary degree and 16 percent a post secondary degree. This reflects clearly the change in the society concerning education. Higher education became more and more important. Nowadays it is rare that pupils leave school before completing an upper secondary degree. Examining the differences for the education level of the population aged over 65 between the city and the rural region only marginal differences are visible. People living in the city have a higher share of upper secondary degrees while people living in the rural region have a higher share of compulsory school degrees.

c) Development of the education level

During the period of 2002 to 2006 the proportion of person’s finishing school at compulsory school and upper secondary school level decreased constantly as is visible in figure 42. In return the proportion of the post- secondary degrees held by the population increased. This is partly due to the establishment of the University of Linköping in the city of Norrköping, a campus with approximately 5500 students in 2007. On the other hand Norrköping historically has a very low proportion of persons with post secondary education compared to other municipalities (table base can be found in the appendix 2)
last column of table). This low education level is typical for cities where manufacturing industry dominated because it was possible to find an occupation without much formal education (Norrköpingsfakta 2006:6).

Figure 42: Level of education ages 25 – 64 in the municipality of Norrköping, 2002 - 2006
Source: Municipal facts 2007 - 2008

4.3.2 Income

To analyse the level of income, differences were made between the average/mean income of all inhabitants of a statistical area and the average income where only persons that have an income were considered. The latter will therefore always be higher. In the year 2005 the average income of all inhabitants in the municipality of Norrköping was SEK 156300. The average income for those with an income was around SEK 217000 (figure 43). There exist differences of the income level between the city and the rural region. Persons living in the rural regions of Norrköping municipality earned on average SEK 26200 more per year (Average income of all). Examining the differences of income in the category ‘average income for those with an income’ the difference between city and rural region is with SEK 15400 no longer significant. This fact reflects the situation of a lower share of the population with income within the city.

Figure 43: Income level and share of population with income in 2005
Data source: Statistics Sweden and Norrköping municipality
4.3.3 Family status

In the year 2004 the municipality of Norrköping had a share of families with children of 28 percent. Of those almost one third (31 percent) were single parents with children living at home. However, the city of Norrköping only had a share of 25 percent of families with children living at home compared to 38 percent in the rural region as illustrated in figure 44. The opposite situation can be found in the category of single parents with children living at home. In the rural region only 22 percent of all families with children are single parents whereas in the city 35 percent of the families with children are single parents. This implies a higher importance of the traditional family (both parents and child/children) in the rural region compared to the city.

![Figure 44: Share of families in the population and share of single parents from the year 2004](image)

Data source: Statistics Sweden and Norrköping municipality

4.3.4 Immigrant background

Since the year 2003 the number of inhabitants with an immigrant background increased in the municipality of Norrköping (see table 8 below). In the year 2006 almost every fifth inhabitant had an immigrant background.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number</th>
<th>Total prop. % of all</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>20 855</td>
<td>16,80</td>
</tr>
<tr>
<td>2004</td>
<td>21 239</td>
<td>17,10</td>
</tr>
<tr>
<td>2005</td>
<td>21 663</td>
<td>17,40</td>
</tr>
<tr>
<td>2006</td>
<td>22 564</td>
<td>18,00</td>
</tr>
</tbody>
</table>

Table 8: Inhabitants with immigrant background 2003 – 2006

Note: Immigrant background means that the person is born in another country or that both of the parents are born in another country.

By comparing the proportion of inhabitants born abroad with five other comparable municipalities Norrköping ranks with 13 percent in the middle (2005). (A data overview in table form is provided in the appendix 2 – the column before last)
4.4 The economical situation

Due to the close location of the city to the Baltic Sea, Norrköping had a great importance as an industrial town in the 19th and beginning of 20th century. Ship and sugar industry as well as textile industry were the main branches of trade.

Norrköping suffered, like almost all former industrial towns, from the economic change in the second half of the 20th century. As a result Norrköping changed to a centre of business, culture and education as well as tourism, which reformed the city’s face. Today 68 percent of the day population (69 of the night population) works in the industry which is similar to the average of Sweden with 69 percent of each day and night population working in the industry (Municipal facts 2007 – 2008).

### Employment, ages 16-, by sector 2005

<table>
<thead>
<tr>
<th>Night population</th>
<th>Day population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number</strong></td>
<td><strong>Percentage distribution (%)</strong></td>
</tr>
<tr>
<td><strong>Norrköping</strong></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>37 554</td>
</tr>
<tr>
<td>Public sector</td>
<td>16 407</td>
</tr>
<tr>
<td><strong>Sweden</strong> (thousands)</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>2 892</td>
</tr>
<tr>
<td>Public sector</td>
<td>1 293</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Night population:</th>
<th>Residing in the area, regardless of workplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day population:</td>
<td>Working in the area, regardless of residence. Also defines number of jobs in the area</td>
</tr>
</tbody>
</table>

Table 9: Employment in the municipality of Norrköping by sector in the year 2005

Nowadays leading industries such as paper and packaging, trade, logistics and transport, electronics and information technologies benefit from the good geographical location of Norrköping and from an efficient transport hub featuring the railway, a net of highways and the airport. Major employers are the municipality of Norrköping (approximately 8500 employed), Östergötland county Council (2824 employed), Holmen AB (950 employed), Billerud Skärblacka AB (710 employed) (Norrköping kommun 2007) and Prison and Probation Administration (475 employed) (Municipal facts 2007 – 2008 – Contacts with companies).

In Norrköping municipality 5.5 percent of the men and 4.7 percent of the women were unemployed in March 2006. This corresponds to an unemployment ratio of 5.2 percent for both genders. This unemployment ratio is marginally lower than the average unemployment rate of Sweden with 5.4 percent (Schmitt J. 2007). Figure 45 shows that
unemployment ratios vary among genders as well as among the city and rural region. In all three spatial categories (city, rural region and municipality) the men unemployment ratio is higher than the women unemployment ratio. Moreover the unemployment ratios in the city (6.4 for men and 5.4 for women) are higher than the average ratio for the rural region (4.5 for men and 3.9 for women). During the period of 2004 to 2007 the unemployment rate of the municipality’s population aged 18 – 64 varied between 6.1 and 5.2 (Municipal facts 2007 – 2008).

Figure 45: Proportion of unemployment in the population aged 18 – 64 in March 2006
Data source: Statistics Sweden and Norrköping municipality

Norrköping together with Linköping, an approximately equal-sized city near to Norrköping, forms Sweden’s fourth largest big-city region. Both cities are also called the ‘Twin Cities’ and profit from a combined marketing and tourism management. The region is referred to as one of Sweden’s most dynamic and future-oriented regions. The region of the Twin Cities has about 410 000 inhabitants, 36 000 companies and 50 percent of Sweden’s population within a radius of 200 km. The most important advantage of this region is the favourable location with easy accessibility to a large market. The Twin Cities of Sweden lie on the Nordic triangle, northern Europe's most important transport corridor, linking Scandinavia's metropolitan regions. The region is ranked as the third-best logistics centre in Sweden (Twin cities of Sweden 2007). Furthermore, a part of Norrköping is, with the reconstruction and conversion of the old manufactures - called “Industrilandskapet” - on the way to get a unique face.
4.5 Housing market and municipal expenditures

4.5.1 Housing market

In January 2006 the housing market of the municipality of Norrköping was in an overall balance, but a shortage of housing existed in the city and in particular in downtown/the city centre (see figure 46 - red circle).

![Housing market map]

Figure 46: Housing market situation in the municipality of Sweden; January 2006
Source: Bostadsmarknaden 2006 – 2007

Population groups that are specially affected by this shortage of housing are: middle-aged and older inhabitants that want to move to smaller flats (in 90 percent of all municipality’s 2006), households with high requirements for attractive locations (in approximately 78 percent), youth (in approximately 68 percent) and families with children (in 60 percent of all municipality’s) (Boverket 2006).

4.5.2 Housing construction and municipal expenditures

The number of constructed houses in the municipality of Norrköping varied strongly depending on the type of building and year of construction. In the year 2003 over 190 dwellings in multifamily housing were built and available on the housing market. This number was the highest since the turn of the millennium as is visible in table 10. In the years 2001 and 2006 with 146 and 195 buildings respectively the highest amount of detached or semi-detached buildings were constructed (Municipal facts 2007 – 2008). Compared to other municipalities the housing production activity of Norrköping municipality is low (Boverket 2006).

Table 10: Construction of buildings between 2000 and 2006 in the municipality of Norrköping

<table>
<thead>
<tr>
<th>Norrköping</th>
<th>2000 Number</th>
<th>2001 Number</th>
<th>2002 Number</th>
<th>2003 Number</th>
<th>2004 Number</th>
<th>2005 Number</th>
<th>2006 Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>One- or two-dwelling buildings</td>
<td>44</td>
<td>146</td>
<td>66</td>
<td>103</td>
<td>97</td>
<td>109</td>
<td>195</td>
</tr>
<tr>
<td>Dwellings in multi-dwelling buildings</td>
<td>89</td>
<td>38</td>
<td>78</td>
<td>191</td>
<td>5</td>
<td>90</td>
<td>10</td>
</tr>
</tbody>
</table>
The following figure shows the municipal expenditures per inhabitant during the period of 2003 to 2006. Obvious is the high municipal expenditure on education and child care as well as care for the elderly and disabled with more than 14000 SEK per inhabitant and year. The amount of money spent in these two categories increased since 2004 indicating the high importance of education and child-, elderly- and disabled care (Municipal facts 2007-2008).

**Municipal expenditures per inhabitant 2003 - 2006**

<table>
<thead>
<tr>
<th>Activity</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and child care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Care for the elderly and disabled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation and culture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Political administration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special activities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 47: Municipal expenditures per inhabitant 2004 – 2006 in Norrköping
4.6 Crime in Norrköping

It is very difficult to find information or published reports about crime in Norrköping. Information, which can be found - but should be read very critically - are reports in the media for example in the local newspapers. Norrköpings newspaper Folkbladet reported increasing numbers of violent crimes in the year 2004. Inhabitants were appeased that only assault between youth (offender and victim under 20) increased (Häggkvist 2005). This can indicate a problem of violent crime in schools as almost all young people attend school until the age of 19.

In the municipality of Norrköping as well as in the city of Norrköping theft, traffic crimes and drug incidents account for approximately two thirds of all crimes (65.08% for the municipality; 63.85% for the city). As is visible in the table below in both cases theft is the numerically largest category. All cases of homicide and around 90% of all drug incidents occurred in the city of Norrköping making these two categories a phenomenon of the city. On the other hand ‘only’ 65% of the traffic crime occurred in the city of Norrköping. Crimes of other categories occur with approximately 80 to 90 per cent in the city and 10 to 20 per cent in the rural regions of Norrköping’s municipality.

<table>
<thead>
<tr>
<th>type of crime</th>
<th>Norrköping municipality</th>
<th>Norrköping city</th>
</tr>
</thead>
<tbody>
<tr>
<td>all real crime</td>
<td>Count 21836</td>
<td>17902</td>
</tr>
<tr>
<td></td>
<td>% 100</td>
<td>100</td>
</tr>
<tr>
<td>assault</td>
<td>Count 139</td>
<td>1233</td>
</tr>
<tr>
<td></td>
<td>% 6.370</td>
<td>6.89</td>
</tr>
<tr>
<td>drugs</td>
<td>Count 1860</td>
<td>1685</td>
</tr>
<tr>
<td></td>
<td>% 8.52</td>
<td>9.41</td>
</tr>
<tr>
<td>fraud</td>
<td>Count 867</td>
<td>777</td>
</tr>
<tr>
<td></td>
<td>% 3.97</td>
<td>4.34</td>
</tr>
<tr>
<td>homicide</td>
<td>Count 6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>% 0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>rape</td>
<td>Count 124</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>% 0.57</td>
<td>0.66</td>
</tr>
<tr>
<td>robbery</td>
<td>Count 154</td>
<td>131</td>
</tr>
<tr>
<td>sexual incidents</td>
<td>% 0.71</td>
<td>0.73</td>
</tr>
<tr>
<td>theft</td>
<td>Count 8426</td>
<td>7156</td>
</tr>
<tr>
<td></td>
<td>% 38.59</td>
<td>39.97</td>
</tr>
<tr>
<td>traffic crime</td>
<td>Count 3940</td>
<td>2591</td>
</tr>
<tr>
<td></td>
<td>% 18.04</td>
<td>14.47</td>
</tr>
</tbody>
</table>

Table 11: Share of crime types for Norrköping municipality and city
Data source: County police in Östergötland
5. THE POPULATION OF THE CITY OF NORRKÖPING

5.1 Population distribution

In the year 2006 the city of Norrköping counted 83,885 inhabitants. Most populated statistical areas in the city of Norrköping are Hageby (7,502 inhabitants), Östantill (5,844 inhabitants), Nordantill (5,733 inhabitants); Haga (5,205), Klockaretorpet and Enebymo each with 4,880 inhabitants. Least populated areas are Vrinnevi (63 inhabitants), the Industrial areas (247 inhabitants), Herstadberg (259 inhabitants), Brännestad (664 inhabitants) and Fiskeby with 699 inhabitants in the year 2006. As it is visible is the figure below districts with the highest population rates are quite distributed within the city.

Figure 48: Population distribution in the city of Norrköping
Data Source: Statistics Sweden and Norrköping municipality

Taking different sizes of the districts into account the population density should be examined as shown in figure 49. High population density can be found in and around the centre of Norrköping as well as in the southwest and northwest direction from the city centre.
5.2 Population development

The development of the population varied to some extent considerably between the statistical areas. Population development from 1995 to 2006 is classified into categories of decrease, increase and stagnation/stable development. Statistical areas were considered to be stable or in a stagnation phase if the population in- or decrease was smaller than 3% in the year 2006 based on the year 1995. Districts with declining population rates are to be found on the margins of the city (Klockaretopet, Herstadsberg, Rambodal and Navestad) and between the city centre and the outskirts (Marielund, Ektorp and Vilbergen). The area around the city centre is ostensibly affected by a stable population development during the examined decade.

It has to be kept in mind that an increasing population in specific districts might as well just reflect construction activity in this region. Some outskirts (like Lindö) record increasing inhabitant numbers through the construction of mainly one or two family housing. Decreasing population may be caused by renovation work which forces inhabitants to leave their flats but also by conscious decision to leave an unappreciated living environment. Even if decreasing population development in some district may reflect bad popularity, vacancies are not so high (over 10 percent) that a district is facing serious problems. Thus population development may to a high extent depend on the housing market development and housing type!
In general 7 districts had a declining, 11 districts a stable and 12 districts of the city of Norrköping had a rising population number during the time examined. Districts of declining population are distributed within the whole city. In general the city centre and a greater area east and south-eastward from the centre experienced a stable or increasing population development.

5.3 Population development and population density

Next the relationship between the population density and development was examined. From 12 districts having very low and low population density six noted a population increase, four were stable and two experienced a decreasing population. Districts located on the outskirts (10 districts) show very low to medium population density and different population development. Whereas five districts had an increasing population, four districts showed a decreasing and one district a stable population development. There is just little evidence for a suburbanisation in Lindö, Fiskeby and Brännestad which again might depend on the type of housing (only single and two family houses). The city centre and all districts around showed very high and high population densities and an increasing or stable population development, which may reflect the shortage of housing in and around the city centre. While highly populated districts in the south-western part of the city (Vilbergen and Ektorp) lost inhabitants the very densely populated district in the north-western part of the city (Haga) shows a rising population.
Figure 51: Population density and development from 1995 to 2006
Data Source: Statistics Sweden and Norrköping municipality
5.4 Type of housing in the city of Norrköping

As stated before the type of housing may have a great impact on the decision of moving, and therefore population development, in some areas. This is meant in terms of “availability” of a desired type of living in only certain districts. One example is the availability of new single family houses based on owner-occupation mostly only on the outskirts (for instance Lindö or Rambodal). It has to be kept in mind that these here called “availabilities” strongly depend on the local housing market, vacancies as well as construction activity. In the city of Norrköping multi family houses can be found in and around the city centre as well as in the southeast westward of the E22. Single and two family as well as row housing can be found, with the exception of Lagerlunda, on the outskirts. Crucial for this category is that each owner or tenant has its own entrance, even if more than one house is arranged in a row. Mixed districts are to a great extent located in the western part of the city.

Figure 52: Crude overview of the type of housing in the districts of Norrköping city
Data Source: Norrköping municipality Turist- och informationskarta; inspections
6 THE AGE STRUCTURE OF NORRKÖPING’S POPULATION

6.1 The age structure by main age groups within the city

To examine the age structure of a population the proportion of inhabitants of a specific age or within an age group related to the whole population has to be explored. Usually each district of a city has its own population age structure. To provide a better overview three main age groups aged 0 to 19 being children and youth, age 20 to 64 being the working population or adults and age 65 and older being elderly, were generated for each district and shown below. The proportion of the three main age groups varies between districts making them in average more or less ‘older’ (high proportion of population aged over 65 – for example in Såpkullen and Vilbergen) or ‘younger’ (high proportion of children and youth - for example in Klockaretorpet and Brånnestad). The following figure gives an overview of the proportion of the three age groups in all districts. The first bar shows the average of the city of Norrköping.

Figure 53: Age structure 2006, three broad age groups. City average and districts of the city of Norrköping. Percentage of total population
Data source: Statistics Sweden and Norrköping municipality
Following each age group and their proportion on the total population of each district is depicted in graphs as well as in a map.

THE AGE GROUP CHILDREN AND YOUTH AGE ‘0 – 19’

A very high proportion of children and youth can be found in the statistical areas of Brännestad, Klockaretorpet, Navestad and Rambodal. These four districts have more than 40 percent more children and youth than the average of Norrköping city (figure 54), which makes these districts very young. The proportion of the age group 0 – 19 on the whole population of the city is 22 percent. Districts with a high proportion of children and youth can be seen as family districts with probably more than one child per family.

Figure 54: Differences of the share for the age group 0 - 19 compared to the average of the city of Norrköping (Norrköping city = 0). Relative representation compared with the City average representation. Percentage.
Data source: Statistics Sweden and Norrköping municipality

Districts with the least proportion of children and youth are Söderstaden, Såpkullen and the Industrial areas. These districts have more than 40 percent fewer inhabitants aged between 0 and 19 than the average of the whole city. Examining this situation on a map a good pattern is visible. Districts with a very high proportion of children and youth are solely located on the outskirts. Moreover districts in the east and south-east of the city hold the highest proportions of children and youth. Districts with a very low proportion of children and youth are situated directly in the city centre and south of it.
THE AGE GROUP WORKING POPULATION/ ADULTS AGED 20 – 64

Districts with a very high proportion of inhabitants aged between 20 and 64 are Gamla Staden, Berget and the Industrial areas. All these districts have over 20 percent more inhabitants of the mentioned age than the overall average of the city of Norrköping with 59.59 percent. It can be assumed that these three districts have a below average proportion of children and youth aged between 0 and 19 or/and elderly aged over 65.

Figure 55: Differences of the share for the age group 20 - 64 compared to the average of the city of Norrköping (Norrköping city = 0). Relative representation compared with the City average representation. Percentage.

Data source: Statistics Sweden and Norrköping municipality
The districts Enebymo, Såpkullen and Smedby and Vilbergen have more than 10 percent fewer inhabitants aged between 20 and 64 than the Norrköping city average. To explore the spatial distribution it is vital to redivide this age group into two age groups depending on different life situations of the life circle. The first age group is formed by inhabitants aged between 20 and 29. Due to their age people of this group just started their occupational career or are seeking a job. The purchasing power is therefore quite low. Furthermore a high percentage of inhabitants of this age group do not have a child or give birth to their first child (the average age for giving birth to the first child was 28.62 years in Sweden for 2007 [Statistics Sweden/ online query]). The dominant family status is therefore probably singles, couples/ young married and small families (1/ 2/ 3 person-households). In cities with a university the age group is in addition characterised by a high percentage of students. The main difference to the age group 30 – 64 is the significantly higher proportion of families with children and therefore the increasing household- size (2/3 and more person-households). More working years and higher incomes increase the purchasing power and decisions of ownership of housing are taken which influences the distribution of this age group.

Districts with a very high and high proportion of young adults aged between 20 and 29 are situated in and around the city centre. The proportion decreases continuously with an increasing distance to the city centre. This distribution pattern can be explained by the life style of young adults and their habit to live close to the university (in Norrköping the university is located in the very east part of Marielund, westward of the city centre) or close to the city centre with its nightlife and the possibility of partying. Another important and mostly crucial factor influencing the choice of accommodation is the renting price of apartments.

Figure 56: Proportion of young adults aged 20 – 29 in each district
Data source: Statistics Sweden and Norrköping municipality
Districts with a very high and high proportion of working population aged between 30 and 64 are situated at remote locations of the city. One exception is Navestad in the south of the city with a very low proportion of the age group 30 – 64. Similarities to the pattern of the age group ‘children and youth’ becomes visible.

Figure 57: Proportion of the working population aged 30 – 64 in each district of the city
Data source: Statistics Sweden and Norrköping municipality
6.2 The elderly in Norrköping

In this section the proportion and development of elderly for the districts of the city of Norrköping is going to be examined. In recent years researchers divide the group of elderly (age 65 and older) into two subgroups of ‘young elderly’ with an age between 65 and 79 and ‘aged elderly’ with an age of over 80. This division better respond to occurring behavioural and physiological changes in the age group of the elderly. Whereas the young elderly mostly are in an active phase of their life enjoying good health and physical conditions, those of the group ‘aged elderly’ show increasing need for medical services and care. They might be more limited in their daily life through weakening physical as well as mental personal conditions. Nevertheless, there is a quite high number of aged elderly in Sweden that need almost no additional help and are mobile until a very high age or even until the very end of life.

However, in the following section quantity and distribution issues are discussed first for the whole group of elderly (age 65 and older) followed by a display of the discussed issues for the younger group (age between 65 and 79) and the older group with inhabitants aged over 80.

6.2.1 THE AGE GROUP ‘ELDERLY’ (AGED OVER 65)

Hageby, Vilbergen, Enebymo, Haga and Östantill are statistical areas holding the highest amount of elderly. Analysis of age structure however showed a high proportion of elderly in Såpkullen, Vilbergen and Enebymo which makes these districts older compared to other areas. The proportion of elderly in each district can be seen in the following overview graph. The figure simply shows the proportion of elderly people (65+) of the total population in one year (2006). At an average the city of Norrköping has an elderly share of 18.36%. Districts with least this proportion of elderly are Brännestad, Rambodal and Klockaretorpet.
As it is traceable in the following figure, the districts Enebymo, Såpkullen and Villbergen have over 50 percent more elderly than the average of the city. It is conspicuous that in these three districts the elderly seem to concentrate strongly; because all other districts with an above-average percentage of elderly population have a proportion of maximum 30 percent. Furthermore ‘only’ 11 of 29 districts show an over-average proportion (there were 12 districts for the age group 0 – 19 and 15 districts for the age group 20 – 64 showing over-average proportion of the examined age group) which may indicate a concentration of the elderly age group in few districts. On the other hand Berget, Rambodal, Brännestad and Klockaretorpet have more than 50 percent less elderly inhabitants than the whole city.
Figure 59: Differences of the share for the age group 20 - 64 compared to the average of the city of Norrköping (Norrköping city = 0). Relative representation compared with the City average representation. Percentage.
Data source: Statistics Sweden and Norrköping municipality

The figure below gives an idea about the proportion of elderly combined with the proportion of children and youth for each district. There could be a tendency of demographic segregation - at least in some districts of the city- visible. The continuous line representing the proportion of elderly is mostly contrary to the interrupted line representing the inhabitants aged 0 – 19. As extreme examples Brännestad and Klockaretorpet - with a proportion of children and youth more than 35 percent and a proportion of elderly less than ten percent - can be stated.

Figure 60: Picture of the proportion of ‘elderly’ and ‘children and youth’ in the districts of Norrköping city in the year 2006
Data Source: Statistics Sweden and Norrköping municipality
High and very high proportions of elderly can be found to a great extent in districts situated in the south of the city centre (except Enebymo and Haga in the north-west part of the city). As mentioned before the very high proportion of elderly in Vrinnevi can be explained through a long term care centre and no other regular housing in this area. Districts situated not too central and too remote show the highest proportion of elderly population.

![Map of Proportion of Elderly](image)

**Figure 61: Proportion of the elderly of districts**
Data source: Statistics Sweden and Norrköping municipality

**DEVELOPMENT OF THE ELDERLY**

Examining the development of the number of elderly in the different districts it has to be considered that the whole city of Norrköping lost 1047 inhabitants aged over 65 between 1995 and 2006. This corresponds to a decline of this age group of six percent.

Between 1995 and 2006 five districts lost over 20 percent of elderly. These areas are Fiskeby Haga, Berget, Ljura and Klingsberg, located around the city centre and in the north-west part of the city. It is clearly visible that all districts of the second belt around the city centre lost elderly. From districts belonging to the city centre, the first and the second belt around the city centre only Söderstaden and Säpkullen experienced an increase of elderly. On the other hand all districts in the south of the city (eastern and western part) and the remote districts in the north/northeast gained older inhabitants. Another striking feature is the increase of elderly by over 20 percent on the outskirts where a very high proportion of children and youth (0 – 19) was stated (Lindö, Rambodal, Brännestad and Klockaretorpet).
Figure 61: Development of the elderly
Data source: Statistics Sweden and Norrköping municipality
ELDERLY PROPORTION AND DEVELOPMENT

Districts with a very high proportion of elderly located to the south-west of the city centre (Vilbergen and Säpkullen) display increasing numbers of elderly, whereas densely elderly populated districts in the northwest of the city (Enebymo, Haga) experienced a drop in their older population. A striking feature is the increase of an older population in districts with a low and middle proportion of elderly on the outskirts (only Skarpågen has a high proportion of elderly). Exceptions are made by the low and high elderly populated districts in the northwest part of the city (Fiskeby, Enebymo and Pryssgården). All districts of the second belt around the city centre lost elder inhabitants regardless of their density.

Figure 62: Elderly density 2006 and development from 1995 to 2006
Data Source: Statistics Sweden and Norrköping municipality
6.2.2 THE YOUNG AND AGED ELDERLY

Vilbergen, Enebymo and Såpkullen are the three districts with the highest proportion of young elderly (shown in figure 63). The highest proportion of aged elderly can be found in Såpkullen, Klingsberg, Enebymo and Vilbergen. (Note: Vrinnevi with a proportion of 84.1 percent aged elderly is not included in the figure.) Districts with a higher proportion of young elderly tend to have a higher aged elderly proportion as well. Exceptions are Haga and Klingsberg where the two lines – representing the young and aged elderly proportion of each district - in the figure below converge. In Klingsberg the proportion of young elderly is almost as high as the proportion of aged elderly.

Figure 63: Picture of the proportion of ‘young elderly’ and ‘aged elderly’ in the districts of Norrköping city in the year 2006
Data Source: Statistics Sweden and Norrköping municipality
Three of the four most ‘young elderly’ populated districts are situated south-westward of the city centre (Skarphagen, Vilbergen and Såpkullen), the fourth district - Enebymo - is situated in the north-west part of the city. High proportions of young elderly can be found as well in the south-east of the city instead (Hageby, Smedby). Thus young elderly seems to be concentrated in some districts but quite distributed within the city. Districts experiencing a very low proportion of young elderly are situated on the outskirts (Rambodal, Brännestad and Klockaretorpet), yet only Berget is located close to the city centre.

Figure 64: Proportion of the ‘young elderly’ aged between 65 and 79 for all city districts
Data source: Statistics Sweden and Norrköping municipality
Contrary to the ‘young elderly’ group districts with high and very high proportions of ‘aged elderly’ are numerically more, indicating a higher distribution within the city. A concentration of districts with a high proportion of aged elderly can be found around the city centre as well as in the south and the northwest of the city. Vrinnevi with a very high proportion of aged elderly – as stated – can be explained by a long term care centre. Districts at the outskirts just have a low proportion of aged elderly.

To sum up Enebymo, Såpkullen and Vilbergen experience a very high proportion of young and aged elderly which makes these districts especially ‘old’. On the other hand, the three districts Rambodal, Brännstad and Klockaretorpet on the outskirts have a very low proportion of young as well as aged elderly indicating a very “young” age structure in these districts. Districts having very high and very low proportion of young and aged elderly tend to be the same for both age groups.
DEVELOPMENT OF THE YOUNG AND AGED ELDERLY

As stated previously the city of Norrköping lost six percent of elderly in the period from 1995 to 2006. However the development of the number of young and aged elderly proceeded differently. Whereas the number of ‘young elderly’ decreased with 1691 persons, which correspond to a fall of 13.4 percent, the number of ‘aged elderly’ increased constantly. In the year 2006 the city of Norrköping counted 644 more inhabitants aged over 85 compared to the year 1995 (a plus of 13.3 percent).

This differentiated development between the two elderly groups has to be kept in mind by having a closer look to the trend of the young and aged elderly numbers for each district. Between 1995 and 2006 only five districts gained inhabitants aged between 64 and 79. All these districts are located quite remotely in different parts of the city. Numerically 18 of the 29 city districts in Norrköping lost inhabitants of the age group considered. Districts which have numerically lost the most ‘young elderly’ are located southeastward of the city centre and in the north-west part of the city (Enebymo, Haga).

Figure 66: Development of the ‘young elderly’ aged between 65 and 79 from 1995 - 2006
Data source: Statistics Sweden and Norrköping municipality
Examining the development of the ‘aged elderly’ the pattern appears naturally different. 15 of the 29 city districts experienced a rise of the numbers of inhabitants aged over 80 (increase of more than 10 inhabitants). On the other hand only 7 districts lost inhabitants of this age group. The pattern seems to show a process of redistribution and dispersion from some districts close to the centre to more remotely located districts. Exceptions appear for the districts Såpkullen and Nordantill where ‘aged elderly’ numbers rose in spite of the spatial proximity to the city centre. Districts obtaining more than 50 inhabitants aged over 80 in the examined period are distributed across the whole city from locations close to the centre (like Såpkullen) to very remote sites (like Lindö).

Figure 67: Development of the ‘aged elderly’ of age over 80 from 1995 - 2006
Data source: Statistics Sweden and Norrköping municipality
YOUNG AND AGED ELDERLY PROPORTION AND DEVELOPMENT

Except Skarphagen and Vilbergen, both situated in the southwest part of the city, all districts with high and very high proportions of ‘young elderly’ experienced a fall of this age group. Districts gaining inhabitants aged between 65 and 79 have very low (Klockaretorpet, Rambodal), low (Navestad) and medium young elderly proportions (Lindö). Thus districts facing increasing number of young elderly have different densities.

Figure 68: Proportion of young elderly 2006 and development from 1995 to 2006
Data Source: Statistics Sweden and Norrköping municipality
Districts with a very high proportion of aged elderly experienced an increase of this age group. One exception is Klingsberg where aged elderly numbers declined. Districts with middle and high proportions show very differential developments. Berget, located westward of the city centre, is the only district with a low aged elderly proportion and a fall of aged elderly numbers during the examined period from 1995 to 2006. All other districts characterised by very low and low proportion of aged elderly (located on the outskirts – except Lagerlunda) were stable or gained inhabitants aged over 80.

Figure 69: Proportion of aged elderly 2006 and development from 1995 to 2006
Data Source: Statistics Sweden and Norrköping municipality
SUMMARY

A recapitulate overview of the age group structure of each statistical area is given in the figure 70 below.

**Age structure by age groups in the statistical areas of Norrköping**

Figure 70: The age structure of Norrköping’s districts
Data source: Statistics Sweden and Norrköping municipality

As stated in the chapter 1.1. “Focus and research questions” the future labour supply, pensions and public finances were much discussed topics of the 1990s. To show the threat of too many elderly and a small working population to guarantee a well working pay-as-you-go pension system the ‘old age supporters’ ratio’ can be calculated. With this index people of the active or working age are compared with elderly people (population 20 – 64 divided by population 65+ multiplied by 100). In general the smaller the number the worse it would be for a ‘closed’ system. In the city of Norrköping an extreme range of the old age supporters’ ratio from 141 in Såkullen (except 7 in Vrinnevi) to 1842 in Brännestad is detectable.
Especially districts in the south of the city centre show a very low ratio which indicates a bad workers-elderly relation. In the northern part of the city only Enebymo faces a very low old age supporters’ ratio. Rambodal, Brännestad and Klockaretorpet, three districts on the outskirts, as well as Berget, situated close to the city centre, face very high old age supporters ratios (over 600) - a very fortunate workers-elderly relation.

Figure 71: The old age supporters’ ratio of all city districts
Data source: Statistics Sweden and Norrköping municipality
6.2.3 *THE AGE GROUP 55 – 65 – THE NEXT YOUNG ELDERLY*

Today’s inhabitants aged between 55 and 65 will constitute part of the young elderly group of the near future. Statements about the size of this age group will therefore help to predict the amount of people leaving active working life in the next ten years. In the city of Norrköping the number of inhabitant’s aged between 55 and 64 rose by 33 percent during the period from 1995 till 2006. This quite high increase will be reflected in an increase of the age group ‘young elderly’ during the next ten years.

The following figure shows the proportion of people aged 55 - 64 of the total population in the year 2006. Averaged the city of Norrköping has a proportion of 12.72 percent aged between 55 and 64. The highest proportions are to be found in Fiskeby (17.45%), Säpkullen (17.40%), Smedby (17.20%), Kneippen (16.66%) and the Industrial areas (20.24%). This means that in these districts the highest proportion of the working population is going to retire naturally during the next 10 years.

Figure 72: Crude picture of the present proportion of inhabitants aged between 55 and 64 in 2006
Data source: Statistics Sweden and Norrköping municipality

Districts with the least proportion of inhabitants aged between 55 and 64 are Oxelbergen (8.6 percent), Berget (8.9 percent) and Ljura with 9.6 percent.
For many employers as well as those in charge of health, social and pension schemes it is important to know how many from the active working age (20 – 64) will retire in near future. The so called ‘Ageing labour force’ is an index representing exactly this issue. He shows the oldest age segment of active or working age as a proportion of the total group (Population 55 – 64 divided by the population aged between 20 and 64 multiplied by 100). An ageing labour force of 50 implies that 50 percent of the current working population will retire naturally in the coming ten years. Besides Vrinnevi, with its special age structure that has been discussed already in detail, Vilbergen, Såpkullen and Smedby facing proportions of over 29 percent for the age group 55 – 64. In other words in these three districts every third active worker will go into retirement during the next ten years. In a number of districts in the north and southwest of the city 24 to 29 percent of the active workers will retire, which corresponds to every forth up to every third worker. A low and very low ageing labour force can be found around the city centre (except Såpkullen), in the southeast (Navestad, Brännestad and Rambodal) and the southwest part of the city (Klockaretorpet).

Figure 73: Ageing labour force for the districts of the city of Norrköping in percent
Data source: Statistics Sweden and Norrköping municipality
6.3 The population of statistical areas by age – age pyramids

The exact structure of a population can be explored by examining the age pyramids. In this case gender-specific data were missing and only “half age pyramids” generated. Each district has its own population structure which differs considerably between different districts. To achieve age structure types - each with a particular age characteristic - seven main age types were generated and introduced below.

1. YOUNG ADULTS

Districts of this type are characterized by a very high proportion of inhabitants aged between 20 and 29 (5 districts). All other ages show a very low proportion of the whole population.

The population in the five districts Marielund, Gamla Staden, Oxløbergen, Berget and Östantill has such an age structure.

Figure 74: Age pyramid of the age structure type “Young adults”
Data source: Norrköping municipality

2. WORKING POPULATION

Kneippen and the Industrial areas are mainly populated by the working population aged between 20 and 65. Striking is a very high proportion of future pensioners (inhabitants aged between 55 and 64). The proportion of children (age 0 – 19) and elderly aged over 65 is relatively low.

Figure 75: Age pyramid of the age structure type “Working population”
Data source: Norrköping municipality
3. YOUNG ADULTS AND AGED OVER 55 (55+)

The dominant proportion of inhabitants in these districts are young adults aged 20 to 29 (in some cases up to an age of 34). In addition high proportions of persons aged between 55 and 64 are visible. Furthermore young and old elderly contribute to a high number of inhabitants aged over 65 in these districts.

Districts of this age type are: Nordantill, Haga; Klingsberg, Söderstaden

Figure 76: Age pyramid of the age structure type “Young adults and 55+”
Data source: Norrköping municipality

4. YOUNGER FAMILIES

The age type ‘Younger families’ is characterised by a very high proportion of young children (age 0 – 9 - corresponding parents aged approximately 30 – 39) and older children (age 10 – 19 – corresponding parents aged approximately 40 – 49). However, the proportion of young adults aged between 20 and 29 is relatively low and the proportion of elderly is very low.

Fiskeby, Brännestad, Navestad, Klockaretorpet and Rambodal are districts of the ‘Younger families’ age structure type.

Figure 77: Age pyramid of the age structure type “Younger families”
Data source: Norrköping municipality
5. OLDER FAMILIES

Districts of this type show a lower proportion of young families (children aged 0 – 9 and parents aged 30 – 39) and higher proportion of older families (children aged 10 – 19 and parents aged 40 – 49). In addition high proportions of inhabitants aged between 55 and 64 as well as young elderly are detectable. The half-age pyramid shows a great break-in for the inhabitants aged between 20 and 29 (sometimes also till an age of 34).

Figure 78: Age pyramid of the age structure type “Older families”
Data source: Norrköping municipality

Districts of this age structure type are: Lindö, Smedby, Lagerlunda, Pryssgården, Skarphagen and Herstadsberg

6. ALL AGES (BELL DISTRICTS)

An almost equal proportion of all age groups up to high age characterizes the age structure type of ‘All ages’! Due to the high proportion of elderly in the whole population of this district the form of the age pyramid (bell) signalises the process of an ageing population.

The ‘All ages’ age structure type can also be called ‘Bell district type’ because the age pyramid looks like a bell.

Districts of this type are: Ektorp, Ljura and Hageby

Figure 79: Age pyramid of the age structure type “All ages”
Data source: Norrköping municipality
7. ELDERLY (URN DISTRICTS)

An age pyramid looking like an urn is the typical form of an aged population. A really high proportion of young and old elderly and successive decreasing proportion of younger age groups contribute to a gradual ageing of the population of this district.

Såpkullen, Vilbergen, Enebymo and Vrinnevi are districts of this age structure type.

Figure 80: Age pyramid of the age structure type “Elderly”
Data source: Norrköping municipality

The following table 11 gives an overview of the belonging of each district to a specific age structure type. Numerically most districts belong to the age structure type of ‘Older families’ (6 districts), ‘Young adults’ (5 districts) and ‘Younger families’ (5 districts). 11 out of 29 districts are stated to have a high to very high proportion of elderly (age structure types of ‘Elderly’, ‘All ages’ and ‘Young adults & 55+’).

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<tr>
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<tbody>
<tr>
<td>112 Marielund</td>
<td>411 Kneippen</td>
<td>111 Nordantill</td>
<td>124 Fiskeby</td>
</tr>
<tr>
<td>211 Gamla staden</td>
<td>888 Industrial areas</td>
<td>121 Haga</td>
<td>315 Brännestad</td>
</tr>
<tr>
<td>213 Oxelbergen</td>
<td></td>
<td>303 Söderstaden</td>
<td>321 Navenstad</td>
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<td>301 Berget</td>
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<td>304 Klingsberg</td>
<td>412 Klockaretorp</td>
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<tr>
<td>212 Östantill</td>
<td></td>
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<td>314 Rambodal</td>
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<table>
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<tr>
<th>5. Older families</th>
<th>6. All ages</th>
<th>7. Elderly</th>
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<tbody>
<tr>
<td>219 Lindö</td>
<td>421 Ektorp</td>
<td>302 Såpkullen</td>
</tr>
<tr>
<td>312 Smedby</td>
<td>305 Ljura</td>
<td>422 Vilbergen</td>
</tr>
<tr>
<td>113 Lagerlund</td>
<td>311 Hageby</td>
<td>122 Enebymo</td>
</tr>
<tr>
<td>123 Pryssgården</td>
<td></td>
<td>424 Vrinnevi</td>
</tr>
<tr>
<td>423 Skarphagen</td>
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</tr>
<tr>
<td>119 Herstadsberg</td>
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</tbody>
</table>

Table 12: Districts of the city of Norrköping and their age structure type
Data source: Statistics Sweden and Norrköping municipality; own representation
Figure 81 below shows the distribution of these seven age structure types in a map. Districts of the age structure type ‘Younger families’ and ‘Older families’ are located on the outskirts (except Lagerlunda). Thereby are the districts of ‘Younger families’ even more remotely located. The city centre (Gamla staden) and districts around are characterized by the age structure types ‘Young adults’ and ‘Young adults & 55+'. Districts of the types ‘All ages’ and ‘Working population’ are situated between the centre and the outskirts. The ‘Elderly’- districts are distributed within the west part of the city.

Figure 81: Age structure types

Data source: Statistics Sweden and Norrköping municipality
6.4 Living preferences of age groups

CHILDREN AND YOUTH – age 0 – 19:
Children and young adults from an age of zero to twenty tend to live in more remote areas of the city. Districts with the highest number of inhabitants from this category are Hageby and Klockaretorpet where almost 20 percent of all children and youth live. The five districts Hageby, Klockaretorpet, Lindö, Navestad and Ektorp accommodate almost 40 percent of all children and youth.

YOUNG ADULTS/ STUDENTS/ FAMILY FOUNDER - age 20 – 29:
Over 40 percent of the inhabitants belonging to this group live in the five districts Östantill, Nordantill, Gamla staden, Haga and Hageby. All these areas are situated relatively central in and around the centre of Norrköping. Furthermore two thirds (67.57%) live in the 10 by this age group mostly inhabited districts. This indicates quite a strong concentration on some districts which are situated close to the centre. With increasing distance to the city centre fewer persons of this age group will be found.

ADULTS – aged 30 – 64:
The age group adults live more dispersed. Although one third (31.59%) of the persons of this age group live in the five districts Hageby, Östantill; Lindö, Nordantill and Klockaretorpet, a focus on a specific region within the city cannot be found. The five districts which accommodate most adults are situated both close to the centre of the city (Östantill and Nordantill) and more outside (Lindö and Klockaretorpet). Expectedly a high congruence with the preferred living areas of children and youth are visible.

ELDERLY – aged over 65 (65+)
The older population of Norrköping tends to live around the city centre (Östantill and Nordantill) as well as in areas not too much outside, but also not too central (like Hageby, Vilbergen and Enebymo). 40 percent of all elderly persons live in these five districts. Almost two third of this age group lives in ten districts, which indicates a preference for some city areas.
Figure 82: Living preferences by the age groups 0 – 19; 20 – 29; 30 – 64 and 65+
Data source: Statistics Sweden and Norrköping municipality; own representation

YOUNG ELDERLY – aged 65 – 79:
Person of this age group tend to live in areas that are situated not too close to the city centre but also not too remote (Hageby, Vilbergen, Enebymo). Furthermore districts situated around the centre are favoured living areas (Nordantill, Östantill). Almost 40 percent of the young elderly live in these five districts. In addition, two thirds are accommodated in ten districts which suggest a visible concentration of this age group.
AGED ELDERLY – aged over 80 (80+):
Favoured living areas of this age group are Enebymo, Haga, Vilbergen, Hageby and Östantill, that accommodate 43 percent of persons aged over 80. All theses districts, except Östantill which is situated directly eastward the centre of Norrköping, are located outside the city centre but not totally distant. Beside these districts, areas situated around and especially in the south of the city centre (Söderstaden, Klingsberg, Såpkullen and Ektorp) are favoured living areas of the aged elderly.

Figure 83: Living preferences by the age groups 20 – 64; 65+; 65 – 79 and 80+
Data source: Statistics Sweden and Norrköping municipality; own representation
7 THE SOCIAL SITUATION AND DISTRICT TYPOLOGY IN NORRKÖPING

7.1 The social structure of Norrköping’s population

In this chapter the social characteristics of the districts population is going to be explored. Examined features are the education level, income, unemployment and families. The chapter ends with the generation of ‘social structure types’ that describes the districts of the city of Norrköping socially.

7.1.1 Education

a) Education level of the population aged 20 - 64

The following graph gives an overview of all districts and the share of degrees featured by their inhabitants in the year 2006.

![Image showing the education level of Norrköping's population aged 20-64 after districts.](image)

Figure 84: Education level of Norrköping’s population aged 20-64 after districts
Data source: Statistics Sweden and Norrköping municipality

All three kinds of degrees can be found in every district, but the share of the particular degree varies considerably between the districts of the city. To evaluate the education level of a district the share of post- secondary degrees (university or equivalent) was taken and is shown in the image below. Hence districts with the highest education level - means inhabited with the highest number of people with post- secondary degrees - are Gamla staden, Lindö, Berget, Kneippen and the Industrial areas. In these districts over 40 percent of the inhabitants have a post- secondary degree. On the opposite side the districts Hageby, Navestad and Vilbergen have the lowest education level with fewer than 21 percent of the population holding a post- secondary degree.

All areas with inhabitants with a very high education level are situated along the river “Motala ström”. Furthermore districts situated in the south of the city centre (Söderstaden and Klingsberg) seem to attract highly educated people. Districts where inhabitants have lower levels of education are mainly situated in the south-, southeast and northwest of the city.
b) Education level of the population aged over 65

Districts with the most educated elderly are Lindö, Kneippen, Gamla staden, Söderstaden and Nordantill. These areas show a post-secondary degree proportion of over 19 percent. As mentioned before, the general level of post-secondary degrees is considerable lower compared to today’s the education level.

Figure 86: Proportion of elderly with post-secondary degrees in districts
Data source: Statistics Sweden and Norrköping municipality

Districts with a high and very high education level of elderly (black and dark grey shaded areas) are concentrated in and around the city centre as well as along the ‘Motala ström’ (Lindö, Gamla staden, Nordantill, Söderstaden, Berget and Kneippen). The education level seems to decrease with increasing distance to the city centre. Areas of very low education levels are to be found in the southeast of the city (besides the industrial areas in the northern part of the city).
A correlation analysis showed a strong correlation ($R = 0.875$) between the proportion of post-secondary degrees from the population aged 20 – 64 and the population aged over 65. This indicated that elderly tend to live in areas with equal education levels of the age group 20 – 64.

Figure 88: Correlation of the proportion of post-secondary degrees held by the age group 20 – 64 and 65+
Data source: Statistics Sweden and Norrköping municipality
7.1.2 Income

Even if the differences of the income level between the city and rural region is not so remarkable, differences between districts within the city are partly striking. Comparing the real income of all inhabitants of a district, values range from SEK 78400 in Hageby to SEK 227700 in Lindö. Outstanding is the high level of income of all inhabitants in Lindö, Brännestad and Rambodal, where inhabitants have a 40 to 60 percent higher income than the average level of the city with 142.820 thousand kronor. The five districts with the highest average income are Lindö, Brännestad, Rambodal, Smedby and Kneippen.

In contrast districts with the lowest income of all inhabitants are Hageby, Vilbergen, Navestad, Ljura and Såpkullen with an average income of fewer than SEK 120000 per year. Inhabitants of these districts have on average more than 20 percent less income per year than the average of the city. Around 45 percent less has the population of Hageby compared to the average of the city.

![Income of all inhabitants aged over 20](image)

Figure 89: Income of all inhabitants aged over 20
Data source: Statistics Sweden and Norrköping municipality

Values of the category ‘average income of those with an income’ range from SEK 156900 earned on average in Hageby to SEK 297000 in Lindö. That means that persons living in Lindö earn on the average twice as much as inhabitants of Hagby. This confirms a correlation analysis between the income of all inhabitants and the income of those with income. With a correlation coefficient R of 0.886 a strong positive relation between these two categories of income can be assumed here. This means that in districts with a lower income level of all inhabitants even people with work earn less compared to people living in districts with higher income level of all inhabitants.
Figure 90: Correlation of income of all inhabitants and average income of those with regular income
Data source: Statistics Sweden and Norrköping municipality

Furthermore a high positive correlation coefficient R of 0.837 proves that the income of all inhabitants is depending on the proportion of population with income. The more inhabitants have regular work the more income can be reached within a district which is logical and self-explanatory.

The following graph gives a rough overview of the two income categories and their level in the districts of Norrköping city. The extent of the difference between the category ’income of all inhabitants of a district’ and the category ’income of those with regular income’ varies from one district to another.

Figure 91: Overview about the level of the two income categories in each district of the city
Data source: Statistics Sweden and Norrköping municipality
A correlation analysis showed that the extent of the difference between the two types of income may depend \((R = -0.855)\) on the proportion of working population (and therefore persons with a regular income). The higher the difference of the two income categories, the less is the share of population with income. In other words the more people work (higher share of population with income) the higher will be the income (correlation above) and the lower will be the difference between the two income categories, which is quite logical.

![Figure 92: Correlation of the proportion of population with income and Difference between the two income- categories](image)

Data source: Statistics Sweden and Norrköping municipality

This can also be seen in the following maps. Districts of higher income correspond to areas of higher shares of population with income and the other way around. Areas with very high income levels can be found on the outskirts. Especially Lindö, Bånnestad and Rambodal, situated in the east of the city, are districts with very high income with more than 175 thousand SEK per year. Areas with low and very low income levels (dark grey and black shaded areas) can be found around the city centre (Oxelbergen, Klingsberg, Berget or Nordantill) and in the south of the city (Navestad, Hageby).
Figure 93: Mean income of the total population aged above 20 (upper figure) and proportion of population with income (lower figure)
Data source: Statistics Sweden and Norrköping municipality
7.1.3 Unemployment

The unemployment ratio varies considerably among the districts starting with 2 percent in Brännestad and ending with 12 percent in Hageby. The unemployment situation seems to be problematic in Hageby, Navestad, Ljura and Marielund where the unemployment ratio is more than 40 percent higher than the average value from the city with 5.93 percent (see figure 94). On the other hand districts like Brännestad, Lindö, Smedby, Fiskeby and Pryssgården show unemployment ratios which are over 40 percent lower than the average of the city.

Figure 94: Comparison of unemployment ratio in districts with the average of the city with 5.93 percent
Data source: Statistics Sweden and Norrköping municipality

A correlation can be found between the unemployment ratio and the total number of persons living in a district. With a correlation coefficient R of 0.627 districts with higher numbers of inhabitants tend to have higher unemployment ratios as well. However, this relation should not be overrated without having a look at other variables.

Districts with the highest unemployment ratio are situated in the southeast of the city westward of the A-road ‘E22’. Districts of the first and second belt around the city centre, like Östantill, Oxelbergen and Berget, also show quite high unemployment ratios. However they are quite distributed within the city. Areas with the lowest unemployment ratios can be found on the east and west outskirts (except Klockaretorpet) of the city.
7.1.4 Family

The following graph gives an overview of the share of families with children living at home and the share of singles with children living at home for each district.

Figure 96: Share of families and share of singles with home living children in the districts of the city
Data source: Statistics Sweden and Norrköping municipality
Districts with the highest shares of families are Rambodal (55.9%), Brännestad (55.8%), Klockaretorpet (54.8%) and Lindö (47.6%) with a share of more than 45 percent. Areas with very few families are the industrial areas (9.4%); Söderstaden (12.5%) and Klingsberg (13.8%) with a family share less than 14 percent. ‘Singles with children living at home’ live in Oxelbergen (50.9%) and Ljura with a share of 50.7 percent. Districts with a very low share of singles are Brännestad (10.5%), Smedby (11.3%), Lagerlunda and Fiskeby each with a share of 14 percent. The correlation of the family variable and the single variable shows a correlation coefficient $R$ of -0.655. This means that singles with children living at home seem to live in other areas than families with children living at home. Even if the correlation coefficient is not so high, it can be explained by the different household size and availability of adequate housing. These differences in living areas can be seen clearly in the following maps.

![Maps showing family and single share in Norrköping city](image)

Figure 97: Family and single share in the different districts of the city, 2004
Data source: Statistics Sweden and Norrköping municipality
It is clearly visible that districts situated at the periphery of the city, independent of the direction (except the industrial areas in the north of the city), feature a high share of families with children living at home. The whole city centre and areas around are characterized by a very low share of families. A high share of singles with children living at home can be found in districts around the city centre (Oxelbergen, Ljura and Ektorp). In general, the whole area around Gamla staden and in addition Hageby, Vilbergen and Haga display high shares of singles with children living at home.

7.1.5 The social structure types

Social structure types were identified by combining the three variables of share of post-secondary degree (education), average income of all persons of a district and the unemployment ratio of the districts. Before the relation between these variables were examined.

![Correlation of the three variables post secondary degree, mean income of all, unemployment ratio– overview](image)

Data source: Statistics Sweden and Norrköping municipality

It seems that the education level does not have a great impact on neither the income nor the unemployment level of the districts. Nevertheless, correlation coefficients of 0.478 (post-secondary degree – average income) and -0.502 (post-secondary degree – unemployment ratio) indicate an evidence for a (frail) relation. Between the income level and the unemployment ratio exist with a coefficient R of -0.829 a strong negative correlation. Districts with a high income have lower unemployment ratios which is
logical. The following graph shows each district and their values from the post-secondary degrees proportion, unemployment ratio and income level (size of circles). In addition the threshold for the classes of the variables has been made visible. Based on this classification the social structure types were generated. Districts with higher income levels can only be found with low unemployment ratios. The post-secondary degree proportion doesn’t play such an important role for districts of highest income (biggest circles – shares of 30 and around 45). The city of Norrköping has no districts with a very low education level and unemployment ratio as well as no districts with a very high unemployment ratio but middle or high education level (share of post-high secondary degrees).

![Graph showing proportion of post-secondary degrees, unemployment ratio, and income level](image)

Figure 99: Arrangement of proportion of post-secondary degrees, Unemployment ratio and Income level

Data source: Statistics Sweden and Norrköping municipality

The social groups are numbered from one to eight with one being the lowest social level and eight being the highest. It has to be stated clearly here that the ascending numbering DOES NOT represent an absolute ranking! There is a trend of improved values for all three variables with ascending numbering, but the order does not necessarily present higher social status. This results from the fact that it is risky to argue that a school degree and a lower unemployment rate will definitely lead to higher income or higher social status of a district (missing of positive correlations). The following table provides an overview of the characteristic of each social structure type.
### Table 13: Overview of the eight ‘social structure types’
Data source: Statistics Sweden and Norrköping municipality

Each district was assigned to one social class as is shown in the following overview table.

<table>
<thead>
<tr>
<th>social structure type</th>
<th>Education</th>
<th>Income</th>
<th>Unemployment</th>
<th>Code Education</th>
<th>Unemployment</th>
<th>Income</th>
<th>number of districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>113</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>low</td>
<td>low or middle</td>
<td>middle</td>
<td>112 / 122</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>low</td>
<td>middle</td>
<td>low</td>
<td>121</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>middle</td>
<td>low to middle</td>
<td>middle</td>
<td>212 / 222</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>middle</td>
<td>low to middle</td>
<td>low</td>
<td>211 / 221</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>high</td>
<td>low to middle</td>
<td>middle</td>
<td>312 / 322</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>middle</td>
<td>high</td>
<td>low</td>
<td>231</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>high</td>
<td>middle to high</td>
<td>low</td>
<td>321 / 331</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 14: Classification of districts into social structure types
Data source: Statistics Sweden and Norrköping municipality
 Whereas the social structure type 3 can only be found in the northwest part of the city, the type 1 is only located in the southeast of the city to the west of the major road E22. Striking is the concentration of the two types 4 and 6 in and around the city centre. Type 2 and 5 are both very distributed within the whole city. The social structure types 7 and 8 are to be found on the outskirts. One exception is Kneippen which can be explained by the very good location along the ‘Motala ström’ and the proximity to a park.

Figure 100: Norrköping city – social structure types
Data source: Statistics Sweden and Norrköping municipality
7.2 District typology

The district typology was achieved by combining the seven age structure types (described in chapter 5.1) and the eight social structure types (described in chapter 5.2). The age structure types were derived from the half age pyramids of each district of the city of Norrköping and therefore represent the age- composition of each district. The seven obtained age structure types were: 1. Young adults; 2. Working population; 3. Young adults and aged over 55 (55+); 4. Younger families; 5. Older families; 6. All ages and 7. Elderly. The social structure types were created from the combination of the three factors ‘education’, ‘income’ and ‘unemployment’ and hence represent the social characteristics of the population of each district. An overview of the eight obtained social structure types is given again below:

<table>
<thead>
<tr>
<th>social structure type</th>
<th>Education</th>
<th>Income</th>
<th>Unemployment</th>
<th>Code Education</th>
<th>Unemployment</th>
<th>Income</th>
<th>number of districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>113</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>low</td>
<td>low or middle</td>
<td>middle</td>
<td>112 / 122</td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>low</td>
<td>middle</td>
<td>low</td>
<td>121</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>middle</td>
<td>low to middle</td>
<td>middle</td>
<td>212 / 222</td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>middle</td>
<td>low to middle</td>
<td>low</td>
<td>211 / 221</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>high</td>
<td>low to middle</td>
<td>middle</td>
<td>312 / 322</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>middle</td>
<td>high</td>
<td>low</td>
<td>231</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>high</td>
<td>middle to high</td>
<td>low</td>
<td>321 / 331</td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Table 15: Social structure types – overview table
Data source: Statistics Sweden and Norrköping municipality; own representation

With the combination of the demographic and social aspects of the district’s population it is possible to see the social characteristic districts with certain dominant age groups have. The assignment of each district to the social and age structure type is given below in table 16.

In general districts of the city of Norrköping face a relatively big differentiation in the social as well as the age structure of their inhabitants. It is visible that all age structure types, except younger and older families, have a similar social environment. Quite striking is the cluster of the age structure types ‘All ages’ and ‘Elderly’ in the lower level (small numbers) of social type. In contrast districts belonging to the ‘Working population’ are a part of the social type 8 with high education and income and low unemployment.
Districts of the age structure type ‘Younger families’ vary from social structure type one to seven and districts belonging to the age structure type ‘Older families’ vary from social structure type two to eight. The family districts are therefore socially very heterogeneous. In these two age-structure categories a substantial difference of the social level is visible. Therefore the following section will take a look at the spatial distribution of the districts which may explain the social differences.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Navestad</td>
<td>Haga</td>
<td>Klockaretorpet</td>
<td>Lagerlunda</td>
<td>Ektorp</td>
<td>Ljura</td>
<td>Vilbergen</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Haga</td>
<td>Klockaretorpet</td>
<td>Lagerlunda</td>
<td>Ektorp</td>
<td>Ljura</td>
<td>Vilbergen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fiskeby</td>
<td>Herstadsberg</td>
<td>Ekebo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Marielund</td>
<td>Öxelbergen</td>
<td>Söderstaden</td>
<td>Klingsberg</td>
<td>Smedby</td>
<td>Pryssgården</td>
<td>Skarphagen</td>
<td>Såpkullen</td>
</tr>
<tr>
<td>5</td>
<td>Östantill</td>
<td>Nordantill</td>
<td>Söderstaden</td>
<td>Klingsberg</td>
<td>Smedby</td>
<td>Pryssgården</td>
<td>Skarphagen</td>
<td>Såpkullen</td>
</tr>
<tr>
<td>6</td>
<td>Gamla staden</td>
<td>Berget</td>
<td>Brännestad</td>
<td>Rambodal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>Brännestad</td>
<td>Rambodal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Kneippen</td>
<td>Industrial areas</td>
<td></td>
<td></td>
<td>Lindö</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 16: District typology by age- and social structure types
Data Source: Statistics Sweden and Norrköping municipality; own representation

Looking at the following table it is conspicuous that all family districts (except Lagerlunda) – younger families as well as older families – regardless of the social level are located on the outskirts. From a geographic point of view they thus have the ‘same location’, which may strongly reflect the type of housing available on the outskirts (single/double family housing mostly with garden). Another distinctive feature is the districts of the age structure type ‘All ages’ that are socially very homogeneous and all situated south of the city centre. The ‘Elderly’-districts, which are socially more heterogeneous, are located in the west part of the city at different places. It can be carefully assumed that elderly districts located closer to the city (here Såpkullen) centre have a higher social level. However, the explanation for this has to be left open. The age structure type ‘Young adults’ have a social level of 4 or 6 indicating a middle or high education level, middle unemployment level and low up to middle income level.
This combination and the central location of all districts (first circle around Gamla Staden and Oxelbergen/Marielund with housing only close to the first circle) is a strong indices that students and persons that have completed university and are seeking for a job or starting to work live in these areas. One crucial factor for the explained distribution of age and social structure types within the city of Norrköping is the structure of buildings, which may explain much of these patterns.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Navestad</td>
<td>Hageby</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Haga</td>
<td>Klockaretorpet</td>
<td>Lagerlunda</td>
<td></td>
<td>Ektorp</td>
<td>Vilbergen</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fiskeby</td>
<td>Herstadsberg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enebymo</td>
</tr>
<tr>
<td>4</td>
<td>Östantill</td>
<td>Marielund Oxelbergen</td>
<td>Klingsberg</td>
<td></td>
<td>Nordantill</td>
<td>Söderstaden</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Smedby Pryssgården</td>
<td></td>
<td>Skarphagen</td>
<td></td>
<td>Såpkullen</td>
</tr>
<tr>
<td>6</td>
<td>Gamla staden</td>
<td>Berget</td>
<td></td>
<td></td>
<td>Brännestad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Kneippen</td>
<td>Industrial areas</td>
<td></td>
<td></td>
<td>Rambodal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lindö</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Locations:  
- **Blue**: in and around the city centre  
- **Orange**: on the outskirts

Table 17: District typology with location within the city  
Data Source: Statistics Sweden and Norrköping municipality; own representation
8 THE CRIME SITUATION IN NORRKÖPING

8.1 Preliminary global statistical tests

In this study four preliminary global statistical tests were applied to the Norrköping crime data: Mean centre (MC) determination, Calculation of Standard deviation distance (SDD), Standard deviation ellipses (SDE) and the calculation of the nearest Neighbour index (NNI) as a test for clustering.

The MC analysis showed that different crime types tend to occur at different locations. The mean centre point of the category ‘all real crime’ can be found in the north eastern part of the district Berget close to Gamla staden and Nordantill directly in the centre of the city of Norrköping. Whereas homicide and traffic crimes showed a greater tendency to occur in the northern part of the city (mean centre in Nordantill), the offences of fraud and rape tend to occur more in the south of the city (mean centres in Såpkullen and Söderstaden) compared to the all crime mean centre (quod vide figure 101 below).

![Figure 101: Mean centre of different crime types in the city of Norrköping](image)

Data source: County police in Östergötland

The measurement of the standard deviation distance and standard deviation ellipses were used to explain the level and alignment of dispersion of the crime incidents (Chainey 2005). The category of all crime with an SDD of 1909 metres shows together with Traffic crimes (1986 metres), Sexual incidents (1941metres) and theft incidents (1928 metres) large standard deviation distances, indicating that crimes of these categories are more dispersed in the area of interest. In contrast homicide incidents with an SDD of 767 metres tend to occur more concentrated. The following table gives an overview of these values.
Table 18: Standard deviation distance and standard distances of ellipses for all crime types
Data source: County police in Östergötland

<table>
<thead>
<tr>
<th>Crime type</th>
<th>Mean standard distance in meter</th>
<th>X Standard Distance</th>
<th>Y Standard Distance</th>
<th>Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All real crime</td>
<td>1909.45</td>
<td>2256.33</td>
<td>1483.57</td>
<td>140.48</td>
</tr>
<tr>
<td>Assault</td>
<td>1717.38</td>
<td>2052.22</td>
<td>1298.92</td>
<td>139.97</td>
</tr>
<tr>
<td>Drugs</td>
<td>1604.9</td>
<td>2039.43</td>
<td>996.05</td>
<td>146.48</td>
</tr>
<tr>
<td>Fraud</td>
<td>1845.5</td>
<td>1966.99</td>
<td>1715.43</td>
<td>168.93</td>
</tr>
<tr>
<td>Homicide</td>
<td>767.18</td>
<td>924.41</td>
<td>567.98</td>
<td>139.67</td>
</tr>
<tr>
<td>Rape</td>
<td>1779.89</td>
<td>2091.46</td>
<td>1400.63</td>
<td>123.37</td>
</tr>
<tr>
<td>Robbery</td>
<td>1543.41</td>
<td>1758.08</td>
<td>1293.59</td>
<td>129.83</td>
</tr>
<tr>
<td>Sexual Incidents</td>
<td>1941.74</td>
<td>2555.82</td>
<td>1004.22</td>
<td>138.28</td>
</tr>
<tr>
<td>Theft</td>
<td>1928.91</td>
<td>2286.33</td>
<td>1487.98</td>
<td>141.59</td>
</tr>
<tr>
<td>Traffic Crime</td>
<td>1986.4</td>
<td>2355.07</td>
<td>1531.39</td>
<td>137.34</td>
</tr>
</tbody>
</table>

The analysis of the Standard deviation ellipses showed a crime orientation from northwest to southeast for all categories, excluding fraud with a circular formed ellipsis (see figure 102 above). This indicates a greater dispersion of fraud crime in the western part of the city compared to all other categories.
By comparing the actual crime distribution against a data set of the same sample size but with a random distribution the Nearest-Neighbour Index or ratio can be calculated (Chainey 2005) indicating an evidence of clustering in the crime data set if the result is smaller than 1. By doing so the category of all real crime shows with a NNI of 0.06 very strong evidences of clustering and therefore crime hot spots in the dataset (see also table 19). Furthermore, the incidents of drugs seem to cluster to a large extent (NNI = 0.08) and sexual incidents still show evidence of clustering (NNI=0.35) though weaker.

<table>
<thead>
<tr>
<th>Crime type</th>
<th>Observed Mean Distance</th>
<th>Expected Mean Distance</th>
<th>Nearest Neighbor Ratio &quot;NNI&quot;</th>
<th>Z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real crime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norrköping city</td>
<td>1.96</td>
<td>28.51</td>
<td>0.06</td>
<td>-238.41</td>
</tr>
<tr>
<td>Assault</td>
<td>17.42</td>
<td>108.64</td>
<td>0.16</td>
<td>-56.4</td>
</tr>
<tr>
<td>Drugs</td>
<td>8.03</td>
<td>92.94</td>
<td>0.08</td>
<td>-71.74</td>
</tr>
<tr>
<td>Fraud</td>
<td>19.39</td>
<td>136.85</td>
<td>0.14</td>
<td>-45.77</td>
</tr>
<tr>
<td>Homicide</td>
<td>349.2</td>
<td>1557.43</td>
<td>0.23</td>
<td>-3.64</td>
</tr>
<tr>
<td>Rape</td>
<td>193.95</td>
<td>588.65</td>
<td>0.33</td>
<td>-8.31</td>
</tr>
<tr>
<td>Robbery</td>
<td>95.23</td>
<td>349.71</td>
<td>0.27</td>
<td>-15.19</td>
</tr>
<tr>
<td>Sexual incidents</td>
<td>118.24</td>
<td>333.31</td>
<td>0.35</td>
<td>-14.13</td>
</tr>
<tr>
<td>Theft</td>
<td>5.55</td>
<td>45.1</td>
<td>0.12</td>
<td>-141.92</td>
</tr>
<tr>
<td>Traffic crime</td>
<td>8.31</td>
<td>74.95</td>
<td>0.11</td>
<td>-86.58</td>
</tr>
</tbody>
</table>

Table 19: Nearest Neighbour Index for crime subtypes
Data source: County police in Östergötland

The results of the preliminary global statistic tests should be seen as evidences of the presence of crime hot spots. To further investigate the differences between the crime categories as shown above would be very interesting but is going beyond the topic of this paper. However, there exist strong evidences for a clustering and therefore hot spots of crime in the category ‘all real crime’. Based on this result choropleth mapping and interpolation techniques were used to identify areas of high crime – crime hot spots.

8.2 Choropleth mapping

Choropleth maps reveal areas of equal crime level throughout the whole area with an abrupt change to the crime level at the borders (Eck 2005).

The figures 103 and 104 show the crime incidences counted per statistical area for two different scales, nyckelkod 3 (city districts) and nyckelkod 6 (blocks).
First crime hot spots were identified by simply counting all real crime incidences per district or statistical area at the different scales. In scale of district (nyckelkod 3) areas of highest crime are Gamla staden, Hageby, and the Industrial areas. Areas of high and very high crime can be found in and around the city centre as well as in the south of it (Hageby). Districts of very low crime are situated on the outskirt. Exceptions are Såpkullen and Lagerlunda located close to the city centre.

Figure 103: Real crime incidents counted per statistical area – nyckelkod 3
Data source: County police in Östergötland

By reducing the size of statistical areas to nyckelkod 6 a quite different situation within the districts is visible (see figure 104). Mainly 6 crime hot spots can be identified, two being in the direct centre of the city (north and south part of Gamla staden), one at the north end of the city and two more south-eastwards. All these 5 crime hot spots form together a northwest to southeast orientation of the high crime occurrence. An eye-catching last hot spot can be found in the southwest part of the city (west part of Vilbergen). This concentration of high crime is surrounded only by very low crime areas indicating something special in this particular area.
As is visible in the figures all statistical areas hold different shapes and sizes. This can mislead the observer because large areas draw more attention than smaller areas (here for example the industrial areas – with the big area in the northeast part of the city). Misinterpretations of crime hot spots can be one outcome (Chainey 2005). To overcome such misinterpretations crime per square kilometre was calculated. At the scale of nyckelkod 3 (figure 105), crime is very low in remote districts (industrial areas, Skarphagen, Brännestad) whereas crime levels increase continuously towards the city centre with Gamla staden having the highest crime ratio.
At a scale of nyckelkod 6 (block level) represented in figure 106 a greater area in the centre of the city is characterized by high crime levels. Some single-area crime hot spots can be found as well in the southwest, south and north part of the city.

Figure 106: Real crime incidents per square kilometre – nyckelkod 6
Data source: County police in Östergötland

So far no underlying population distribution has been considered. To consider possible underlying causes of crime is of particular importance, as an example crime will occur more frequently where you have a larger population and residential burglary crime hot spots will simply represent high housing density (Chainey 2005). To take this into account crime hot spots were identified below by presenting the crime rate per inhabitant. Relating the crime to the target group of this report – the elderly or the population aged over 65 – the ‘crime per elderly’ does not seem to be a meaningful ratio. This simply results from the fact that crime analysed in this study was not necessarily targeted at elderly. Examining figure 107, representing the ratio of crimes per person at a level of nyckelkod 3, crime seems to concentrate in and around the city centre. Specially striking is the large amount of crime incidents per person in the industrial area. Very low crime per inhabitant ratios can be found on the outskirts.
Reducing the level to nyckelkod 5 (figure 108) several crime hot spots seem to exist in different parts of the city. Noticeable are some in and around the city centre, one in the northwest and southeast part of the city respectively and two in the northeast. Here the different sizes of the areas may have a major effect on the crime hot spot result. To overcome this disadvantage of choropleth maps an interpolation of crime data was carried out.

Figure 107: Real crime incidents per inhabitant – nyckelkod 3
Data source: County police in Östergötland

Figure 108: Real crime incidents per inhabitant – nyckelkod 5
Data source: County police in Östergötland
8.3 Interpolation

The approach of summarizing crime within administrative or statistical boundaries helped to get an overall view of the crime situation within the city. But crime hot spots can be distorted or even overlooked because crime is not following statistical borders. High concentration of crime can be ‘divided’ by a statistical border of two areas and therefore maybe never recognized. Therefore the Kernel density estimation was used to create a continuous smooth surface of crime occurrence. Interpolation maps imply that a centre of high- crime activity exists and that criminal activity tapers off gradually from that centre. It directs police attention to the centre and its surroundings (Eck 2005).

As it is visible in figure 109 below, lower crime exists at the borders of the city of Norrköping and increases towards the centre being highest directly in the centre. Striking are as well the 3 local crime hot spots: one in the south, one to the southeast and one in the north in the industrial area.

![Figure 109: Norrköping city – Kernel density estimation of real crime incidents](image)

Data source: County police in Östergötland

It is known that elderly are most afraid of robberies and fraud (Jönson 2003). Figure110 below presents the interpolation of robbery in the city of Norrköping. A larger area with many robberies can be found in the city centre (Gamla staden) as well as around the centre. Smaller robbery hot spots are located south- eastward of the city centre (especially Hageby), in Enebymo in the northwest of the city and Klockaretorpet in the southwest.
Observing the kernel density estimation of fraud incidents two obvious hot spots, one situated directly in the city centre and the other situated in the southwest part of the city, are visible. Other fraud incidences are scattered across the whole city which makes the two large fraud hot spots outstanding.
### 8.4 Crime level and residential areas of old people

The following figure 112 shows areas of high crime and the corresponding proportion of elderly living in this area. Hageby, Nordantill and Gamla staden are identified as districts with a high or middle proportion of elderly and a high crime level. It could be said that elderly living in these areas are most exposed to crime and therefore more likely to become victims. It has to be mentioned that no district shows a low crime level in combination with a high elderly proportion.

![Crime situation and elderly residential areas in Norrköping – nyckelkod 3](image)

**Figure 112: Crime situation and elderly residential areas in Norrköping – nyckelkod 3**

Data source: County police in Östergötland, GIS- enheten Norrköping

Reducing the scale to *nyckelkod 4* it becomes obvious that only some parts of the districts have high crime or elderly proportions. Especially blocks situated in Östantill and Nordantil as well as Ljura – all located close to the city centre – are characterized by a high crime occurrence and high or middle elderly shares. That implies that even if in these areas crime seems to be high a lot of older inhabitants live there. Areas with low crime but a high share of elderly can be found in districts that lie further away from the city centre but not remote.
In order to overcome the issue of fixed borders two kernel density surfaces, one representing elderly density and the other one displaying crime density, were combined. The following figure illustrates the distribution of elderly as an interpolated surface.
The goal of this combination is to be able to make areas with high elderly and crime density visible. Figure 115 presents the combination of elderly and ‘all real crime’ density. Only extremely high values from 490 to 510 are displayed in order to guarantee a very high value of both variables. As is visible larger parts of Östantill and Nordantill show very high elderly and crime density. Four more small spots are visible in Hageby, Vilbergen, Berget and Klingsberg.

Figure 115: Norrköping city – Hot spots of high elderly and crime density
Data Source: GIS- enheten Norrköping

Figure 116 presents areas of high elderly density and high robbery respectively fraud density. Larger areas of high robbery and elderly density can be found in Östantill and Nordantill. There exist several smaller spots within the city. All areas together are oriented from a northwest to southeast direction. Areas of high elderly and fraud density are located in Nordantill and Villbergen.
Figure 116: Norrköping city – Hot spots of high elderly and robbery (left side), fraud (right side) density
Data Source: GIS- enheten Norrköping
9 ELDERLY – ACCESSIBILITY ANALYSIS FOR NORRKÖPING

The term accessibility describes how difficultly or easily a specific site can be reached. Accessibility can be measured using for instance distance or the travel time (ArcGIS Desktop Help). This chapter tries to answer the question if old people in the city of Norrköping live closer to the public transport and health centres (vårdcentralen) compared to the working population. This fact can be assumed due to weakening physical condition with increasing age and therefore increasing effort to reach important or desired locations for older inhabitants. The public transport guarantees mobility even if the personal constitution restricts for instance the ability to walk longer or without a walking frame. Considering this circumstance the accessibility of the health centres is very important since doctors generally are not available for home visits in Sweden.

In the following analysis the accessibility of the public transport and the health centres in the city of Norrköping was evaluated using service areas around the points of the bus or tram stops and the health centres. Service areas are of concentric shape and indicate how the accessibility changes with increasing impedance (ArcGIS Desktop Help). ArcGIS Network Analyst with a walkway-tram-bus network was used to calculate the walking time to the public transport stops and the travel time to the health centres. In addition a road network was applied to calculate the car driving time to the health centres.

9.1 Accessibility of public transport – bus and tram stops

To measure the accessibility of the public transport all stops of buses and trams were digitized. Public Transport information was obtained from the ostgotatrafiken webpage and valid from the 17th June 2007. An overview of all bus and tram lines gives the following figure. For the network analysis only the walkway- network and stops of the trams (lines 2 and 3) and the city busses with frequent tours were considered (lines 113, 116, 117, 118, 119 and 145). The industrial lines, city district buses, that can be ordered, and the Airport bus were not included in the analysis. In a first step service areas with walking time in minutes and distance in meters to the bus or tram stop were generated. After that inhabitants of the specific age groups falling within different buffers were counted.
Figure 117: Public transport network in the city of Norrköping  
Source: http://www.ostgotatrafiken.se/templates/MapPage____2533.aspx  

Around 90 percent of Norrköpings population lives within 500 meter of a bus or tram stop and almost 60 percent (58.5%) have a public transport stop within a 250 meter distance from their home. The accessibility of the public transport stops is shown in figure 118 and in form of a map in figure 119.

Figure 118: Accessibility of stops of public transport by walking (in minutes)  
Data source: Norrköping municipality; own representation
There are only marginal differences between the age groups. A higher percentage of the age group 20 – 64 have a shorter walking time, less than four minutes, to the stops of the public transport compared to both groups of old people. With a walking time of four and more minutes slightly more of the aged elderly tend to live closer to the stops compared to the young elderly and the working population. In general the short walking time to the nearest bus or tram stop (over 80% of the population reaches the nearest bus or tram stop within five minutes) indicates a very good public transport network in the city of Norrköping.
9.2 Accessibility of Health centres – Vårdcentralen

The city of Norrköping has nine health centres all spread across different districts. An overview of the location of the health centres and the distribution of the older population as an interpolated surface (age over 65) is shown in the following figure. The exact addresses of the health centres used for this study can be found in the appendix 8.

Figure 120: Distribution of older population (interpolation) and location of health centres
Data source: Norrköping municipality, internet; own representation

From a visual point of view seven of the nine health centres are surrounded by or close to places with a high older population density (black colour). The two health centres located in Kneippen and Skarphagen (in the west part of the city) have fewer old people in their surroundings. Older people living in Lindö and districts in the south-east of the city (Navestad, Brännestad and Rambodal) have to cover quite a long distance to reach the nearest health centre.

A summary of all accessibility analysis (by car, public transport, walking) is given in table form in the appendix 3 to 7.
ACCESSIBILITY OF HEALTH CENTRES BY CAR

For analysing the accessibility of the health centres the road network with speed limits is used and only the pure driving time without any consideration of traffic jams or traffic lights is calculated.

![Figure 121: Accessibility of health centres by car (in minutes)](image)

Data source: Norrköping municipality; own representation

In general 97 percent of the entire inhabitants of Norrköping city can reach the nearest health centre within five minutes driving. Having a closer look at the age groups especially the age group 80+ tend to live closer to the health centres. Differences between the age groups 20 – 64 and the young elderly aged between 65 and 79 are insignificant.

ACCESSIBILITY OF HEALTH CENTRES BY PUBLIC TRANSPORT

In this analysis a minor distortion appear due to the use of an older public-transport network. Most changes of bus and tram stops occurred around Ljura centrum and in Lindö. For the accessibility analysis of the health centres the differences between the bus stops used in the study road network and today’s location of the bus stops do not affect the main results achieved; because, the location of Lindö is so remote that inhabitants will always have the longest way to the closest health centre. Distortions in Ljura will be of small importance because the system of bus and tram stops is very close in this area.

It has to be considered that the travel time using public transport includes walking to the bus stops (walkway network). This means that the travel time to the health centres depends on the inhabitant’s location related to the bus and tram stops as well as the location of this stop within the public transport network.
Half of Norrköping’s population (49.8 percent) is able to reach the nearest health centre within eight minutes using public transport. With a travel time of 30 minutes almost the whole population of Norrköping city (99 percent) can reach the nearest health centre. Observing the three different age groups in the following figure small differences are visible. For all travel times a higher percentage of inhabitants aged over 80 reaches the closest health centre compared to the other two age groups. Interestingly more inhabitants aged 20 to 64 can reach the health centres within a specific travel time than inhabitants aged between 65 and 79. The biggest difference can be seen at a travel time of eight minutes. Travelling this time 56 percent of the age group 80+ can reach the health centres. For the other two age groups the proportion are 52 percent (age group 20 – 64) and 48 percent for inhabitants aged between 65 and 79.
ACCESSIBILITY OF HEALTH CENTERS BY WALKING DISTANCE

The following figure gives an overview of the accessibility of the health centres by walking to the facilities:

About 60 percent of the whole population in the city of Norrköping lives within 1000 meter from the closest health centre (see also figure 124 above). Approximately 90 percent of the population live within a distance of 2500 meters. Differences between the examined age groups are minor, but greater than the differences achieved in all other previous analysis. The most distinctive difference can be seen for the distance of 1000
meter. About 70 percent of the inhabitants aged over 80 live within this distance from the health centres. For the other age groups the percentage rate is 63 (age group 20 – 64) and 61 for the age group 65 – 79.

Figure 125: Service areas for accessibility of health centres by walking distance
Data source: Norrköping municipality; own representation

Discussing the accessibility of the health centres as well as the public transport by walking time or distance it has to be kept in mind that the walking speed of elderly can differ considerably from other age groups. The walking time presented above (figure 125) is calculated with a walking speed of about 3 km per hour which is almost twice as slow as the ‘usually’ taken speed of 5 km per hour. Applying this approach the travel time to the health centres or public transport stops increases for the same distance. This means that a smaller percentage of especially elderly aged over 80 reaches the desired facilities in a specific time. Differences between the age groups are thus necessarily not valid.
10 DISCUSSION AND CONCLUSION

In this work the demographical, social and crime situation within the city of Norrköping was examined. Firstly, analyses were done to explore differences between the city and the rural region in the municipality, as a study of this level had not been done before. Secondly, differences within the city were analyzed to identify and characterise preferred residential neighbourhoods of elderly. In addition an accessibility analysis has been done to verify the assumption that elderly live closer to - for them - important facilities than other age groups.

ELDERLY POPULATION IN THE CITY OF NORRKÖPING

The highest total number of ‘elderly’, ‘young elderly’ as well as ‘aged elderly’ can be found in Hageby, Vilbergen, Enebymo, Haga, Östantill and Nordantill. Almost 47 percent of all elderly, 45 percent of the young elderly and 50 percent of the aged elderly live in these six districts. All districts are very distributed within the city. Östantill and Nordantill are located close to the city centre, whereas Hageby, Vilbergen, Enebymo and Haga are situated between the outskirts and the city centre. A summary of the characteristics of each of these six districts is given below in table 20.

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<th>District</th>
<th>65+ total nr.</th>
<th>65+ percent</th>
<th>65 - 79 total nr.</th>
<th>65 - 79 percent</th>
<th>80+ total nr.</th>
<th>80+ percent</th>
<th>age structure type</th>
<th>social str. type</th>
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Table 20: Characterisation of the six most elderly populated districts in the city of Norrköping

Data source: Statistics Sweden and Norrköping municipality

The districts were assigned different age- as well as social structure types. All districts characterises the assignment to a relatively low social structure type (from 1 to 4). Striking is the high amount of elderly in Östantill, which was categorised as a ‘young adults’ district. Another interesting point is that only Vilbergen, characterised as an ‘elderly’ age structure type with a very low social level (social structure type 2), experienced increasing numbers of all three elderly categories.

The following table 21 lists for each elderly category the six districts with the highest proportion of the respective age group. These six districts are marked red. Vrinnevi, Säpkullen, Vilbergen, Enebymo, Klingsberg and Skarphagen hold the highest proportion of elderly aged above 65, which makes them very ‘old’. Almost every third to fourth person (except Vrinnevi) is aged over 65 in these districts. Hageby and Smedby show as well a high proportion of young elderly. Except Enebymo and Haga all districts are concentrated in the south of the city.
Table 21: Characterisation of districts with the highest elderly, young elderly and aged elderly proportion

Data source: Statistics Sweden and Norrköping municipality

Older people living in districts categorised as ‘all ages’ and ‘elderly’ (except Såpkullen) have a very low social level. This can be elucidated by the population composition of the districts. The high proportion of old people with low education, which can be explained by lower importance of post secondary degrees 30 to 40 years ago, and the lower income as pensioner compared to the working population to some extent cause the low social levels. Old people living in districts with younger inhabitants (age structure type ‘young adults & 55+) show consequently a higher education level which increases the social level.

Comparing both tables it becomes apparent that Nordantill and Östantill though they have a very high number of elderly, both districts show a lower proportion of elderly within the district. On the other side, Vrinnevi, Såpkullen, Klingsberg and Skarphagen hold a very high proportion, but a low total number of elderly. However, there is no evidence that the age structure or the social structure to a certain extent can explain the development of the elderly in certain areas.

INFLUENCE OF TYPE OF HOUSING/ HOUSING MARKET

The type of housing as well as options of tenure (private rental, public rental, tenant cooperative and owner occupation) has a great impact on the living decisions of populations. This fact may not be considered sufficiently in this work. In Sweden it is generally very difficult to conduct housing market analysis from a data- analytical point of view because no overview or summarised data of housing can be found on a level of statistical areas. Data are only available from the public housing companies, which may not represent an entire statistical area. To attach importance to the housing market the type of housing as well as tenure structure has to be investigated.
CRIME ANALYSIS

Preliminary global statistical test showed strong evidences of crime clustering in the city of Norrköping. Several crime hot spots could be identified. A bigger area of high crime concentration in the inner city of Norrköping (parts of Gamla staden, Nordantill, Östantill and Berget), indicates a need for actions against crime. Furthermore mainly three smaller crime hot spots were identified: one being in the north of the city within an industrial area, one being in the northeast of Hageby – determined as ‘Hageby centrum’- and another one in the northwest of Vilbergen. The representations of crime counted per statistical area, crime per square meter and the interpolation corresponded mainly with their results of high crime concentrations. There is a noticeable high crime activity in the industrial areas, even though only a few people live there. This indicates the existence of crimes like theft where people are not the target.

In the three districts Gamla Staden, Nordantill and Hageby a high or middle proportion of elderly and a high crime level can be detected. On the opposite side a high and middle proportion of elderly and low crime can be seen in the four districts Skarphagen, Säpkullen, Smedby and Linö. These districts are located on the outskirts (except Säpkullen) compared to a more central location of districts with high crime levels. It has to be mentioned that no district experiences a low crime level in combination with a high elderly proportion. Examining the elderly and crime level at smaller scales it becomes obvious that not the whole districts are ‘dangerous’ and only some smaller hot spots face high crime and elderly proportions.

The main threat against old people is said to be distraction burglaries. The Swedish police and media have named these crimes ‘åldringsbrott’ and ‘åldringsrån’ (elder crimes and elder-robberies) (Jönson 2003). Dividing the dataset into subsets of people harming and not harming crime should therefore be done to better give consideration to crime which really matters for elderly or other population groups. A very high proportion of elderly faces a very high level of robbery crime in some areas of Östantill, Nordantill, Söderstad, Hageby and Enebymo. For the crime subtype fraud only three areas with high elderly and fraud proportion was achieved, one being in Nordantill and two in Vilbergen.

In order to improve crime analysis related to the elderly the crime databases or police records should have at least one age-category for elderly or persons over the age of 65 to analyze in detail crime against elderly and risk of elderly being victimized. The only category available in today’s data is called crime against disabled person, where disabled can mean mentally or physically occurring as a result of for example ageing.
ACCESSIBILITY ANALYSIS
For the accessibility analysis it was assumed that elderly and especially aged elderly live closer to public transport stops and important facilities such as health centres (compared to the age group 20 – 64) in order to consider increasing physical weakening. The expected result could not be affirmed. An accessibility analysis has shown that ‘aged elderly’ live only insignificantly closer to public transport stops or health centres. The age group of the ‘young elderly’ lived even further away than the comparison group of inhabitant’s age between 20 and 64. A possible reason for this result can be the very well distributed system of public transport in the city of Norrköping. Furthermore, additional services such as transport services guarantee that older and disabled people do not have to use public transport or walk to the facilities.
Besides the analytical results, the methodology used in this work or related aspects have to be discussed as well.

USE OF GIS/SPATIAL ANALYSIS – SCALE ISSUES
Analysts have to be aware of scale issues. Results presented at for example district level (nyckelkod 3) are not definite – findings are likely to be of smaller-scale, which means that only a part of a district represents the main findings, others may not. By scaling down greater areas a differentiation will occur. A good example demonstrating this effect is the crime level in Hageby. At the level nyckelkod 3 Hageby is categorized having a very high crime level. Through a subdivision of this district in smaller areas only one point of very high crime, identified as the Hageby (shopping) centre, can be found.

CLASSIFICATIONS USED
A general issue of classification concerns the accuracy of representations. Because it is impossible to present smooth transitions, only an approximation of the reality can be shown. Interpretations should therefore be done with care. For example, it can happen that a value is just slightly below a border, but its assignment to a lower class may influence the interpretation as well as the presentation of the findings. The ‘natural breaks’ classification method, used amongst others to classify proportions of the population or crime level, calculates new thresholds of classes for each dataset depending on the data’s variations. If the values of two datasets are assigned to the 3rd class (using a classification with five classes), a different range of values is treated as ‘equal’ as they are both ‘middle’.

COMBINING TWO INTERPOLATION SURFACES
The same problem discussed for classification applies to the combined interpolation surfaces, which were reclassified in order to guarantee an equal range of values. Furthermore the presented result of high crime and elderly hot spots strongly depends on the threshold chosen (in this case it was 490) to show the relevant areas. The presented procedure involves that it is impossible to see which values the two variables have, and which variable is changing.
SOURCES

ArcGIS Desktop Help.


SPSS – Desktop Help

Statistics Sweden (Statistiska centralbyrå) online query
http://www.scb.se/templates/tableOrChart____25831.asp. last visit 2008/05/19.

Statistisk årsbok för Sverige 2007 (Statistical yearbook for Sweden 2007)


Statistics Sweden/ Statistiska Centralbyrån Sweden - online query:


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APPENDIX


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Källa: Statistiska centralbyrån och Norrköpings kommun, planeringskontoret

Appendix 1: Real population in 2005 and population prognosis and forecast for the municipality of Norrköping 2006 – 2015
Source: Norrköpingsfakta 2006:6

Norrköping och fem jämförbara kommuner

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Källa: Statistiska centralbyrån

Appendix 2: Municipality of Norrköping in comparison with five other comparable municipalities
Source: Norrköpingsfakta 2006:6

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<th>65 - 79 (nr)</th>
<th>65 - 79 (%)</th>
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<th>80+ (%)</th>
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Appendix 3: Accessibility of stops of public transport by walking (in minutes)
Data source: Norrköpings kommun; own calculation

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Appendix 4: Accessibility of stops of public transport by walking (in minutes)
Data source: Norrköpings kommun; own calculation

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Appendix 5: Accessibility of health care centres by car (road network – in minutes)
Data source: Norrköpings kommun; own calculation
### Appendix 6: Accessibility of health care centres by public transport (walking, bus, tram – in minutes)

**Data source:** Norrköpings kommun; own calculation

#### Accessibility of vårdcentralen by walking (in meter)

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<th>65 - 79 (nr)</th>
<th>65 - 79 (%)</th>
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<th>20 - 64 (%)</th>
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<td>15453</td>
<td>87.54</td>
<td>9648</td>
<td>85.43</td>
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<td>91.29</td>
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<td>83.42</td>
<td>72957</td>
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<td>2500 m</td>
<td>16205</td>
<td>91.80</td>
<td>10202</td>
<td>90.34</td>
<td>6003</td>
<td>94.40</td>
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<td>89.34</td>
<td>78513</td>
<td>88.79</td>
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<tr>
<td>3000 m</td>
<td>16659</td>
<td>94.37</td>
<td>10513</td>
<td>93.09</td>
<td>6146</td>
<td>96.65</td>
<td>49463</td>
<td>93.53</td>
<td>82288</td>
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</tr>
<tr>
<td>3500 m</td>
<td>16743</td>
<td>94.85</td>
<td>10579</td>
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<td>96.93</td>
<td>50081</td>
<td>94.70</td>
<td>83243</td>
<td>94.14</td>
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<tr>
<td>4000 m</td>
<td>17014</td>
<td>96.39</td>
<td>10758</td>
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<td>6256</td>
<td>98.38</td>
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<td>95.90</td>
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<tr>
<td>5000 m</td>
<td>17577</td>
<td>99.58</td>
<td>11227</td>
<td>99.42</td>
<td>6350</td>
<td>99.86</td>
<td>52388</td>
<td>99.06</td>
<td>87559</td>
<td>99.02</td>
</tr>
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</table>
Appendix 8 - follows: Addresses health care centres
Data source: Internet, Norrköpings kommun homepage sjukvårdskartor:
http://www.norrköping.se/kartor/sjukvardskartan/

Vårdcentralen Sandbyhov; Sandbyhovsgatan 19; 602 14 Norrköping
Vårdcentralen Kungsgatan; Kungsgatan 36; 602 20 Norrköping
Vårdcentralen Väven; Hantverkaregatan 51; 601 82 Norrköping
Vårdcentralen Östertull; Vikboplan 7; 601 82 Norrköping
Kneippens Vårdcentralen; Kneippgatan 4; 602 36 Norrköping
Vårdcentralen Såpkullen; Gamla Lasarettsgatan 18; 602 39 Norrköping
Vårdcentralen Hageby; Grundläggaregatan 2; 603 59 Norrköping
Skarptorps Vårdcentral, Dalviksgatan 69, 603 80 Norrköping
Vilbergens Vårdcentral; Vilbergens centrum, 603 56 Norrköping