

The Geographic Dimension of Intergenerational Proximity in the Netherlands

Work in Progress

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Introduction

The consequences of current developments of population ageing and population decline require insights and understanding of how societies have to come across needs for support for the older population, but at the same time for the younger population as well. On the one hand, the feminization of old age, an increasing share of the very old persons and greater variation in family structures make older people make greater use of institutional services (Grundy 1991) whereas on the other hand household earnings in the Netherlands are based on 1.5 or 2 incomes generating a demand for child care as a result of increased labour force participation of women.

Support by family and the state are complementary to each other and whereas cutbacks in state support will play a greater role in the future provision of institutional care, (informal) support within the family may become more important than it was before (Mulder and Van der Meer 2009).

In many European countries care for the elderly is primarily a concern for public institutions. Dutch policies, for example, strive to stimulate people to live independently as long as possible though subsidizing adaptations to houses and providing formal care at home (Bloem, van Tilburg et al. 2008) which will put pressure on both formal and informal care institutions in the near future. Within the Dutch care regime, childcare is characterized to be a predominantly private responsibility (Kaptijn, Thomese et al. 2010) .

In contrast to the perceived negative consequences of population decline and ageing, two structural processes allow for a more intense relationship between (grand) parents and (grand) children which can benefit informal support and care giving; increased longevity and improved health conditions allow the lives of generations to overlap for a longer period of time; decreased fertility leads to fewer (grand) children per (grand) parent (Geurts, Poortman et al. 2009). These processes could explain why even though family structures are changing, a substantial part of the exchange of goods and services remains to occur within the family (Komter and Vollebergh 2002).

Research indicates that adult children, and daughters in particular, are more likely than any other group of potential caregivers to provide personal and medically related care to elderly persons (Spitze and Logan 1990; Klein Ikkink, Van Tilburg et al. 1999; Komter and Vollebergh 2002; Michielin, Mulder et al. 2008; Mulder and Van der Meer 2009) . Since family relatives are the first alternative when parental care is not available, grandparents are the most important source for (complementary) childcare (Hank and Buber 2009; Kaptijn, Thomese et al. 2010). Thus, instead of relying on formal care facilities only, 'living close to family members could be a way to facilitate intergenerational contact, support and care at times when the financing of public care institutions may be at risk' (Pettersson and Malmberg 2009).

These insights show that the exchange of instrumental support requires structural conditions like the household composition of kin (having children) and the actual or perceived need for support (being older or having children). Knijn and Liefbroer (2006) indicate that besides these conditions geographic proximity and the availability of resources contribute to the exchange of instrumental support as well.

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Interaction and transfers of assistance across generations are very sensitive to the geographic distance between older parents and their adult children, making distance the strongest predictor of assistance exchange among family members that require physical presence (Rogerson, Burr et al. 1997).

Various studies have shown the (negative) relation between geographic distance and support levels (Lawton, Silverstein et al. 1994; Van Tilburg, Groenou et al. 1995; Greenwell and Bengtson 1997; Hank 2007; Bordone 2009; Mulder and Van der Meer 2009) and according to Hank and Buber (2009) there is a positive relationship between geographic proximity and the propensity of grandparents to provide care to their children. Another study shows that more contact, affection and involvement with grandchildren is measured when older parents live closer to their children (Silverstein and Angelelli 1998).

A combination of the above societal changes and the important role of kin in the provision of support and caretaking show that not only insight into the composition and characteristics of the population is relevant to understand and predict (future) care and support needs, but also the geographic landscape of family networks matters. Although geographic distances in the Netherlands are not very large, travel distance restrains relationship maintenance significantly in the Netherlands (Bloem, van Tilburg et al. 2008). Empirical results show that for the Netherlands a distance of over five, rather than under five kilometres made a great difference for support exchange, whereas distances over 20 kilometres are associated with less support and for 60 kilometres this effect is stronger (Knijn and Liefbroer 2006).

Concerning intergenerational proximity, a lot of research has been conducted on whether and how proximity affects issues like support, assistance and care, whereas the determinants of proximity have been investigated thoroughly as well. Unfortunately among these determinants, little research has been done on the characteristics of the family landscape itself. For the Netherlands, one study has focused on the pattern of geographic proximity in particular; Michielin and Mulder (2007) found that, from the perspective of the adult children, parental characteristics do not explain proximity very strong, whereas life course events of the children do (Michielin and Mulder 2007). Pettersson and Malmberg (2007) were the first to approach intergenerational proximity with register data approaching distance from both the perspective of the parents and the children as well, although in separate models.

Although place of residence approaches the institutional context in which individuals are living, and therefore the resources they have access to, in both studies the spatial aspect in explaining intergenerational proximity has received little attention. The exploration of the relation between intergenerational proximity and its regional determinants will therefore be the main contribution of this paper. By gaining insight into the geographic dimension of proximity in the Netherlands, this study enables us to say something about whether, and to what extent social support networks in regions of population decline and population ageing are at risk.

Secondly, we extend previous analyses with the inclusion of demographic characteristics of both generations in one model. Based on the findings of Mulder and Michielin (2007), life course events of children are included since they are of importance in order to explain and understand intergenerational geographic distance, solidarity and support giving (Michielin and Mulder 2007). Malmberg and Petterson did not model the characteristics of both parents and children together which may have limited their results. For this reason we explore whether children's characteristics contribute indeed more to the explanation of intergenerational proximity than only parental's characteristics do.

For obtaining insight in the contributions of independent variables on distance, we will incorporate a broader set of distances than Malmberg and Petterson were able to do. They limited to analyse two very extreme distances, i.e. living within 100 meters and 50 kilometres. Since studies have indicated

that support level already differ within 5 kilometres, we will approach intergenerational proximity with more nuanced distances, i.e. 1, 5, 20 and 60 kilometres.

Finally, the Swedish study limited their analysis on the closest child; we will incorporate the dyads of parents with all their children to avoid bias through selection effects.

The overall research question that will be dealt with in this paper is:

What is the level and pattern of geographic intergenerational proximity in the Netherlands and how does it vary across demographic and spatial characteristics of parents and children?

Theoretical framework

The social production function and the enabling role of intergenerational proximity for well being

Geographic proximity of close kin members is essential to look at since geographical distance can be described as ‘a dimension of structural solidarity that enables face-to-face interaction and exchanges of instrumental support between generations and should encourage emotional intimacy insofar it facilitates social contact and increases the opportunities for shared experiences’(Lawton, Silverstein et al. 1994).

The Social Production Function theory (Ormel, Lindenberg et al. 1999) is a good basis for understanding the importance of structural solidarity for individuals. Five instrumental goals that individuals strive for in order to reach physical and social well being are at the basis of this theory; stimulation and activation, comfort, status, behavioural conformation and affection (figure 1). Various activities and resources for these activities are required in order to obtain these goals. Geographic proximity facilitates certain activities and resources; for example, an intimate tie requires physical closeness.

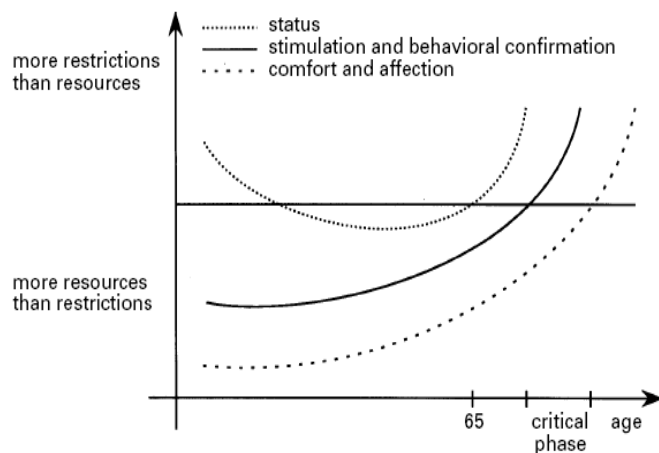
Figure 1: Social Production Function Theory

Top level			Subjective well being		
Universal goals					
	Physical well being		Social well being		
First order instrumental goals	Stimulation Activation	Comfort	Status	Behavioural Confirmation	Affection
Activities and endowments (examples)	Physical and mental activities producing arousal	Absence of pain, fatigue, thirst, hunger, vitality, good housing, appliances, social welfare, security	Occupation, life style, excellence in work or sports	Compliance with external and internal norms	Intimate ties, offering emotional support
Resources (examples)	Physical and mental effort	Food, health care, money	Education, social class, unique skills	Social skills, competence	Spouse, empathy, attractiveness

Source: adapted from (Ormel, Lindenberg et al. 1999).

Individual resources are not stable over the life course which make particular instrumental needs more likely to be lost than others; status and stimulation are for example more difficult to maintain than affection and comfort are, see figure 2. If the latter two become more difficult to obtain, individuals become confronted with a critical stage where intervention is needed in order to secure their well being (Steverink, Lindenberg et al. 1998). Research has shown that through compensation and substitution of lost resources, one is able to retain the balance for a particular period of time although every individual differs in upholding and rebalancing their resources.

Figure 2: Instrumental goals over the life course



Source: adapted from (Steverink, Lindenberg et al. 1998).

Providing and receiving care and support can have a particular function in this optimization process but can differ by individual demographic, socioeconomic characteristics and histories, health condition, and, very important in the context of this research, by geographic proximity. Adjustment of geographic proximity to close kin could be strategy to uphold certain required resources in order to sustain well being.

Intergenerational proximity over the life course

Proximity is a difficult concept to unravel because it is a result of complex processes of location choice, migration and residential mobility (Mulder and Kalmijn 2006). But although complex processes underlie proximity, it is not a complete result of coincidence, particular patterns do exist. Distance between elderly and their adult children is shaped by past residential mobility of both parents and their children (Mulder and Kalmijn 2006) and therefore 'proximity in later life is a consequence of migration decisions reflecting changing needs and resources of both generations over time' (Mulder and Cooke 2009). These changing needs and resources refer to the fulfilment of instrumental goals and therefore reflect the social production function theory.

From the literature we know that migration has a particular pattern by age; Lin (1995) developed a so called intergenerational proximity development cycle model which results from a combination of specific migration patterns of two generations. The model shows a curvilinear association of age with distance, i.e. distance increasing with age for the young-old, and decreasing with age for the old-old (Lin and Rogerson 1995).

The largest changes in proximity are expected to take place in the years when the child is a young adult and when the parent(s) reach retirement age (Rogerson, Burr et al. 1997). Individual needs pull young adults to more urban areas with more possibilities for education, work and meeting friends and potential partners. In the second stage the process of intergenerational separation encounters stabilization and adjustment since young adults establish careers and families. With the presence or arrival of grandchildren, intergenerational involvement may begin to increase (Rogerson, Burr et al. 1997). In the last stage, proximity between parents and adult children tend to become greater; both generations have low mobility rates and may have the desire for closer proximity and/or dependent living arrangements. Elderly's declining health, together with the fact that families with young children perceive a high burden of care, parents and their adult children may benefit from each other presence close by (Rogerson, Burr et al. 1997).

Demographic and socio economic determinants of intergenerational proximity

Proximity between parents and their adult children can be approached by life stages, but since specific life course events occur within these stages demographic characteristics like sex, marital status, migration histories, and the available number of children should not be neglected (Dykstra and Knipscheer 1995; Lin and Rogerson 1995; Rogerson, Burr et al. 1997; Mulder and Kaptijn 2006; Hank 2007; Michielin and Mulder 2007; Bloem, van Tilburg et al. 2008; Michielin, Mulder et al. 2008; Bordone 2009; Hank and Buber 2009; Mulder and Van der Meer 2009; Hjalml Pettersson 2011).

On the one hand, women move more than men do, and end up further away from their parents compared to their brothers while on the other hand, a study of Malmberg and Pettersson (2007) found for Sweden that at higher ages this gender difference diminishes, which could be explained by the fact that at higher age women might be more likely to move towards their parents, or, the parents themselves could move closer towards their daughter since they are more eligible in providing care and support than sons are (Pettersson and Malmberg 2009; Smits 2010). According to Spitze and Logan (1990) the expression of responsibility is different for men and women, or son and daughters. Men and women are different in feeling responsible and providing caring activities for their elderly parents. Concerning child care, grandparents from the mother's side are more likely to take care of their grandchildren than the mothers of the fathers side do. This refers to the fact that needs of men and women differ and they make use of different activities and resources to fulfil certain instrumental goals.

Since marital status determines the type of living arrangement but also individual's resources and needs, marital status has particular implications for geographic proximity between parents and their children.

Unmarried persons seem to live closer to their parents or children than married persons do; spending time with family might be more important to persons who are not married (Mulder and Van der Meer 2009). In this way unmarried persons can obtain resources needed to fulfil affection, which married persons most probably obtain from their partner.

Being in a relationship generates different needs and could be a major constraint on migration leading to lower intergenerational proximity. Even when people are not employed anymore, the costs of moving as a couple are greater than when moving alone because two persons are tied to one place, making married people less likely to move.

Feelings of reciprocity and obligation related to widowhood tend to make persons live closer to their children (Smits 2010), probably to rebalance the lost resources required for stimulation, comfort and affection.

Divorce most of the times implies a move since one of the persons, often the man, has to leave the household. Therefore, it becomes more likely that distance between the parent and child is affected. In general, divorced women live closer to children than men do which can be explained by feelings of obligation; women receive more assistance from their children after divorce or widowhood than men do. Children tend to move more towards their mother than to their father in these situations (Smits 2010), feelings of obligation and behavioural conformation could play a role in their decision making process. Especially for men, divorce may result in a lower attachment to the family (Komter, Knijn et al. 2006).

Another demographic factor that influences proximity between parents and children is the number of children people have. Having only one child makes it more likely for elderly to move or live closer because parents do not have to choose between multiple children. On the other hand, the only child could be less mobile due to responsibilities for taking care of the parents, or because they themselves are depending on support from their parents (Pettersson and Malmberg 2009; Smits 2010). Again, behavioural conformation could play a role here.

Various studies have shown that education is an important predictor of mobility and therefore the spatial distribution of parents and children; according to Kalmijn (2006) there is a sharp educational gradient in contact and proximity where each year of schooling would lead to a 17 percent increase in distance, where 42 percent of the primary educated live close (0-2 kilometres) to their parents, whereas only 10 percent of the children with university education do. Since educational level not only determines adequate locations for education and employment, it also affects the timing and occurrence of a number of demographic behaviours. Considering the elderly, education of both parents and children determines for example the likelihood of, and age at, becoming a (grand)parent (Komter, Knijn et al. 2006).

Spatial determinants of intergenerational proximity

Geographic distance is derived from residential locations which are the result of complex processes of location choice, migration and residential mobility (Mulder and Kalmijn 2006). Therefore place of residence determines distance between parents and children to a large extent. Since more urban areas have a broader set of institutions for (high skilled) education and employment, offer more cultural and leisure facilities and have more affordable housing possibilities (Feijten, Hooimeijer et al. 2008), young people tend to move towards the more urban areas. After being pulled to more urban areas, during the phase of family formation especially middle class households are likely to move to suburban areas which can be associated with family living (Feijten, Hooimeijer et al. 2008).

After retirement some return to their place of birth. Some rural areas are less attractive to (re)settle due to the lack of urban facilities, which enforce processes of population decline and population ageing. For the Dutch situation this is especially the case for the Northern and Southern Netherlands; Groningen, Zeeland and Limburg are areas that suffer most from the consequences of population aging and decline (Haartsen and Venhorst).

Based on the above theoretical insights our expectations for the role of demographic and regional characteristics to intergenerational proximity are captured within the following hypothesis:

Expected demographic effects:

1. Intergenerational proximity increases with the age of the parent
2. Women live closer to their children than men do, whereas daughters live closer to their parents than sons do.
3. Single and widowed persons live closer to their parent or child than married and divorced persons do
4. Proximity becomes smaller with increasing number of children.
5. Grandparents live closer to their children than parents who do not have grandchildren (yet).
6. Demographic characteristics of the child to have a stronger effect on intergenerational proximity than the demographic characteristics of the parents have.

Expectations for the effect of spatial determinants

7. Intergenerational proximity is higher in more urban areas.
8. Intergenerational proximity is greater in more traditional areas.
9. Parents living in urban areas live closer to their children than parents living in more rural areas.
10. Children living in more urban areas live further away from their parents than children living in more rural areas.
11. The presence of an university make children live further away from their parents, but make parents live closer to their children.

Data and methods

Investigating intergenerational proximity with register data

To approach geographic distance between older parents and their children, register data enables us to study a large, nationally representative population. In addition, it provides the possibility to create a complete spatial overview of intergenerational proximity.

For the Netherlands, the Netherlands Central Bureau of Statistics (CBS) is responsible for the 'Gemeentelijke basisadministratie' (GBA) which is a register-based dataset based on municipal population registers and other registers. The GBA enables to trace all the individual residential locations and relocations of all people living in the Netherlands. Record linkage between parents and adult children allows for the investigation of geographic distance between them over time. The GBA is introduced on 1 October 1994 which means that residential addresses, relocations and other mutations can only be traced back until that particular date.

Study population

Birth cohorts before 1954 are selected as a set of potential parents from the *GBA1995-2009* dataset which results in over 6.6 million individuals being 55 years or older. Registered children of these persons can be identified by making use of the *GBAOK1995-2009* dataset. Because only addresses of persons registered in the Netherlands are available, dyads in which a parent or a child lives abroad for the whole period 1995-2009 cannot be captured and are therefore not included in the population under study. In order to distinguish change over time and age, it is chosen to work with five selected ages, i.e. 55, 65, 75, 85 and 95. This selection enables us to study nearly 6 million dyads, see table 1. Due to higher longevity of women less dyads with men at older ages are present.

Table 1: Available dyads in GBA for the ages 55, 65, 75, 85 and 95 for the period 1995-2009

	55 years	65 years	75 years	85 years	95 years	Total
Men	516,218	782,137	783,562	488,043	133,900	2,703,860
Women	586,736	827,609	924,936	679,546	245,570	3,264,397
Total N	1,102,954	1,609,746	1,708,498	1,167,589	379,470	5,968,257

Source: based on own calculations GBA1995-2009, Statistics Netherlands (2010).

Operationalisation of intergenerational proximity and the explanative variables

The physic characteristics of the Dutch landscape and a dense infrastructure system do not lead to serious barriers in geographic distance between inhabitants (Haandrikman, Harmsen et al. 2008). For these reasons geographic proximity is measured with Euclidean distances, or 'as the crow flies', by calculating the distance of the straight line between the geographic coordinates of the geographical midpoints of neighbourhoods at a particular age of the parents.

Characteristics of the demographic and spatial explanatory variables of parents and children are reconstructed from the register data; time varying variables, are based on the selected age of the parent within the dyad. Demographic characteristics of the parent are sex, age, marital status and number of children. For children sex, the presence of a sister, marital status and whether or not having children are incorporated. The spatial determinants are the degree of urbanisation of the place of residence of both the parent and the child. The variable contains a separate category when a municipality has a university. For the parents' place of residence at NUTS 2 level is taken in order to gain insight in the spatial distribution of social support networks available for the elderly. Co-resident parents or children are included in the analyses, although not defined as a separate variable. Frequency distributions of the independent variables can be found in the appendix.

Logistic regression

It is chosen to work with both descriptive methods and logistic regression models since we are interested in the likelihood for parents to live at a particular distance from children and to explore the role of demographic and spatial determinants in this likelihood. For Sweden, Pettersson and Malmberg (2009) described that at a 100 meter distance help and support can be carried out on a

daily basis, while a 50 kilometres distance represents a commuting distance and the possibility to meet and socialise. For the Netherlands these cut points could be valid as well, but we consider 100 meter as too close and therefore choose to use one kilometre as first cut off point; living within one kilometre distance enables persons to contact each other on a daily basis without costing too much effort and mobility restrictions. A distance of five kilometre is the second cut point for the reason that empirical results show that for the Netherlands a distance of over five, rather than under five kilometres made a great difference for support exchange (Knijn and Liefbroer 2006). Finally, 20 and 60 kilometres will be modelled because the same study found that distances over 20 kilometres are associated with less support whereas for 60 kilometres this effect is stronger.

Descriptive findings

We find that 86 percent of the persons older than 55 live within 40 kilometres distance from their children see table 2. This is in line with the findings of Dykstra and Knipscheer (1995) who found that 86 percent of the persons who are aged 55 to 89 years have at least one child living within 30 minutes travelling distance. According to Mulder and Kalmijn (2006) the average distance between parents and children is just over 29 kilometers. For Sweden, Pettersson (Malmberg and Pettersson 2007; Pettersson and Malmberg 2009; 2011) found that 85% of all elderly have at least one child within a 50 kilometer radius (Hjalm Pettersson 2011). Concerning proximity, we find that over one third of the of the persons who live within a 60 km radius live within 100 meters from their children, 16 percent within one kilometre. Children who did not leave the parental home yet are included in the population under study. When excluding the age category of 55 years, nearly one quarter of the parents live within 100 meters from their children, 30 percent within one kilometre.

Table 2: Cumulative distribution of selected distances for both sexes, in percentages by age or the parent

	Age 55	Age 65	Age 75	Age 85	Age 95	Total 55+	Total 65+
< 100 m	67.3	31.9	23.3	20.7	19.2	38.8	26.0
<1 km	80.0	58.6	49.9	46.1	44.1	60.9	52.4
< 5km	89.2	78.6	72.1	69.3	67.1	78.7	74.1
<20 km	92.7	85.7	80.7	78.9	76.5	85.4	82.3
<40 km	94.7	89.6	85.6	84.6	82.5	89.3	87.1
<60 km	97.3	94.7	92.0	92.2	90.9	94.4	93.3
<100 km	99.1	98.3	68.7	97.5	97.0	98.2	98.0

Source: GBA1995-2009, Statistics Netherlands (2010).

Demographic dimension of intergenerational proximity

Intergenerational proximity seems to increase by age of the parent, figures 3 and 4, a pattern which is not in line with the intergenerational proximity cycle from Lin from which we would expect proximity to become greater by age. For the Dutch situation the descriptives do not show a very distinct difference between the sexes; women seem to live somewhat closer to their children, whereas sons seem to live somewhat closer to their parents than daughters do.

For the Dutch situation marital status matters, although the differences between marital status of the children seem to be smaller than they are for the parents, figures 5 and 6. Unmarried persons seem to live closer to their parents or children than married persons do.

Figure 3: Distance (in km) between parents and children, by age and sex of the parent

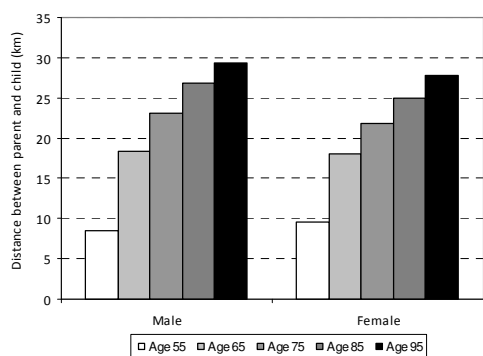


Figure 4: Distance (in km) between parents and children, by age of the parent and sex of the child

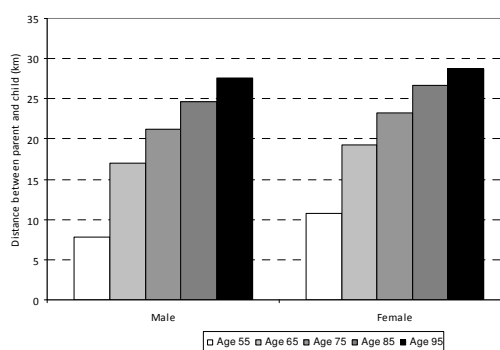


Figure 5: Distance (in km) between parents and children, by age and marital status of the parent

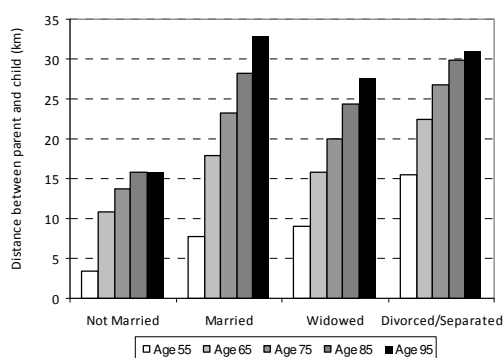
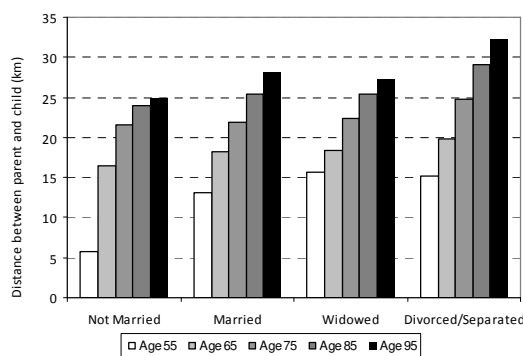


Figure 6: Distance (in km) between parents and children, by age parent and marital status of the child



Source: GBA1995-2009, Statistics Netherlands (2010).

Another demographic factor that influences proximity between parents and children is the number of children people have. When a child has one or more siblings, he or she seems to live further away from the parent as when being the only child. Especially at older ages, 75 and above, this becomes clear, see figure 7. Although relocation decisions of elderly in the Netherlands are more often based on the desire for contact among the generations rather than a need for help (Van Diepen and Mulder 2009), figure 8 does not show impressive differences in distance between parents and children with or without the presence of grandchildren

Figure 7: Distance (in km) between parents and children, by age and number of children of the parent

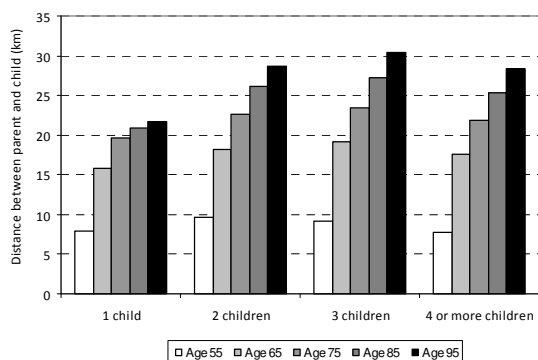
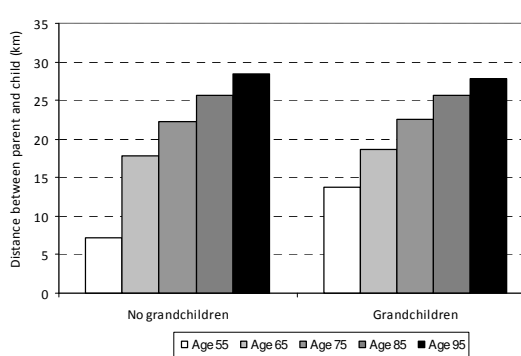


Figure 8: Distance (in km) between parents and children, by age and grandparental status of the parent



Source: GBA1995-2009, Statistics Netherlands (2010).

Spatial dimension of intergenerational proximity

The degree of urbanisation of the municipality where the parent lives does not seem to matter a lot, although the less urban the greater the distance between parents and children seem to be. When looking at the degree of urbanisation of the municipality in which the child lives it immediately becomes clear that the reverse pattern is shown; children living in more rural areas seem to live closer to their parents than children living in urban areas do. Interestingly, children living in a municipality that has a university seem to live much further away from their parents.

Figure 9: Distance (in km) between parents and children, by degree of urbanisation parent

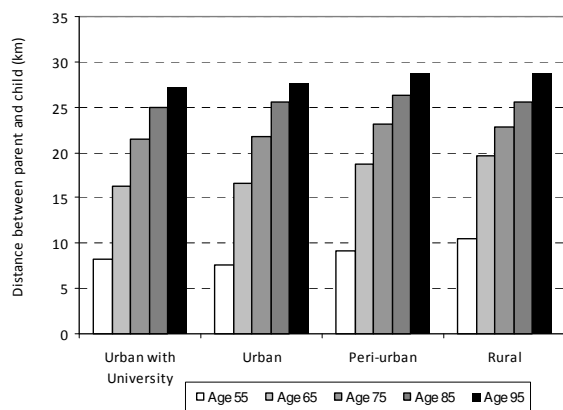
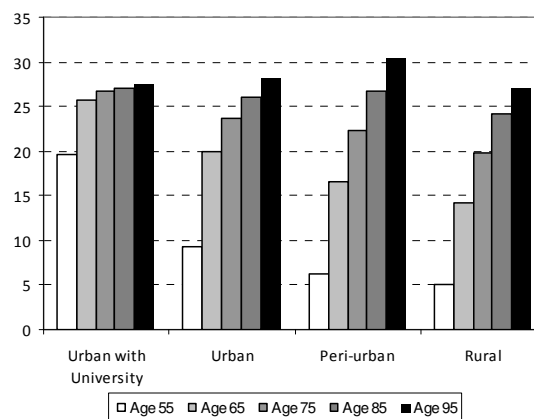


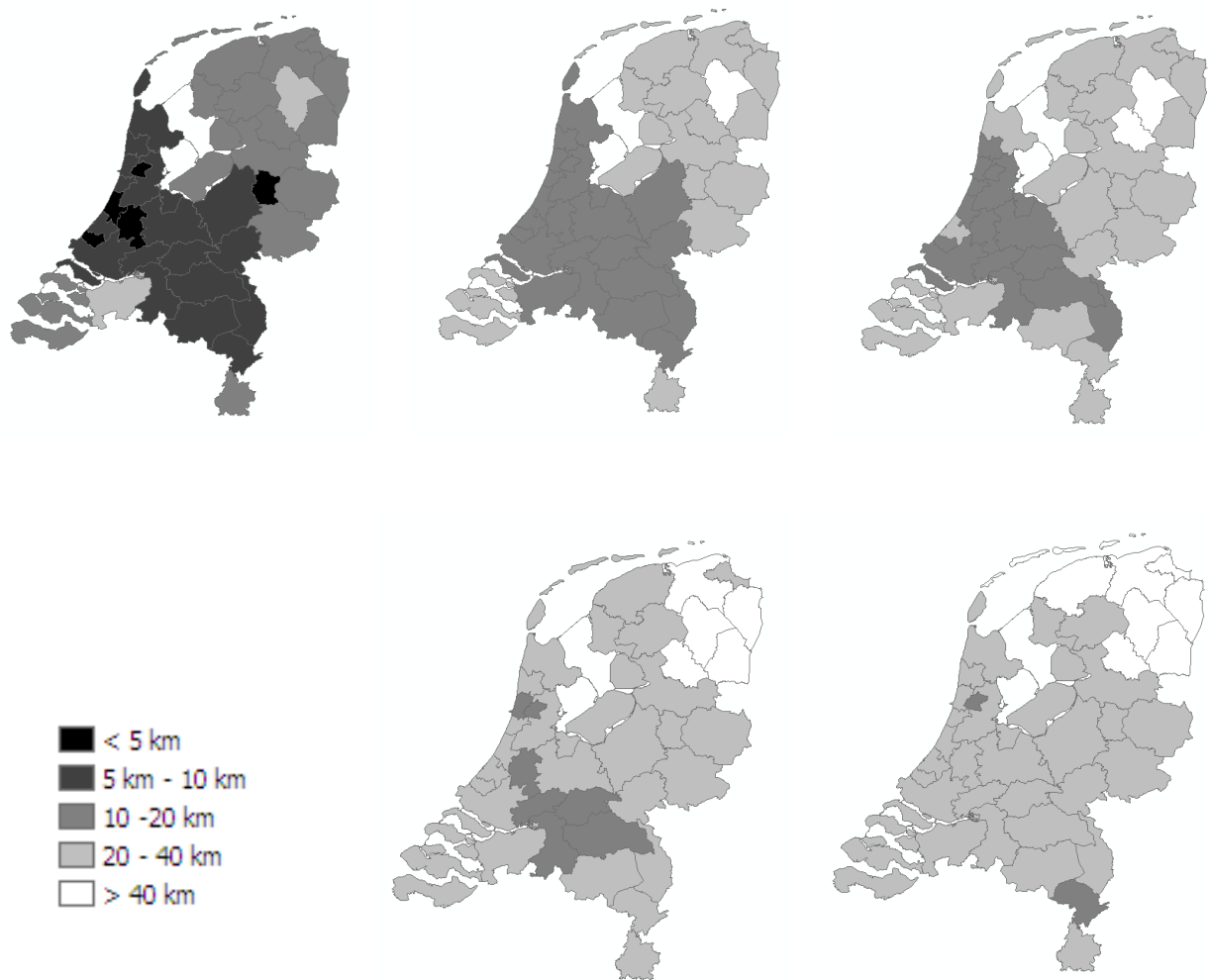
Figure 10: Distance (in km) between parents and children, by degree of urbanisation child



Source: GBA1995-2009, Statistics Netherlands (2010).

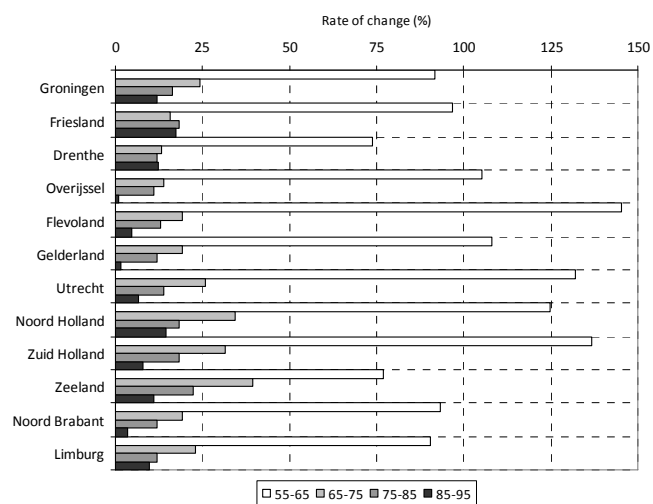
Besides degree of urbanisation we also expect intergenerational proximity to differ by residential location of the parent which indeed seems to be the case when looking at the maps in figure 11; for all NUTS 3 level districts distance increases by age, whereas the rate of increase is not equal for each area, see figure 12 for more details. If looking at the rates of change in distance by age as represented in figure 11, in Flevoland the highest difference in distance between the ages 55 and 65 is shown. Change in intergenerational distance between the age 65 and 75, are highest among the provinces in the Randstad (Noord Holland, Zuid Holland en Utrecht) and Zeeland. Of course these figures do not show whether proximity is changed because of the mobility of the parents or the child, but it seems that in the more rural areas distance increases most when parents (and therefore their children as well) are younger, or, when their children leave the parental home. At higher ages the distance between parents and children is increasing most in the Randstad which could refer to mobility of children or parents. For different reasons both could decide to live in the more suburban areas, as well more in the centres. Nevertheless whether proximity is affected by the mobility of parents or children is outside this scope of this paper.

Figure 9: Distance (in km) between parents and children, by age (55, 65, 75, 85 and 95) of the parent and COROP area



Source: GBA1995-2009, Statistics Netherlands (2010).

Figure 12: Rate of change in distance between parents and children, by age of the parent and province



Source: GBA1995-2009, Statistics Netherlands (2010).

Regression results

Modelling parental and children's characteristics

Since Mulder and van der Meer (2009) have shown that life course events of children are more important for explaining intergenerational proximity than parental characteristics are, table 5 shows the full model results when we include the characteristics of the children for predicting the likelihood of living at a certain distance from each other. The models include demographic and spatial characteristics of the parent and child at the moment the parent has a particular age. The model with parental characteristics only is presented in table A4 of the appendix. For the four selected distances the addition of each explanatory variable makes a significant improvement of all models.

It immediately becomes clear that the predictive power of the model improves when including the characteristics of the children. Nearly 40 percent of the variance (pseudo R²) in the likelihood of living within one kilometre is explained by the model, whereas for the model with parental characteristics only predicts 28 percent of the variance.

Nevertheless, with increasing distance the predictive power decreases, indicating that other factors besides the characteristics of the child remain important. Again, various studies have shown that education is an important predictor of mobility and therefore the spatial distribution between persons which could be the explanation for the decrease in predictive power with increasing distance.

Demographic dimension of intergenerational proximity

As expected, women are somewhat more likely to live closer to their children than men are, see table 4, but in contrast to our expectations for all distances the likelihood to live close diminish with increasing age of the parent. After controlling for the age of the children, the effect of age of the parents on the likelihood to live at a particular distance becomes less strong and constant over the various distances. When comparing the models, it becomes clear that especially the older and very old parents are least likely to live within a short distance from their children.

Considering the age of the child; the older the child, the less likely he or she will live close to his or her parent. Children below 20 years are four times more likely to live close to their parent than children in their twenties are. When the children are over 30 years the likelihood remains to decrease although the differences are not impressing different from each other.

As we expected, not married and widowed parents have a much higher likelihood of living closer than married and divorced or separated parents have. To a smaller extent than age of the child does, marital status of the child matters as well. After a five kilometres distance parents with not married children are somewhat more likely to live closer than parents with married children are. Non married or children in a partnership are more likely to live further away from their parents than married, widowed or divorced children are. Educational status could explain this finding, since it are the higher educated that are more likely to live further away because of educational and occupational reasons. At the same time this group is less likely to marry.

Then, the number of children a person has does not show a very strong effect on the likelihood of living close although having two children make people more likely to live closer. Having more than three children leads to lower intergenerational proximity.

In contrast to our descriptive findings, for all distances daughters are more likely than sons to live closer to their parents which is in line with our expectations considering the gender differences in the expression of responsibility. Interestingly, a son with a sister is more likely to live close to his parents than a son without a sister is. The clustering effects of siblings could explain this outcome although for daughters having a sister a reverse effect is shown. The presence of a sister seems to attract sons to live closer, but daughters who have sister this is not the case.

Finally, having grandchildren make parents somewhat more likely to live closer to their children than those who do not have grandchildren. This effect is does not differ for the various distances indicating that it are other factors than distance explaining this pattern.

Table 4: Logistic regression models of intergenerational proximity
with demographic and spatial characteristics of both parents and children (odd ratios)

	1 km	5 km	20 km	60 km
Constant	0.631	1.872	3.655	11.661
<i>Sex parent</i>				
Male	1	1	1	1
Female	0.96	0.99	1.00	1.02
<i>Age parent</i>				
55 years	4.25	3.53	3.64	3.52
65 years	1.30	1.30	1.35	1.33
75 years	1	1	1	1
85 years	0.84	0.79	0.76	0.77
95 years	0.74	0.69	0.65	0.65
<i>Marital status parent</i>				
Unmarried	0.86	1.32	1.58	1.61
Married	1	1	1	1
Widowed	1.09	1.12	1.18	1.21
Divorced/Separated	0.35	0.55	0.64	0.70
Partnership	0.33	0.47	0.52	0.59
<i>Number of children parent</i>				
One child	1	1	1	1
Two children	0.70	0.77	0.77	0.80
Three children	0.67	0.75	0.76	0.77
Four or more children	0.67	0.80	0.94	0.84
<i>Degree of urbanisation parent</i>				
Urban, with university	1.16	1.06	1.60	1.63
Urban	1	1	1	1
Suburban	1.01	0.88	0.84	0.85
Rural	1.08	0.73	0.77	0.77
<i>Place of residence parent</i>				
Groningen	0.74	0.86	0.76	0.40
Friesland	0.77	0.78	0.62	0.36
Drenthe	0.59	0.67	0.52	0.29
Overijssel	0.96	1.15	0.92	0.42
Flevoland	0.75	0.73	0.48	0.47
Gelderland	0.99 ^a	1.09	0.94	0.55
Utrecht	1	1	1	1
Noord Holland	1.00 ^b	1.11	1.20	1.19
Zuid Holland	1.23	1.32	1.46	1.15
Zeeland	0.99 ^c	0.95	0.75	0.34
Noord Brabant	1.04	1.29	1.21	0.71
Limburg	1.17	1.55	1.44	0.60
<i>Period selected age parent</i>				
1995 – 1999	1.17	1.14	1.11	1.13
2000 – 2004	0.94	0.96	0.97	0.97
2005 – 2009	1	1	1	1
<i>Sex child</i>				
Son, without sister	1	1	1	1
Son, with sister	1.45	1.32	1.22	1.15
Daughter, without sister	1.55	1.39	1.27	1.18
Daughter, with sister	1.05	1.05	1.04	1.03
<i>Age child</i>				
Younger than 20 years	4.85	4.67	4.55	4.37
20 - 30 years	1	1	1	1
30 – 40 years	0.34	0.54	0.71	0.78
40 – 55 years	0.31	0.50	0.64	0.71
55 years and older	0.37	0.48	0.58	0.62

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continuation table 4

	1 km	5 km	20 km	60 km
<i>Marital status child</i>				
Not married	2.16	1.44	1.12	1.07
Married	1	1	1	1
Widowed	1.13	1.12	1.15	1.13
Divorced / separated	0.94	0.96	0.96	0.96
Partnership	1.13	0.86	0.75	0.76
<i>Grandchildren</i>				
No	1	1	1	1
Yes	0.96	0.99	1.00	1.02
<i>Degree of urbanisation parent</i>				
Urban, with university	1.16	1.06	1.60	1.63
Urban	1	1	1	1
Suburban	1.01	0.88	0.84	0.85
Rural	1.08	0.73	0.77	0.77
<i>Model summaries</i>				
N	5.968.257	5.968.257	5.968.257	5.968.257
LL	6007385	6941680	5504594	3577269
Cox & Snell R2	0.288	0.155	0.097	0.061
Nagelkerke R2	0.389	0.210	0.151	0.126
Degrees of freedom	43	43	43	43

Source: based on own calculations GBA1995-2009, Statistics Netherlands (2010)

All odds ratios are significant at $p < 0.01$

a: significance 0.156

b: significance 0.878

c: significance: 0.064

Spatial dimension of intergenerational proximity

We expect that the effect of urbanisation level differs by generation. The results show that in most cases parents who live in the more urban areas are more likely to live close to their children than parents living in the other areas do. The likelihood of living very close to parents is highest in the rural areas and is nearly at the same level of urban areas.

As expected, the degree of urbanisation of the municipality in which the child is living shows a clear reverse effect; children living in urban areas are least likely to live close to their parent whereas children living in suburban and rural areas are more likely to live closer. Children living in municipalities that have a university are least likely to live close to their parent, which could reflect the positive relation of educational status on distance. This finding refers to existing knowledge about the educational effect on intergenerational proximity. According to Komter and Knijn (2006) those persons having had an education up to primary level, live at an average distance of 24 kilometres from their family members; for those with an university degree this is 55 kilometre (Komter, Knijn et al. 2006). The incorporation of the presence of a university can be a proxy for the level of education of the child.

When including children's demographic characteristics, the effect of place of residence of the parent on explaining geographic proximity does not change considerably compared to the models with parental characteristics only. When looking into more detail at the regions in which the parents live, not much difference is found between the provinces when living at very close distance (within one kilometre). With increasing distance the likelihood of living close becomes weaker for the more rural provinces. In the more urban provinces Noord- and Zuid-Holland parents are clearly more likely to live at a shorter distance from their children than parents living in other areas are. Due to the fact that the economic centre of the Netherlands lies in the Western part of the country, distance between parents and children is greatest in the more rural Northern and Southern parts of the country i.e. parents living in the Northern provinces and Zeeland are most likely to live at a longer distance from their children. Interestingly, the Southern provinces Noord-Brabant and Limburg show a higher likelihood of living close as well. Historically these are more traditional (Catholic) areas where family norms and traditions may still be more important for intergenerational contact, support and proximity.

Intergenerational proximity is weakest for the province of Drenthe. Beside the fact that Drenthe is a popular region among pensioners, Drenthe does not have a university and colleges offer a selected range of studies which pushes young adults to leave the parental home for obtaining higher education elsewhere. This push factor could have the same effect for provinces like Friesland, Flevoland, Overijssel and Zeeland.

Conclusion and discussion

In this paper we have explored the level and pattern of intergenerational geographic proximity in the Netherlands and have estimated the impact of demographic and spatial characteristics on this phenomenon. Distances in the Netherlands are generally short and we find that 85 percent of the older parents live within 20 kilometres distance from their children. In comparison to other countries this may be relatively short, but it is certainly important since the provision of care and support diminishes substantially with increasing distance, especially in the case of close-kin relationships.

Our results confirm previous findings and theories about demographic determinants and mechanisms of intergenerational proximity and meet our expectations; described effects of marital status, sex, the number of children and having a grandchild are found. Interestingly, the expected effect of age is not in line with our expectations based on the intergenerational proximity framework; for the Dutch situation proximity between parents and children is decreasing by age of the parent. Although theoretical models indicate that at older age parents and children move closer to each other, this does not seem to be applicable for the Netherlands. The fact that this patterns does not show up in this large representative sample of nearly six million dyads could indicate that for the Dutch situation it is a very small proportion of the population who indeed increases their intergenerational proximity at older age of the parents. We therefore recommend investigating the intergenerational proximity adjustment process in future research. For this analysis we can conclude that in relation to support and caretaking of parents, children and/or grandchildren is arranged by members within the household itself, is taken care of by formal care institutes, or geographic distance is not a serious barrier in providing care and support.

Then, it is relevant to include the characteristics of the parent and the child together since it improves the explained variance of the models, but more importantly shows that especially the age of the child affects the effect of the age of the parents on intergenerational proximity substantially.

We also find that the regional dimension in explaining intergenerational proximity is an important element to take into account in future studies. As expected, intergenerational proximity differs by urbanisation level, although in a different direction for parents and children; we find that parents are more likely to live close to their children when they reside in urban areas, whereas children are more likely to live close to their parents when they live in more rural areas. This finding shows that it is of importance to distinguish between place of residence of the parent and the child since it implicates the opposite effect. Access to higher education and high skilled employment could be an underlying mechanism for this finding. We can therefore not simply assume that intergenerational proximity increases with degree of urbanisation.

We stated that the inclusion of place of residence of the parents at a particular age could enable us to get some insight into the support levels in different parts of the country. We found that parents who are living in the more urban provinces of the country are more likely to live close to their children than parents living in the other areas do. Among the more rural provinces, intergenerational proximity tends to be stronger for the more traditional (Catholic) areas than for the very Northern and Southern provinces. Of course, the higher ratios for the latter provinces can be explained by the fact that they are furthest away from the 'economic core' of the Netherlands but it remains of interest to obtain more information about intergenerational proximity in regions of population ageing and decline. And indeed, for Groningen and Zeeland the results show a smaller likelihood of close proximity between parents and their children. The negative effects of population decline could be a cause for this since

these regions to become less attractive to live, leaving the elderly behind, thereby resulting in lower intergenerational proximity.

Over the life course individual the fulfilment of instrumental goals require different activities and resources in order to sustain well being. For some, the adjustment of geographic proximity to close kin could be strategy to uphold certain required resources in order to sustain well being. This paper did not look at this adjustment process in particular, but when considering the demographic characteristics, the needs of for example widowed and single persons, but also being an only child or grandparent can be met when at the moment intergenerational geographic proximity facilitates certain activities and resources that are important for that person.

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Appendix

Table A1: Descriptive statistics explanatory variables - parental characteristics

	<i>N</i>	%
Total	5.968.257	100
<i>Sex parent</i>		
Male	2.703.860	45,3
Female	3.265.397	54,7
<i>Age parent</i>		
55 years	1.102.954	18,5
65 years	1.609.746	27,0
75 years	1.708.498	28,6
85 years	1.167.589	19,6
95 years	379.470	6,4
<i>Marital status parent</i>		
Not Married	20.790	0,3
Married	4.043.885	67,8
Widowed	1.505.178	25,2
Divorced/Separated	394.186	6,6
Partnership	4.218	0,1
<i>Number of children parent</i>		
One child	369.374	6,2
Two children	2.607.879	43,7
Three children	1.192.158	20,0
Four or more children	1.798.846	30,1
<i>Degree of urbanisation parent</i>		
High urban	915.245	15,3
Urban	1.618.307	27,1
Suburban	1.182.515	19,8
Rural	2.252.190	37,7
<i>Place of residence parent</i>		
Groningen	211.506	3,5
Friesland	274.658	4,6
Drenthe	166.559	2,8
Overijssel	424.247	7,1
Flevoland	86.110	1,4
Gelderland	773.435	13,0
Utrecht	377.800	6,3
Noord Holland	926.746	15,5
Zuid Holland	1.317.443	22,1
Zeeland	150.243	2,5
Noord Brabant	798.198	13,4
Limburg	461.312	7,7
<i>Period</i>		
1995 - 1999	627.369	10,5
2000 - 2004	2.213.596	37,1
2005 - 2009	3.127.292	52,4

Source : GBA1995-2009, Statistics Netherlands (2010)

Table A2: Descriptive statistics explanatory variables - characteristics of the child

	N	%
<i>Sex child and presence sister</i>		
Son, without sister	1.008.404	16,9
Son, with sister	2.071.003	34,7
Daughter, without sister	1.332.254	22,3
Daughter, with sister	1.556.596	26,1
<i>Age child</i>		
Younger than 20 years	424.662	7,1
20 – 30 years	1.340.164	22,5
30 – 40 years	1.574.044	26,4
40 – 50 years	2.157.776	36,2
55 years and older	471.611	7,9
<i>Marital status child</i>		
Not Married	1.800.941	30,2
Married	3.526.972	59,1
Widowed	115.550	1,9
Divorced/Separated	484.197	8,1
Partnership	405.597	6,8
<i>Presence grandchild parent</i>		
No Grandchildren	3.850.697	64,5
Grandchildren	2.117.560	35,5
<i>Degree of urbanisation child</i>		
High urban	961.183	16.1
Urban	1.681.483	28.2
Suburban	1.182.401	19.8
Rural	2.143.190	35.9

Source : GBA1995-2009, Statistics Netherlands (2010)

Table A3: Descriptive statistics dependent variables – intergenerational proximity

	N	%
<i>Total</i>	5.968.257	100
<i>Distance 1 kilometre</i>		
< 1 kilometre	2.388.198	40.0
>= 1 kilometre	3.580.059	60.0
<i>Distance 5 kilometres</i>		
< 5 kilometres	3.680.463	61.7
>= 5 kilometres	2.287.794	38.3
<i>Distance 20 kilometres</i>		
<20 kilometres	4.723.011	79.1
>= 20 kilometres	1.245.246	20.9
<i>Distance 60 kilometres</i>		
<60 kilometres	5.354.642	89.7
>= 60 kilometres	613.615	10.3

Source : GBA1995-2009, Statistics Netherlands (2010)

Table A4: Logistic regression models of intergenerational proximity
with demographic and spatial characteristics of parents (odd ratios)

		1 km	5 km	20 km	60 km
Sex parent	Constant	0.375	1.318	2.980	10.102
	Male	1	1	1	1
	Female	1.31	1.16	1.10	1.09
Age parent	55 years	15.49	8.39	6.67	5.93
	65 years	2.27	1.79	1.64	1.54
	75 years	1	1	1	1
	85 years	0.71	0.72	0.72	0.74
	95 years	0.58	0.60	0.60	0.59
Marital status parent	Not married	1.39	1.66	1.75	1.76
	Married	1	1	1	1
	Widowed	1.12	1.14	1.20	1.23
	Divorced/Separated	0.42	0.57	0.63	0.67
	Partnership	0.41	0.50	0.51	0.55
Number of children Parent	One child	1	1	1	1
	Two children	0.73	0.78	0.79	0.80
	Three children	0.71	0.78	0.79	..798
	Four or more children	0.77	0.86	0.92	0.91
Degree of urbanisation municipality parent	High urban	0.92	0.83	1.11	1.17
	Urban	1	1	1	1
	Suburban	1.22	0.97	1.00 ^c	1.09
	Rural	1.56	0.88	1.13	1.26
Place of residence Parent	Groningen	0.76	0.86	0.81	0.44
	Friesland	0.79	0.79	0.68	0.41
	Drenthe	0.59	0.66	0.54	0.31
	Overijssel	0.97	1.15	0.97	0.46
	Flevoland	0.73	0.71	0.47	0.46
	Gelderland	0.99 ^a	1.08	0.98	0.59
	Utrecht	1	1	1	1
	Noord Holland	0.99	1.10	1.18	1.18
	Zuid Holland	1.15	1.28	1.43	1.15
	Zeeland	0.93	0.92	0.77	0.36
	Noord Brabant	1.01 ^b	1.25	1.21	0.74
	Limburg	1.12	1.51	1.47	0.64
Period	1995 – 1999	1.26	1.18	1.16	1.14
	2000 – 2004	0.76	0.86	0.91	0.92
	2005 – 2009	1	1	1	1
Model summaries	N	5.968.257	5.968.257	5.968.257	5.968.257
	LL	6647865	7203816	5699592	3707218
	Cox & Snell R2	0.207	0.117	0.067	0.040
	Nagelkerke R2	0.280	0.159	0.104	0.083
	Df	28	28	28	28

Source: GBA1995-2009, Statistics Netherlands (2010)

All odds are significant at $p < 0.01$

a: significance 0.027

b: significance 0.204

c: significance: 0.183