Family Structure During Childhood: Survival Effects in Later Life. First Results of the Historical Sample of the Netherlands

NOTE: This version of the paper is based on a limited set of data. The final paper will be based on a much enlarged dataset, which will become available on January 1 2004.

Frans van Poppel Aart & Aart C. Liefbroer
Netherlands Interdisciplinary Demographic Institute (NIDI)
P.O. Box 11650
2502 AR The Hague
Netherlands
Poppel@nidi.nl

Introduction

During the last decades, the effect of physical and social exposures during gestation, childhood, adolescence and young adulthood on health and mortality in later life has become a central issue in epidemiology and demography (Kuh and Ben-Sholomo, 1997; Ben-Shlomo and Kuh, 2002).

In a recent article, Ben-Shlomo and Kuh (2002) have given a short overview of the problems, challenges and perspectives of the life course approach. They first of all focus on what in their opinion is the essence of a life course model of disease causation, that is a clear conceptualization of the temporal ordering of exposure variables and their inter-relationships with the outcome measure, allowing the researcher to test potential pathways. Ben-Shlomo and Kuh stress the fact that exposures may act differentially in critical or sensitive periods. Two basic models are formulated that link exposure to later health outcomes: a critical period model, that is based on the idea that an exposure in a critical period results in permanent or irreversible damage to health, (models may include or not later life life risk factors or later life effect modifiers) and an accumulation of risk model, in which factors that raise disease risk may accumulate over the life course. This model can be further distinguished according to the way these risks are supposed to operate.

A second element discussed by Ben-Shlomo and Kuh is the necessity to apply life course approaches over different generations to find out whether the relationships between exposure and disease outcomes vary over time and region.

Thirdly, Ben-Shlomo and Kuh emphasize that life course approaches have to include risk factors operating at a variety of hierarchical levels, at the national, neighbourhood and household level (multi-level models).

Finally, the authors discuss the empirical challenges in undertaking life course studies. To study the effects of conditions in different stages of life on survival at older ages, a variety of approaches has been followed. In theory, a prospective birth cohort study is the most appropriate research design. However, the results of these studies become available only after a long time. In addition to that, they have very high non-response and loss to follow-up which become more important as the study period is longer, that is, precisely when the effect of childhood conditions on later ages might come to light. The life course approach to human health is therefore usually based on information on baseline exposure of subjects that are recruited in mid-life and are followed up for future disease or death. Out of sheer necessity, information on early life exposure such as birth weight and socioeconomic position

during childhood is usually collected retrospectively. Retrospective data have a high risk of biased information, in particular as far as childhood conditions are concerned, and are only based on the surviving part of the cohort, which might give rise to selection effects. Historical cohort studies are usually limited to one or two exposures in a very specific time period, and have often no data on other periods of the life course (Ben-Shlomo and Kuh, 2002).

In the project *Inequality in longevity from a life-course perspective: The Netherlands 1850-2000* we try to take up some of the issues raised by Ben-Sholmo and Kuh. We use a historical data-set, covering a time period from the mid-nineteenth to the early twenty-first century, to study health and mortality in a life course perspective. Our study will focus in particular on the long-term impact of three conditions during infancy and childhood: socio-economic conditions, family circumstances and the ecological environment in which individuals spent the first part of their life. We focus on the effect of these characteristics on adult mortality and height at age 20 (for men only). The passage of time, individual and social, plays a crucial role in the proposed study. Many epidemiological studies are based on a restricted time perspective. As a consequence, possible changes over time in the importance of specific stages in childhood, or in the relative importance of background characteristics such as social class, cannot accurately be studied. We also include risk factors at a variety of levels.

Historical studies of the kind proposed here of course have also serious shortcomings: they have very limited or no data on biological or psychosocial exposures and the only outcome variable about which information is available is usually death. Therefore it is hardly possible to draw conclusions about the character of the pathways via which exposure affects outcomes (biological, social or a combination of the two).

Childhood experiences and adult health and mortality: socio-economic position, familial circumstances, migration and the passage of time

In recent years, attention in the Netherlands and elsewhere in Europe and in the US has been directed to the role that early-life conditions play in socio-economic health differences later in life. People in lower socio-economic positions are generally worse off with respect to their health than people in higher positions. These socio-economic inequalities in health exist from the first year of life on and are also found at higher ages in many European countries over a long period of time (Kunst et al., 1994a, 1994b). The question which processes underlie these inequalities is still largely unanswered.

Several authors have argued that socio-economic health differences in adult life are partly explained by processes much earlier in life, in particular by childhood socio-economic conditions (Davey Smith et al., 1994; Lundberg, 1991; Lundberg, 1993; Wadsworth, 1997). Are some adult and old people less healthy because they grew up in relatively poor socio-economic conditions? Following a British study (Kuh and Wadsworth, 1993), Van de Mheen et al. (1998) showed that a clear association exists between childhood health and adult health. A substantial part of the differences in health between educational and occupational groups in age group 25-74 years could be attributed to economic differences in childhood environment, such as position of the father in the labor market, occupational level of the father, and financial situation (Van de Mheen et al., 1997).

Specific theories relating past and current activities and positions to adult and old-age mortality risks are still lacking. Recently the importance of considering the cumulative effect of socio-environmental exposures over the life time has been stressed (see for example Davey Smith et al., 1994). Accumulation of disadvantage implies that the longer a person is exposed to poor circumstances, the greater the health risks become. An alternative hypothesis could be that experiences in the remote past may decline in importance as time passes.

Observed socio-economic differentials in mortality in adult and old age do not only result from the effect of social characteristics such as occupation on mortality: they might also be the effect of health-related selection of persons into socio-economic categories (Mare, 1990). One way via which childhood socio-economic status affects adult health is via adult socio-economic status, as adult socio-economic status is heavily influenced by childhood socio-economic status. Lynch et al (1994) for example found that childhood did not predict adult mortality independent of adult socio-economic status.

Our data will allow us to study the influence of an accumulation of adverse socio-economic circumstances on health later in life, measured by mortality at adult and old age. We will use information on the economic position of the child's family at several points in time between birth and adolescence. In addition to the direct effects of the socio-economic background of the child, we will also study the indirect effects on longevity, working through the effect which the child's background might have on his/her socio-economic status established later in life. Longitudinal data will best allow for the understanding and neutralization of such health selection effects on mortality, adding an extra argument to the importance of a life-course perspective (Hummer, Rogers and Eberstein, 1998). Mortality risks in adulthood and old age will be viewed as a function of current and past conditions and we will try to determine empirically the weights of these conditions.

A disadvantage of the data that we use is that the information on the socio-economic status is rather limited: although there is a strong correlation between indicators of parental socio-economic status such as education, occupation and income, each variable partly reflects also a distinct aspect of the childhood environment (Gilman, 2002). We have however only information on the occupation of the parents.

Research into the aspects of family life that might affect the survival of its members has often been limited to the effect of the family income, property or socio-economic status. Yet there are more dimensions of family life which might have an influence on the living conditions of the family members: the structure of the family, the family culture and the quality of the relationship. The increase in the proportion of children growing up in a one-parent family in modern industrialised societies has directed the attention on the different roles that fathers and mothers play in family life and on the effects that the absence of one of these different roles might have on the child (Bozett and Hanson, 1991; Lamb, 1997; Popenoe, 1996).

The importance of the role of family structure for health and survival applies even more to historical societies. Not only were the proportions of one-parent families high, the fact that the family played a much more important role could further increase its potential effect on child health. In nineteenth-century European societies infants and young children spent a much higher proportion of their time under parental supervision inside or directly nearby the home. Only a fraction of children aged less than seven attended school. State and church played only a minor role in

allocating the resources which were essential for the quality of life of the family members. The family situation and the family assets therefore determined to a large extent the life chances of the members of the family, in particular those of the children. A growing body of historical literature now exists on the consequences for children of growing up as a child of an unwed mother and on the effects of growing up in a family which has undergone the death of the parent or a divorce (see for historical studies Van Poppel, 2000; Reher, 2003 and the various contributions in Derosas and Oris, 2002).

Family structure and family composition do not only have immediate effects on the child's health. Whereas in the debate on health inequalities later in life the role of the family has been largely ignored until recently (Sweeting and West 1995), several studies have now been published which observed significant effects of family disruption during childhood on subsequent health. Lundberg (1993) found that living with only one parent up to age 16 was significantly associated with self-reported poor health in adulthood. Preston, Hill, and Drevenstedt (1998) observed that children living in households headed by their mothers had slightly higher probabilities of survival to age 85 than those with father heads but within the group of mother-headed households survival chances were lower when the mother was unmarried. Vågerö, Leon and Modin (1998) showed that men born to unmarried mothers had a higher ischaemic heart disease mortality than men born to married mothers. For total mortality, Smith et al. (unpublished) found that children who had experienced the death of one or both of their parents before the child had reached age 20, had excess mortality in particular during early and middle adulthood. Long-term effects of parental divorce before children had reached age 18 on mortality were found in a large Swedish study, where those who had divorced parents had relative risks which were 30 percent higher than the reference group, after controlling for factors such as social class, income, well-being etc. (Hansagi, Brandt and Andréasson, 2000).

Our study will analyze the long-term effects of different family circumstances in which children grew up during the first fifteen years of their life on mortality later in life. To do this, we will record the marital status of mother and father at the time of birth of the child and the family composition during the first fifteen years of life of the child. We will compare the life course of children of unwed mothers, of children born to widows and of children who lost one or both of their parents later in life with the life course of children born and raised in complete families. We will also pay attention to reconstituted families, and to the presence of other household members. Again we will not only focus on direct effects but will also study indirect effects, working through the effect of family structure on socio-economic status reached later in life.

In studying the long-term effect of socio-economic and familial circumstances in childhood, time, individual **and** social, plays a crucial role. As far as individual time is concerned, it is important to realize that the length of time during which children were in advantaged or disadvantaged positions might play an essential role that has to be taken into account explicitly. Taking into account the passage of social time is at least as important. Many epidemiological studies are based on a restricted time perspective. As a consequence, possible changes over time in the importance of specific stages in childhood, or in the relative importance of background characteristics such as the familial situation class, cannot accurately be studied. The Netherlands was in an economic and social sense, a retarded nation until the 1860s and modernization, industrialization and further urbanization took place only after

that time. This process has been paralleled by an enormous change in family structures, by an increase in the role mothers played compared to fathers in rearing their children, and by a decreasing importance of the role of the family in comparison to that of state and school. From the middle of the nineteenth century on, the home more and more became the sphere of women and within this sphere there was growing resistance by males to participate in day-to-day domestic activities. This made women wholly responsible for the organization of household affairs, for child care and for arranging the family's social life. Men were left with bread-winning as their only clear-cut family role (Popenoe, 1996; Horrell and Humphries, 1997). The loss of function in childrearing on the father's part and the increased mother-child attachment, the taking over by governments of various family functions that had traditionally been held by the father might have changed the relative importance of fathers and mothers for the health and survival of children and may have affected the long-term impact of socio-economic position and familial circumstances at the time of birth.

Modernization also led to a changed meaning of childhood, to increased opportunities for social mobility, and to greater equality in epidemiological regimes within the country, thereby causing changes in the longevity effects of socio-economic position and region of residence over time. A wide time perspective, which makes it possible to study the effect of changes in the role played by the various infant-and childhood- conditions is therefore necessary.

The potential effects of childhood social clas and familial circumstances on health and survival in later life do not only depend on the characteristics of the individual and that of his or her family. Studies have shown that the socio-historical context in which groups of individuals are embedded –socio-economic status of the area, level of segregation of socio-economic groups – has a strong association with the mortality level, net of individual-level characteristics (Hummer, Rogers and Eberstein, 1998). A recent Dutch study (Bosma et al.) for example showed that living in areas characterized by poor socio-economic conditions had negative effects on health for both people with a high and those with a low socio-economic status. A growing number of historical studies has pointed to the importance of examining jointly the impact of area and of the socio-economic characteristics of individuals in historical populations (see for example Williams*,* 1992*;* Reid, 1997*;* Garrett et al*.,* 2001*).*

Few studies have analyzed whether area characteristics have also long-lasting effects on mortality. Yet recently it has been suggested that region of birth had long-term effects on health in later-life. Coggon et al. (1990; 1997) concluded that mortality from stomach cancer and from aortic aneurysm in England reflected influences from both the county of birth and the county of death. The association with place of birth for stomach cancer was found in migrants both out of and into high-risk areas. Wannamethee et al (2002) used information on migration status of middle-aged men in Great Britain to study whether region of birth and region of examination had an effect on cardiovascular disease mortality. The outcomes suggested that exposure to risk factors during early life was less important than those during middle age.
Migration hypotheses have received attention in the studies of long-term consequences of the Dutch Hunger Winter. One of the problems in interpreting the relation between the health of adult and older people and living conditions in childhood is to assess the role played by existing regional differences in health, following from selective migration processes. Selective migration towards the western part of the Netherlands of the healthiest and best fed women has been postulated as

one explanation for the fact that no clear evidence was found for the hypothesis that energy restriction in adolescence during the Hunger Winter led to decreased breast cancer risks. Because of historical migration patterns, there may have been region-specific breast cancer risks, disturbing the expected relation (Dirx et al., 1999).

In our study we will pay attention in particular to the long-term effects of migration to and from areas diverging in their epidemiological regime. The Dutch situation provides an excellent opportunity to study the impact of a wide range of social, cultural and environmental factors during childhood on mortality later in life. Large regional differences in mortality characterized the country in the 19th and early 20th century, and these factors were strongly related to different epidemiological regimes. After 1860, high numbers of migrants left high-mortality Zeeland and low-mortality Friesland, seeking their fortune in the Western part of the country (Knippenberg, 1980). To study whether the mortality of migrants is determined by influences stemming from the region of origin mortality risks among migrants have to be compared with those of the non-migrants from the region of origin and with those of the native population of the region of destination (Brockerhoff, 1994). Cultural or other barriers with the region of origin might partly determine the effects on survival of migrants. Survival prospects will be more effected when moves occur over great distances or do not follow a traditional pattern (Kliewer, 1992). Time since departure and more general the different stages of the migration process thus are essential in studying the mortality consequences of migration. Some of the early-life influences may disappear soon upon arrival in the new area but others will retain their influence for a longer time. In general these factors tend to diminish over time as the effect of past exposures wear off, and as behavioral patterns become more similar to those of the host region (integration or assimilation). The health and mortality of immigrant groups cannot be properly understood without reference to the relatively unfavorable position in which most members of most migrant groups live: therefore, the socio-economic position of mingrants and non-migrants has to be taken into account.

To summarize, our study will focuss on the later life effects of the socio-economic situation during childhood, of the familial circumstances and the migration history of the individual concerned, taking into account societal changes over time and variations in the regional context in which people lived. The outcomes that are studied will in principle be survival and height at age 18.

Period and region of study

To study the above-mentioned questions we will make use of data that come from the so-called Historical Sample of the Population of the Netherlands (HSN). The aim of this project is to build a national database with information on the complete life history of a 0.5 percent random sample (76,700 birth records) of men and women born in the Netherlands between 1812 (the introduction of the vital registration system) and 1922. In all Dutch provinces a random sample of births was drawn which was stratified by period of birth (11 periods) and level of urbanization of the municipality (Mandemakers, 2001). The intention is to follow these births over their whole life course till death or to the present-day if still alive.

In our project, only a selection of data from this HSN-database will be used: The study will be restricted to three of the eleven Dutch provinces and to children born between 1850 and 1922, giving a total of 9,200 births rather evenly distributed over the three areas.

The selection of the provinces is not only based on the fact that in the three provinces, the collection of information has progressed most. Important is also that in economic, social, and demographic aspects, the selected provinces were during the nineteenth and early twentieth century clearly distinct from each other. Utrecht, located in the center of the country, is a region which, as far as religious composition, income level, and demographic characteristics is concerned is considered more or less representative for the Netherlands as a whole. Zeeland a province which was for a large part below sea level and protected by a system of river- and sea-dikes is a rural area in the South-West with sea-clay grain-farming where in the second half of the 19th century agricultural modernization was eroding the position of the small farmer and farm laborer. The majority of the population here belonged to the mainstream Calvinist Church, the *Nederlandsch Hervormde Kerk* (Dutch Reformed Church: Wintle, 1985; Priester, 1998). The province of Friesland in the North-East of the country also mainly was a rural province, where farmers produced for the market, and dairy products formed the backbone of a relatively prosperous agricultural economy that was both commercialized and specialized. The Dutch Reformed Church was dominant in Friesland too, but from the last decades of the 19th century on, secularization weakened the position of the Christian churches (Frieswijk, 1998). The selected provinces can act as a perfect illustration of the sharp divide between the high mortality levels of the coastal and low-lying riverine municipalities and the low levels of the upland area in the North, East and South. At least until the 1880s these upland areas appeared outstandingly healthy by comparison with Western Netherlands.

The restriction to cohorts born in the period 1850-1922 is motivated by the fact that information that is central to our study– on the familial structure during childhood and migration, - can only be collected by using a source of information that is available from 1850 on, viz. the population register. We will come back to this issue when discussing the data.

Cohort life tables for the Netherlands for birth cohorts 1850-1922 lead us to expect that from the total of 9,200 births, 6500 children will reach age 20 and 4600 will reach age 65. The total number of migrants which can be studied is not yet clear. An estimate based on a comparison of places of birth and known places of death and places of last observation showed that the percentage of people who experienced a residential move during their life will be large enough to study the effect of migration. For the provinces of Zeeland and Utrecht, we estimate lifetime migration of about 35 percent outside the province. For Friesland, one might expect at least the same migration rate. A minimum estimate would therefore be that around 20 percent (1300) of all those reaching age 20 will live and die in another province than the one in which they were born. To compare the mortality of migrants from Zeeland and Friesland with the mortality of the resident population of the West, we will primarily make use of the data for the province Utrecht but also of other data from the HSN-database.

For the three provinces as a whole, on May 1 2003 for around 7100 individuals a date and place of death has been found (via the death certificate or personal card) and entered in the database. Complete information on the family situation and the life course (including migration) from the population registers has been collected on paper for 4600 individuals. Information for 2500 individuals has been entered in the database. Only part of this dataset can be used as input for the analysis as inconsistencies have to be solved, and cleaning and standardization have not yet taken place.

Thus, although the final project will focus on three complete provinces, at this stage data are only available for a small part of one of the three provinces, to wit the regions of Zeeuws-Vlaanderen and Tholen in the province of Zeeland (see map). This seriously limits the possibilities to reach our research objectives. The dataset became available in the lat week of April. The small sample size, the little differentiated ecological and economic situation of this small area, and the fact that data on height have not yet been collected also make it difficult to explore already now the whole range of questions which are central in our project. For the same reason, in our analysis we do not use the community information collected for our study, nor do we study the effect of change over time.

We focus here in an exploratory way on only oe issue, to wit the relationship between the familial situation during childhood and survival at adult and old age.

Map 1 location of the research area

Zeeuws-Vlaanderen (literally the part of Flanders located in Zeeland) is a strip of the Flanders mainland in the southwest of the Netherlands. It was separated from the other parts (the former islands of Walcheren and Zuid-Beveland, now a peninsula) of the province of Zeeland by the Westerschelde estuary. The economic and political boundary separating Zeeuws-Vlaanderen in the south from Belgium added to its isolation. The fact that the eastern and western parts of the area were divided by a wide inlet, the Braakman, necessitating all traffic going from East to West to make a big detour over the small strip of Dutch territory along the Dutch/Belgium border added even more to this remoteness. The Braakman was closed as late as 1952.

Zeeuws-Vlaanderen as well as Tholen are part of the low-lying clay coastland of the Netherlands, characterized by specific relief, drainage, soil and accessibility that had a profound effect on the types of settlement, reclamation methods, shapes of fields and farms, land use and communications and degree of urbanization and industrialization of the area (Lambert, 1985, 5-6).

Most of Zeeuws-Vlaanderen consists of land that was reclaimed during the 16th and 17th centuries. The marine clay of the Zeeuws-Vlaanderen was fertile and until recently, the regional economy was almost completely dominated by arable farming. The preference for arable farming was partly caused by the bad quality of the groundwater, which was brackish and unfit for consumption by man or animal, thus severely limiting the possibility of cattle farming. Holdings were generally large, which was partly due to the relatively heavy soil, which made a large number of horses necessary to cultivate the land. Farming was strongly orientated to the market. Relatively labour-extensive crops like wheat, barley and oats dominated farming. These bulk products could be shipped fast to the marketplaces in Middelburg and Rotterdam. A small elite of large and wealthy farmers owned the land. At the lower end of society was a large group of landless farm labourers, stricken by poverty and seasonal unemployment (Van Cruyningen, 2000, 371-379). Only one half to one quarter of these labourers had a permanent position. After 1850, when the labour-intensive sugar beet was introduced and an enormous stream of emigrants left for the US their position improved. In particular after WW I incomes of agricultural labourers increased. Whereas in the middle of the 19th century a large proportion of married and widowed women was working as agricultural labourer, this situation changed as the nineteenth century went on, in particular after the first World War (Steigenga-Kouwe, 1950). A part of the population was involved in the fishing industry. The economy of the region started to change after 1900. Tourism developed

on a small scale from that time on, gaining importance after WW I, but in particular after WW II. After 1900 also industrialization took place, in particular in the zones alongside the canal linking Ghent to Terneuzen and to the Scheld river. After the end of WW I textile and chemical industry became more and more important.

Industrialization did not result in urbanization of the area. Zeeuws-Vlaanderen had 55.3 thousand inhabitants in 1850, living in 37 municipalities, of which the largest one had 4.6 thousand and the smallest one 2 hundred inhabitants. Population size increased to 71.8 thousand in 1900 and 85.3 thousand in 1950. Yet the population continued to live in small villages and towns, the largest municipality in 1950 having 13.4 thousand inhabitants, the smallest one 3 hundred.[1]

The connections between Zeeuws-Vlaanderen and the rest of the Netherlands were rather bad: only around 1920 the ferry-connections to the former islands of Walcheren and Zuid-Beveland started to improve. The eastern part was much more oriented to the Belgian hinterland of Eastern Flanders and its labour surplus and market than the western part, mostly as a consequence of the better transport opportunities to Belgium. This was also reflected in the strong migratory links with Belgium. Migration to other Dutch provinces was partly oriented toward Noord-Brabant (in particular migration from the eastern Catholic part of Zeeuws-Vlaanderen) and partly to the urban areas of Noord-en Zuid-Holland and Utrecht.

Tholen was an isolated island in the eastern part of Zeeland, separated from the province of Noord-Brabant by the Eendracht (nowadays the Scheld-Rhine Canal). Only in 1928 a permanent cross-channel connection with Noord-Brabant was constructed. The small island of St. Philipsland was connected with Noord-Brabant by a dam built in 1884 whereas in 1972 a dam was built connecting the then peninsula to Tholen.The economy of Tholen was dominated by agriculture, with wheat, and, until the mid-1870s, madder as most important products. From 1860 on sugar beet and later on potatoes offered an income to the population. A relatively large part of the population was employed in the fishing sector. Industry hardly existed until the 1960s. Migration to the urban areas in the west, to Rotterdam in particular, was the way in which in the past the superfluous agricultural population managed to survive. The total population of the overwhelmingly Protestant Tholen was 12.2 thousand in 1850, living in 8 different municipalities, ranging from 8 hundred to 2.4 thousand people. The number of inhabitants increased to 16.5 thousand in 1900 and to 17.7 thousand in 1950 (settlements ranging from 1.3 thousand to 2.4 thousand inhabitants).

Data collection strategies

To reconstruct the life histories of the children in our sample use is made of the vital registration system (death and marriage certificates), and of the municipal population registration (population registers, personal cards and Municipal Basic Administration).

Continuous population registers, available from 1850 on, combine census listings with vital registration in an already linked format for the entire population from 1850 on till 1939. For each household member, date and place of birth, relation to the head of the household, sex, marital status, occupation, and religion were recorded. Population registers make it possible to track the new-born down from household to household and from place to place. In many municipalities, registers cover a time span of ten years between the censuses. Families and individuals can, in

[1] Data are form the Databank Nederlandse gemeenten, at NIDI.

principle, thus be followed on a day-by-day basis for a long period. New household members such as live-born children arriving after the registration had started were added to the list of individuals already recorded, and those moving out by death or migration were deleted with reference to place and date of migration or date of death. Residents were also required by law to report migration between communes at both the origin and destination.

In the 1930s, the individual person became the registration unit in all municipalities. Since then, the population register in each municipality consisted of a collection of personal cards, containing nearly the same information as the population register. All persons who were alive in 1939 or were born after that year received a Personal Card. At the moment of death, this card is removed from the files and sent to the Central Bureau of Statistics, where the data on the card are used for statistical purposes, and after that sent to the Central Genealogical Bureau. Personal cards of all persons who died between the 1st of January 1940 and the 30th of September 1994 are available for research.

For persons who died after that date, extracts from the so-called Municipal Basic Administration can be collected, containing almost the same information.

By following the newborn child in the consecutive population registers, and, in case of migration, in the population register of the new place of residence, the complete life history and the migration history of the selected individuals can be reconstructed from birth till death. For those children still alive in 1939, the information from the personal card respectively the Municipal Basic Administration can provide the same information.

The information from these sources makes it possible to reconstruct the composition and structure of the households in which the person lived from birth till death. Demographic events taking place during the life course (marriage, migratory moves, births and deaths) are also known for the individual concerned and for the other members of the household in which the individual lived as long as these events took place during the time span that these other members were part of the household of that of the individual. This implies for example that the death of the parents of the selected individual is only known when it takes place during the time that parent and child are member of the same household.

For those persons who during the period 1850-1939 migrated to a country outside the Netherlands or who during this period left their place of residence without a correct registration of their place of destination, or who left their residence after the introduction of the personal card (that is after 1939) the complete reconstruction of the life course is more problematic. That does not imply however, that this group is completely lost. First of all, in case the persons concerned died after 1939, the life course can be reconstructed from either the personal card or from the extract of the Municipal Basic Administration. Secondly, individuals can and will be followed to their new destination outside the Netherlands (mainly this means migration to Belgium). Thirdly, consultation of the vital registration system might supply information on the survival status of the person concerned, after the departure with unknown destination.[2] Finally, in the next stage of the research the municipal

[2] Electronic databases with information on death records for all municipalities relating to the periods 1812-1940/1952 are now under construction in all eleven provinces. Databases with marriage records for the period 1812-1922 will also become available. For several provinces, these databases are already available, for others only a part of it is accessible. Data from marriage certificates can be used in case no information is available to establish survival at least to ages 20-40. To give an idea of the progress

population administrations will be requested to send information about the time and place of departure of those individuals who left their place of residence after the moment of the introduction of the personal card, and for whom a date of death has not yet been found (i.e. for whom a personal card or a copy from the information from the Municipal Basic Administration is not yet available). In this way we expect to be able to have information on the life history of a very large part of our population.

For a considerable proportion of all births the complete life history could not yet be reconstructed. Table 0 shows the number of births in the sample, and the number of births for which the date of death is available by birth cohort. In the two oldest cohorts the date of death (and thus information on the whole life course) is available for around 78% of all births; in the more recent cohort, this applies to 70% of the cohort. A considerable proportion of births in the two oldest cohorts died already before age 18. This percentage has decreased considerably in the more recent cohort. Children for whom no date at death is available until now, could be followed only to their mid-thirties, and in the more recent cohort only to their mid-twenties. To get more grip on their life course after 1939 (the time of introduction of the personal card), use has to be made of the municipal basic administration.

[Table 0 around here]

For those births for which the date of death is known we analyzed the municipality of death. It turned out that not a single death of children dying before age 18 took place outside the province of Zeeland; in the other hand, a rather high and growing percentage of deaths among those people dying above age 18 took place outside the province of birth: 22.7% in birth cohort 1849-1874, 29.5% in birth cohort 1875-1899 and 33.8% in cohort 1900-1922. The majority of them died in cities in the west of the Netherlands.

Results on childhood family conditions and adult survival

In this section, we will present information on the childhood conditions of people living on Tholen and in Zeeuws-Vlaanderen and on the effect of these conditions on adult survival. Our main focus will be on the household structures in which children grew up. Additional attention will be paid to other childhood factors, like the occupation of parents, their religion and place of residence. Before presenting the results, we want to stress that the analysis is hampered by the small size of the sample currently available. We have information on only 640 persons who have survived until age 18, and the number of persons who have experienced adverse family conditions during childhood is only a fraction of this total sample. Given the fact that the effects on adult survival are expected to be relatively small (albeit even relatively small effects can have major social importance), it is difficult to obtain statistically significant and reliable effects. Therefore, results should be treated as preliminary and as suggestions for further research on the larger sample rather than as definitive.

Childhood household structure

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of this project, on April 1 2003 the database with death certificates included already 357 thousand deaths of a total number of deaths during the period 1812-1942 of 530 thousand.

Although it can be expected (given the relatively high mortality rate in 19th century Dutch society) that a sizable proportion of all children spent at least a part of childhood without one or both parents, little is known about the household structures children grew up in. We use information on entry, exit and death of members of the household from the Population Registers to reconstruct to what extent children up till age 15 lived with their natural parents or with stepparents. We calculated at each exact age from age 0 to age 15 in which of six possible household structures children were residing. These eight household forms were: (1) with both natural parents, (2) with their mother and a stepfather, (3) with their father and a stepmother, (4) with their mother only, (5) with their father only, (6) with a stepmother only, (7) with a stepfather only, and (8) without any parent or stepparent. Each of these household forms could include additional household members. In Table 1, the proportion of children residing in each of these eight household forms until age 15 is presented.

Table 1 about here

At birth the large majority (94%) of children lived in a household that contained both natural parents. The only other household structure of some importance at birth was a mother-only household. About five percent of children were born into a household in which the natural father was lacking. In many cases, these were illegitimate children raised in the parental household of their mother. The proportion of children living in an 'intact' family decreased steadily with age of the child. At age 15, more than one quarter (28%) was not living with both natural parents anymore. To what kind of household structure did these children go to?

Table 1 shows that less than two percent of all children was living with a mother and a stepfather at any time until age 15. The maximum proportion living with a father and a stepmother was somewhat higher ((four percent), not surprising given the higher frequency of remarriage among widowers than among widows. Living in a one-parent household was more common during childhood than living in a stepfamily. At age 15, seven percent of all children were living with their mother only and an additional six percent were living in a lone-father family. Living with a stepparent only was very uncommon among children in the second half of the nineteenth and the early years of the twentieth century. Finally, living with no parent at all was very uncommon at birth, but was experienced by almost one out of ten children at age 15.
To what extent, and if so, how, does the childhood household structure influence the survival chances of adults? To examine this issue, we estimated a series of Cox's semi-parametric regression models on survival from age 18 onwards. In these models, we included controls for sex, father's occupation, parental religion and place of birth. The models vary with regard to the exact indicators of childhood household structures included. The estimated effects for the childhood household structure variables are presented in Table 2.

Table 2 about here

The first question we addressed is whether persons who have ever experienced a period during childhood in which they lived without both natural parents have different survival chances than people who have always lived with both natural parents. We examined this issue in Model 1 in Table 2. About 30 percent of all

persons have ever experienced a childhood spell without both natural parents. We found a statistically significant effect of such living conditions on survival chances in adulthood. However, the sign of the relationship was quite unexpected. Starting from the idea that periods without both natural parents can be viewed as periods of relative deprivation experienced by the child, we would expect a negative effect on survival (and a positive effect on the risk of mortality). However, we observe the opposite effect. Persons who have ever lived without both natural parents during childhood have a 20 percent *lower* mortality rate during adulthood than persons who have always lived with both parents until age 15. To get a better understanding of what aspect(s) of childhood household structure 'causes' this unexpected finding, we performed a series of additional analyses.

In Model 2 in Table 2, we examined whether it is just the mere exposure of children to households without both parents or the number of years exposed to living without both parents that counts. On average, persons have spent almost three years without both natural parents until age 15. The number of years spent without both natural parents shows the same unexpected sign (the longer one has spent without both natural parents the lower the mortality rate is), and its *p*-value is even stronger than for the dummy measure in Model 1.

Next, we examined whether the kind of household structure children lived in made a difference. We specified five continuous variables, indicating the number of years children spent with a father and a stepmother, a mother and a stepfather, with mother only, with father only, and with no natural parent. The results of the analysis are presented in Model 3 in Table 2. Only one of the five indicators shows a clear significant effect. The longer children spent in a father-only family, the lower their adult mortality rate. This seems to indicate that living with your father only (or maybe it is better to say without your natural mother?) is the prime factor accounting for the unexpected finding from Model 1.

In a forth step, we focussed on the timing of loss of parents. It has been suggested that the loss of a parent (and in particular the loss of the mother) during the first year is particularly devastating for the health and the survival chances of their children. To examine this issue we estimated two further models. In Model 4 in Table 2, we report the effect of being without one or both parents during (part of) the first year of life and the effect of being without parents after the first year. Eight percent of all persons who survived until age 18 had lived without one or both parents during (part of) their first year of life, whereas an additional 22 percent had lived without one or both parents at a certain moment after age 1. Adults who have spent part of their first year without one or both parent are found to have a lower mortality than persons who spent their whole childhood with both parents. Adults who spent part of their childhood after their first year of life without a parent have the same survival chances as adults who spent all their childhood in an intact family. This finding suggests that the household structure during the first year of life is the important factor, rather than the household structure during childhood as a whole. Therefore, in Model 5 we focussed in more detail on the first year by creating two dummy variables, indicating whether adults had lived (part of) their first year without their natural mother or without their natural father. About four percent had spent (part of) their first year without their natural mother, whereas six percent had spent (part of) their first year without their natural father. It is clear from Model 5, that having spent part of your first year

without your natural father had no impact on adult survival. However, persons who spent (part of) their first year without their natural mother had a much lower adult mortality rate than persons who had lived with both natural parents.

In a final model, we examined whether the relationships found in Model 5 held for both men and women. As the results show, it did not. In fact, having lived without your natural mother only increased the adult survival chances for men and not for women.[3]

Figure 1 about here

It is not easy to account for this unexpected finding (if one is willing to take it seriously at all). One possible explanation could be that some kind of selection process is at work. Children who are deprived of their mother during the first year of their life run a very high mortality risk during the early years of childhood. It could be that only the strongest survive, and that these have a relatively high chance of survival compared to other adults. The data are to sparse to allow for a thorough test of this possibility, but as a kind of preliminary test, we estimated the survival curves for men who lived part of their first year without their mother and those who lived the whole of their first year of life with their natural mother. Figure 1 presents the two curves. They show a pattern that clearly conforms to the selection hypothesis. At young ages, persons who were deprived of their mother during their first year of life run a much higher mortality risk, but the pattern reverses later on. This process is nicely illustrated by the crossing of the two survival curves.

Other childhood factors

In addition to household structure, a number of other childhood factors have been examined.
Attention has been paid to father's occupation, region of birth and parental religion. Descriptive information on these variables is presented in Table 3.

Table 3 and Table 4 about here

About half of the fathers living in these remote areas of Zeeland were unskilled laborers. The proportions who were members of the elite, the petty bourgeoisie or were clerks were so small, that we collapsed them into one category. Fifteen percent of all fathers belong to these relatively well to do classes. Thirty percent of all fathers were either farmers or skilled laborers. [4]

About one quarter of all respondents lived on the island of Tholen during their childhood, whereas three quarters lived in Zeeuws-Vlaanderen. Within Zeeuws-Vlaanderen, the majority lived in the Eastern-part of the region.

[3] However, one has to notice that the absolute number of persons who had spent part of their first year without their mother and survived until age 18 is very low (15 for males, 8 for females). This underscores our earlier remark on the need for a larger sample to test these issues much more thoroughly.

[4] Analyses with separate categories for all classes did not show different effects for these classes. We pooled those classes who were relatively close in prestige and effect size.

Parental religion was fairly evenly divided between Catholicism and Protestantism. Forty-two percent of all persons were 'born' into a Catholic family, whereas fifty-eight percent were born into a Protestant family. The relatively high proportion of Catholics is mainly due to their dominant position in the Eastern part of Zeeuws-Vlaanderen, a dominance which is caused by the fact that only after the middle of the 17th century this are became part of the Republic.

We present the effects of these factors on adult mortality, based on Model 5 from Table 1. Parameter estimates are presented in Table 4. As can be seen from Table 4, none of the childhood factors (apart from childhood household structure) exert a statistically significant effect on adult survival. In addition, no effect of year of birth on adult survival is visible.[5] The only additional statistically significant effect is for sex, with men (as expected) having a higher adult mortality rate than women.

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[5] However, there is a clear effect of year of birth on child survival, with later born children having higher rates of survival than earlier born children.

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