Psychological and Behavioral Aspects of Receiving Genetic Counseling for Hereditary Cancer

AFSANEH HAYAT ROSHANAI
The overall aims of this thesis were to investigate psychological and behavioral effects of receiving cancer genetic counseling for breast, ovarian and colorectal cancer and/or with a family history of these cancer types and to determine whether counselees’ informational needs were met.

**Study I** was performed 3-7 years post-counseling. Participants (n=214) reported a relatively high level of anxiety but a low level of depression compared to cancer patients in general. However, there was no indication that the distress experienced was due to the counseling. Moderate changes in life and family relations, high level of adherence to recommended controls and satisfaction was reported. **Study II** was a randomized control trial (RCT) intervention study which involved 147 counselees. An increase in the level of knowledge and correct estimation of personal risk was reported in both the intervention and control groups, although this increase declined at later follow-up. Enhanced information led to significantly greater satisfaction with the given information, and the way of informing relatives. Most counselees had shared information with their at-risk relatives. **Study III** focused on sharing information with at-risk relatives among participants in study II and their relatives (n=81). Counselees were interviewed and answered a questionnaire, whilst their relatives only answered the questionnaire. Counselees reported positive/neutral feelings about communicating genetic information and mostly interpreted their relatives’ reactions as positive/neutral. Also, approximately 50% of relatives reported positive/neutral reactions and were generally satisfied with the received information. **Study IV** was conducted in Sweden and Norway based on 235 counselees. Counselees expected counselors to be skillful and thoughtful, take them seriously and provide risk estimations and medical information. Most important issues to counselees were satisfactorily addressed by the counselors. Analyzing importance rankings resulted in five categories of needs: a need for facts, caring communication and medical information, need for understanding and support in sharing genetic information, practical care and medical/practical information.

In conclusion, no adverse psychological or behavioral effect on counselees was observed. Apparently, genetic counseling is managed properly and counselors successfully address counselees’ needs. Providing extended information does not seem necessary, however, tailoring information to individual counselees needs may create a more effective counseling.

**Keywords:** Hereditary cancer, genetic counseling, psychological distress, adherence, genetic knowledge, risk perception, sharing genetic information, at-risk relatives’ experiences, informational needs

Afshaneh Hayat Roshanai, Caring Sciences, Uppsala Science Park, Uppsala University, SE-75183 Uppsala, Sweden

© Afshaneh Hayat Roshanai 2010

ISSN 1652-9030
urn:nbn:se:uu:diva-128870 (http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-128870)
To the memory of my beloved father and brother

And

To my mother and my son
List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


IV Hayat Roshanai, A., Lampic, C., Ingvoldstad, C., Bjorvatn, C., Stenmark Askmalm, M., Rosenquist, R., Nordin, K. What Information do cancer genetic counselees prioritize? (Submitted)

Reprints were made with permission from the respective publishers.
## Contents

Preface ............................................................................................................................... 13  

Introduction ..................................................................................................................... 14  
Cancer .............................................................................................................................. 14  
  Causes of cancer ............................................................................................................. 14  
  Hereditary cancer .......................................................................................................... 15  
Breast cancer .................................................................................................................... 16  
  Hereditary breast cancer .............................................................................................. 17  
Ovarian cancer .................................................................................................................. 19  
  Hereditary ovarian cancer ............................................................................................ 20  
Colon cancer ..................................................................................................................... 21  
  Hereditary colon cancer ............................................................................................... 22  

Genetic counseling .......................................................................................................... 24  
  Cancer genetic counseling background ........................................................................ 24  
    Goals of genetic counseling for hereditary cancer ..................................................... 25  
    Cancer genetic counseling in Sweden and Norway .................................................... 25  
  The risk of developing cancer ....................................................................................... 26  
    Risk perception .......................................................................................................... 26  
    Definition of risk ........................................................................................................ 26  
    Risk assessment ......................................................................................................... 26  
    Genetic testing ........................................................................................................... 27  
    Risk management ...................................................................................................... 28  

Psychological consequences of being at risk of cancer .................................................. 29  
  Emotional aspects of attending genetic counseling ..................................................... 29  
    Psychological distress ................................................................................................ 29  
    Anxiety ....................................................................................................................... 30  
    Depression ................................................................................................................ 30  
  Cognitive aspects of attending genetic counseling .................................................... 30  
    Informational needs and expectations ....................................................................... 30  
    Satisfaction with genetic counseling ........................................................................ 31  

Research findings on psychological and behavioral outcomes ...................................... 32  
  Psychological outcomes ............................................................................................... 32  
  Behavioral outcomes ................................................................................................. 33
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical frame-work of this thesis</td>
<td>38</td>
</tr>
<tr>
<td>Health Belief Model (HBM)</td>
<td>38</td>
</tr>
<tr>
<td>Information processing</td>
<td>39</td>
</tr>
<tr>
<td>Buckman’s “Breaking Bad News Model”</td>
<td>40</td>
</tr>
<tr>
<td>Cancer as an important issue in health-care</td>
<td>41</td>
</tr>
<tr>
<td>Aims</td>
<td>42</td>
</tr>
<tr>
<td>Study I</td>
<td>42</td>
</tr>
<tr>
<td>Study II</td>
<td>42</td>
</tr>
<tr>
<td>Study III</td>
<td>43</td>
</tr>
<tr>
<td>Study IV</td>
<td>43</td>
</tr>
<tr>
<td>Methods</td>
<td>44</td>
</tr>
<tr>
<td>Design</td>
<td>44</td>
</tr>
<tr>
<td>Participants</td>
<td>44</td>
</tr>
<tr>
<td>Study I</td>
<td>44</td>
</tr>
<tr>
<td>Study II</td>
<td>45</td>
</tr>
<tr>
<td>Study III</td>
<td>46</td>
</tr>
<tr>
<td>Study IV</td>
<td>47</td>
</tr>
<tr>
<td>The intervention in Study II.</td>
<td>49</td>
</tr>
<tr>
<td>Data collection</td>
<td>51</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>55</td>
</tr>
<tr>
<td>Study I</td>
<td>55</td>
</tr>
<tr>
<td>Study II</td>
<td>56</td>
</tr>
<tr>
<td>Study III</td>
<td>56</td>
</tr>
<tr>
<td>Study IV</td>
<td>57</td>
</tr>
<tr>
<td>Results</td>
<td>59</td>
</tr>
<tr>
<td>Study I</td>
<td>59</td>
</tr>
<tr>
<td>Study II</td>
<td>61</td>
</tr>
<tr>
<td>Study III</td>
<td>66</td>
</tr>
<tr>
<td>Study IV</td>
<td>71</td>
</tr>
<tr>
<td>Discussion</td>
<td>76</td>
</tr>
<tr>
<td>Psychological consequences</td>
<td>77</td>
</tr>
<tr>
<td>Emotional aspects</td>
<td>77</td>
</tr>
<tr>
<td>Cognitive aspect</td>
<td>78</td>
</tr>
<tr>
<td>Behavioral consequences</td>
<td>81</td>
</tr>
<tr>
<td>Perceived changes in life and family relations</td>
<td>81</td>
</tr>
<tr>
<td>Adherence to recommended surveillance programs</td>
<td>81</td>
</tr>
<tr>
<td>Communication of information to at-risk relatives</td>
<td>81</td>
</tr>
<tr>
<td>Methodological considerations</td>
<td>83</td>
</tr>
<tr>
<td>Study design</td>
<td>83</td>
</tr>
<tr>
<td>Validity</td>
<td>84</td>
</tr>
<tr>
<td>Reliability</td>
<td>85</td>
</tr>
</tbody>
</table>
Conclusion ........................................................................................................ 87
Future considerations ....................................................................................... 87

Swedish Summary (Svensk sammanfattning) ........................................ 89
Studie I ......................................................................................................... 89
Studie II ...................................................................................................... 90
Studie III .................................................................................................... 90
Studie IV .................................................................................................... 91

Acknowledgments ......................................................................................... 92

References ...................................................................................................... 96
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRCA1</td>
<td>Breast cancer 1 gene</td>
</tr>
<tr>
<td>BRCA2</td>
<td>Breast cancer 2 gene</td>
</tr>
<tr>
<td>BSE</td>
<td>Breast self-examination</td>
</tr>
<tr>
<td>CRC</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>C-SHIP</td>
<td>Cognitive-social health information processing</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic acid</td>
</tr>
<tr>
<td>FAP</td>
<td>Familial adenomatous polyposis</td>
</tr>
<tr>
<td>HNPCC</td>
<td>Hereditary non-polyposis colorectal cancer</td>
</tr>
<tr>
<td>HBM</td>
<td>Health belief model</td>
</tr>
<tr>
<td>HADS</td>
<td>Hospital anxiety and depression scale</td>
</tr>
<tr>
<td>MHLC</td>
<td>Multidimensional health locus of control</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnetic resonance tomography</td>
</tr>
<tr>
<td>NSGC</td>
<td>National Society of Genetic Counselors</td>
</tr>
<tr>
<td>NPM</td>
<td>Non-tailored print materials</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomized controlled trial</td>
</tr>
<tr>
<td>SCS</td>
<td>Satisfaction with Genetic Counseling Scale</td>
</tr>
<tr>
<td>SOIS</td>
<td>Satisfaction with given Oncogenetic Information Scale</td>
</tr>
<tr>
<td>TPM</td>
<td>Tailored print material</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual analogue scale</td>
</tr>
</tbody>
</table>
Definitions

**Autosomal dominant**: Mode of genetic transmission whereby a single mutated gene is inherited to 50% of offspring and which is sufficient to produce a phenotype. Refers specifically to a gene on one of the 22 pairs of non-sex chromosomes.

**Carrier**: An individual who carries a disease-causing mutation but does not show signs of the disease.

**Chromosome**: Threadlike structure in a cell on which genes are located, carrier of the genetic material of a cell.

**Colon**: The final portion of the intestine.

**Colonoscopy**: Examination of the inside of the colon using a camera.

**DNA (deoxyribonucleic acid)**: A molecule that contains the code for genetic blueprint i.e. the chemical basis of hereditary. It is found in the nucleus of cells and is responsible for the structure and function of an organism and allows for transmission of genetic information from one generation to the next.

**Family history**: The medical information about relatives’ disorders in a family.

**Gene**: The fundamental unit of hereditary, consisting of a segment of DNA arranged in a linear manner along a chromosome

**Germline mutation**: The presence of an altered gene within the egg or sperm (germ cell), such that the altered gene can be passed to subsequent generations.

**Hereditary**: Genetically transmitted from parent to children.

**Hysterectomy**: Surgical removal of the uterus.

**Metastasis**: The spread of malignant cells, by the lymphatics or bloodstream, from one site in the body to another.

**Mutation**: Any alteration in the DNA sequence at a genetic locus.

**Oncogene**: A gene that can transform cells into a highly proliferative state, resulting in cancer.

**Pedigree**: Family tree. A diagram that describes family relationships, gender, disease status and other attributes using standard symbols and terminology.

**Penetrance**: The probability of expressing a phenotype, given that an individual has inherited a predisposing genotype.

**Salpingo-oophorectomy**: Removal of the ovary and fallopian tubes.
**Screening**: Examinations designed to identify individuals in a given population who are at higher risk of having or developing a particular disorder.

**Targeted therapy**: A type of treatment that uses drugs or other substances to block the growth of cancer cells by identifying and attacking specific targeted molecules needed for carcinogenesis and tumor growths rather than by simply interfering with rapidly dividing cells (e.g. as with traditional chemotherapy).

**Tailored information**: Is intended to be used by one specific person and is adapted to meet the specific needs and characteristics of that individual.

**Tumor suppressor gene**: A gene whose product helps to control cell growth and proliferation, mutations in tumor suppressors can lead to cancer.

**Unaffected**: An individual who does not manifest any symptoms of a particular condition.
Preface

The fact that cancer is more common in some families and that having a family history of certain types of cancer increases the risk of developing cancer has been known for a long time. Nevertheless, both genetic testing and counseling for hereditary cancer was relatively rare until the early nineties. Today, due to many factors such as huge advances in human genetics, increased media attention and a steady upward trend in public knowledge about genetics the demand for genetic counseling has increased and the service is available at specialized health-care units. The aim of cancer genetic counseling is to inform both affected and non-affected individuals about their own and their relatives’ risk of developing cancer, provide information about preventive measures and surveillance programs, support them in making informed decisions regarding matters such as genetic testing and ultimately reduce their worries. However, genetic information is both extensive and complicated and may therefore be difficult for the counselees to understand; particularly in relation to comprehending estimates concerning an individual’s risk of developing cancer. To further complicate the issue, the risk associated with a particular mutation to cause hereditary cancer can be uncertain, and this together with the ambiguity that may arise due to difficulties in interpreting genetic test results, can make it difficult to give an informative answer to counselees. Consequently, it is not unreasonable to assume that being at an increased risk of developing cancer and thus receiving genetic information may be a source of distress, potentially leading to psychological and emotional difficulties. Naturally this area is of interest to psychologists, especially in terms of studying the consequences of receiving genetic information on individuals and their families and hence in trying to improve the care offered.

In Sweden, clinical genetic counseling for hereditary cancer has been offered since the mid nineties, however, the psychological and behavioral consequences of attending genetic counseling for counselees and their families have so far not been extensively evaluated. Hence the aim of this thesis was to evaluate such psychological and behavioral ramifications, with particular focus on three common types of cancers: breast, ovarian and colon cancer.
Introduction

Cancer
Cancer is an umbrella term for a large group of malignant diseases that can affect any part of the body. It includes more than 100 different diseases each with varying risk factors and epidemiology, and is a leading cause of disease-related death worldwide (1, 2). Cancer accounted for around 13% of all deaths worldwide in 2004 (3, 4) and is estimated to reach approximately 17 million cases by 2020 and 27 million by 2050. In Sweden, 51,528 cases of cancer, with an equal gender distribution, were reported to the Swedish Cancer Registry during 2008 (5). The annual increase in the number of cases during the last two decades in Sweden has been 1.8% for men and 1.2% for women (5). In 2007 in Sweden, 25% of all deaths reported to the Cause of Death Register were due to cancer (6). The probability of developing cancer before the age of 75 was estimated to be 30% for men and 27% among women (7).

Cells in the human body grow, divide and die in a controlled manner. However, if cells begin to grow and divide without control, an extra mass of tissue i.e. a tumor, can be formed and such tumors can be classed as either malignant or benign. Malignant tumors are cancerous since they consist of cells that can invade and damage nearby tissue and spread to other organs (metastasis). In contrast, benign tumors are not cancerous as they do not infiltrate other parts of the body, and are rarely life-threatening (4). Depending on the cell type affected and the organ where the tumor is formed, different cancers with various symptoms will arise.

Causes of cancer
Cancer is considered to be a genetic disease that arises due to multiple changes, i.e. mutations within genes. Mutations can be caused by both internal factors (e.g. inherited mutations, genetic variants) and external factors (e.g. chemicals, radiation, infections and tobacco). Hence, transformation of a normal cell into a tumor cell is the result of the interaction between a person's genetic factors and external factors (8).

Two types of mutations can cause cancer; acquired or somatic mutations and germline mutations. Somatic mutations can occur spontaneously as a result of exposure to carcinogens, such mutations cannot be inherited by the
offspring. In contrast, germline mutations may be passed from parents to offspring predisposing them to cancer development (9).

Cancer does not usually result from a single mutated gene and instead is likely to be associated with mutations in multiple genes. There are three major types of genes that can be mutated: tumor suppressor genes (genes that regulate cell division), proto-oncogenes (genes that activate cell proliferation) and DNA repair genes (10). When a proto-oncogene is mutated this can lead to over-activation of cell division, although it still requires other genes to be affected before a cancer develops. On the other hand, tumor suppressor genes or DNA repair genes require both copies (i.e. alleles) of the gene to be mutated before the actual function is lost. This is due to the fact that, if only one allele is mutated the remaining normal allele will compensate for the mutated one (10). It is genes within the latter category that are usually affected in hereditary cancers (see below).

Hereditary cancer

The vast majority (up to 90%) of cancer is sporadic, with only a minor proportion (5-10%) considered to be hereditary (11). As mentioned, hereditary cancer is due to an inherited germline mutation that increases the individual’s risk of developing one or more types of cancer. Nevertheless, having an inherited mutation does not mean that the person will certainly develop cancer; it merely means that there is an increased predisposition to develop cancer.

Hereditary cancer differs from sporadic cancer in several aspects. Firstly, inherited cancer syndromes are caused by germline mutations in either tumor suppressor or DNA-repair genes whilst sporadic cancers are mainly caused by somatic mutations in proto-oncogenes. Secondly in hereditary cancer, one mutation is inherited whilst the other mutation is acquired throughout the life-time. This phenomenon partly explains why hereditary cancers occur at an earlier age than the sporadic form, and this young age at onset is regarded as a key feature of hereditary cancers; for instance, hereditary breast and colon cancers can be diagnosed well before the age of 50. A further characteristic of hereditary cancer concerns the occurrence rate within families, and multiple family members from several generations are usually affected by a similar type of hereditary cancer. Moreover, bilateral occurrence within hereditary cancers is not rare and combinations of certain tumors such as breast and ovarian cancer are often observed (11). In the following sections, important aspects of breast, ovarian and colorectal cancer will be outlined and discussed including the inherited forms of these diseases.
Breast cancer

Approximately one million women are diagnosed with breast cancer annually worldwide, and as a consequence it is the most common malignancy in women comprising 18% of all female cancers. The population risk of developing breast cancer, the second leading cause of cancer death among women in the western world is 1 in 10 (12). In Sweden, breast cancer represented 29% of all female cancer cases in 2008. The incidence of breast cancer in women has increased annually by 1.2% during the last 20 years; however, the increase throughout the last 10-year period has been lower with an annual change of only 0.8% (7). The average age of women developing breast cancer is 60 years, and less than 5% are younger than 40 years of age (2).

Risk factors for breast cancer

One of the strongest known risk factors for developing breast cancer aside from gender and an increasing age is a positive family history (see below). For instance, first-degree relatives of patients with breast cancer are at an increased risk for developing the disease; with their risk being approximately two times higher than that of the general population (11).

The incidence of breast cancer also increases with age; doubling approximately every decade until the menopause, after which the pace of increase reduces considerably (13, 14). Factors that increase the risk of developing breast cancer include an early age at the start of menstruation, late menopause, null parity and a late age at first birth. Other established and probable risk factors for breast cancer include a history of benign breast disease, cancer in the other breast, specific socioeconomic groups, diet, body weight, alcohol consumption, exposure to radiation, and taking exogenous hormones (11).

Prevention, treatment and prognosis of breast cancer

Breast cancer is one of several cancers that can be diagnosed at an early stage, and this is achieved through screening by mammography. Early detection of breast cancer leads to a better prognosis, increases the chance of successful treatment, and reduces the rate of mortality. In Sweden, mammography screening is recommended every two years for all women between the age of 40-75 (2, 11).

The choice of treatment for breast cancer depends on the tumor size, the stage at which the cancer is detected and other tumor characteristics, as well as the patients’ preferences. Nevertheless, breast cancer is primarily treated with surgery. Treatment may also involve use of adjuvants such as radiation, hormone therapy or chemotherapy (before or after surgery), and often a combination of all three is utilized. The purpose of adjuvant treatment is to reduce the risk of recurrence. Biological therapy, targeted therapy or a com-
bination of both are alternative treatment options that have been introduced more recently for the treatment of breast cancer (15).

According to the Swedish National Board of Health report, the relative 5-year survival for women with breast cancer is ~88% and ~79% 10-years after diagnosis (7).

Hereditary breast cancer

Today, between 5-10% of breast cancer cases in Western countries are considered to result from a genetic predisposition, and hereditary breast cancer is one of the most common hereditary cancer syndromes (11). Breast cancer susceptibility generally displays an autosomal dominant inheritance pattern with reduced penetrance (12). This means that a breast cancer gene mutation can be transmitted by both sexes and that some relatives may pass on the mutated gene without developing cancer themselves (16). The cancer risk appears to be variable among families carrying the same mutation but with different ethnicities (17). Hereditary breast cancer is suspected in families fulfilling the following criteria (11):

1. Three cases of breast cancer (at least one before the age of 50) and/or ovarian/fallopian tube cancer at any age among first-degree relatives or second-degree relative through a male.
2. Two cases of breast/ovarian/-fallopian tube cancer among first-degree relatives or a second-degree relative through a male, where at least one case of breast cancer was diagnosed before the age of 40, or two cases of ovarian/fallopian tube cancer at any age.
3. Personal history of breast cancer before the age of 35.
4. A personal or family history of male breast cancer.
5. A woman with both breast and -ovarian/fallopian tube cancer.

Breast cancer genes and testing

Mutations in two breast cancer genes are known to predispose an individual to both breast and ovarian cancer, in addition to several other cancers. The breast cancer 1 (BRCA1) gene was identified in 1994 and the breast cancer 2 (BRCA2) gene in 1995. The BRCA1 gene is located on chromosome 17 and the BRCA2 gene is located on chromosome 13 (18). Both women and men can carry a mutated gene and develop breast cancer, although it is very unusual for men to develop breast cancer. It is estimated that women who carry mutations within the BRCA1 or BRCA2 genes have a 50-80% lifetime risk of developing breast cancer, and a 20-60% risk for developing ovarian cancer (11, 19, 20). Men harboring BRCA2 mutations have a 6% chance of developing breast cancer (21).

Genetic testing for BRCA1 and BRCA2 cancer-predisposing mutations is clinically available for individuals and their relatives who are identified to be
at a high risk for developing cancer (22). To date, the number of mutations identified exceeds 350 within the \textit{BRCA1} gene and 200 within the \textit{BRCA2} gene (23). In addition, several founder mutations exist that are more frequent throughout specific geographical areas.

A large proportion of families with suspected hereditary breast cancer will not exhibit any mutation within the \textit{BRCA1}/\textit{BRCA2} genes following genetic screening (24). Consequently, it has been suggested that more high-penetrance genes must exist, however, searching for these genes has not been successful. On the other hand, a more recent study proposes that there are no further high-penetrance genes but instead multiple low-penetrance genes or genetic variants that may act synergistically and mimic a dominant inheritance pattern (22, 25).

\textbf{Empiric risk estimation}

In families where no \textit{BRCA1}/\textit{BRCA2} mutations can be detected, a woman's risk of developing cancer can be estimated statistically by using a number of tabular and computer models (26). In Sweden, this risk estimation was previously based on the Claus model (16), however in more recent years, genetic centres have switched to the BOADICEA system (26).

The Claus model is mainly based on data derived from the Caucasian American population, where the risk of developing breast cancer is about 10%. In this model, a woman’s cumulative risk of developing cancer up until she reaches 80 years of age can be estimated, and this estimation is based on both the number of affected first-/second-degree relatives and their age when the cancer was diagnosed (16).

BOADICEA, is a web-based online program which can also be used for estimating a woman's cumulative risk of developing cancer before the age of 80, based on the family history. This model is based on data obtained from a substantial number of families screened mainly in the United Kingdom. This model can also be used for calculating the probability of finding \textit{BRCA1}/\textit{BRCA2} mutations within a family. One of the advantages of this model is that in estimating the risk, the results of the BRCA gene-analysis can be taken in account (26).

\textbf{Prevention, treatment and prognosis}

In Sweden, if the mutation screening is positive and identifies a mutation within the \textit{BRCA1}/\textit{BRCA2} genes, the following recommendations are given (11):

- Yearly clinical contact and breast examination from the age of 25 until at least 74 years.
- Yearly mammography screening and/or ultrasound examination from 25 up to 74 years or more, and where possible magnetic resonance tomography (MRI) until approximately 55 years of age.
- Regular contact with a gynecologist during the fertile period.
Information about the possibility of risk reducing prophylactic mastectomy is also given to women carrying BRCA1/BRCA2 mutations. Results from retrospective studies indicate that prophylactic mastectomy in non-affected women, reduces the risk of developing breast cancer by at least 90 percent (27, 28).

In situations where families are seen to carry an elevated risk for breast cancer but where a mutation is not identified, a yearly mammogram and/or ultrasound examination beginning 5 years earlier than the youngest woman in the family was diagnosed with breast cancer will be recommended (11).

Ovarian cancer

Ovarian cancer comprises 4% of all cancers in women and ranks second among gynecological cancers. It is the 7th most frequent cancer in women and the 6th leading cause of death throughout the world (12). The population risk of developing ovarian cancer is 1.1 in 100, but considerable variations are observed in the incidence of ovarian cancer amongst different countries. Ovarian cancer is mostly diagnosed in women between 40 and 70 years of age, and the average age at diagnosis is 59 years (2). Scandinavia is among the regions with the highest incidence of ovarian cancer (12), however, the incidence has declined annually by 2% in Sweden, based on data from the previous 20 years, and survival rates have also improved (7). In 2007, the population risk among Swedish women was 1.5 in 100 and ovarian cancer rated as the 9th most common cancer (2).

Patients with ovarian cancer usually have no obvious symptoms at an early stage; therefore, the disease generally does not present until an advanced stage and consequently the prognosis is poor. The possibility of recurrence is very high and women who experience recurrence are unlikely to be cured (29).

Risk factors

Family history is considered to be one of the strongest risk factors for developing ovarian cancer. For instance, women with a first-degree relative diagnosed with ovarian cancer have an almost 5% increased risk of developing the disease, whilst those with two first-degree relatives carry an increased risk of 7%. Heavier body weight and postmenopausal hormone therapy with estrogen alone may also increase the risk of ovarian cancer (30).

Screening, prevention and treatment of ovarian cancer

In general, ovarian cancer has a poor prognosis and quite a high rate of mortality. This is partly due to the lack of any adequate screening test effective in detecting ovarian cancer at an early stage (7). In Sweden, approximately
48% of patients are alive 5 years after diagnosis and less than 37% survive for 10 years after diagnosis (2).

Ovarian cancer is primarily treated with surgery; removing not only the entire tumor but often the ovaries, fallopian tubes, and the uterus as well. Following surgery, if any remaining micro-metastasis are suspected, the patient will receive chemotherapy (2).

Hereditary ovarian cancer
Approximately 10% of ovarian cancer is considered to be due to inherited mutations that predispose women to ovarian cancer. Hereditary ovarian cancer is generally inherited in an autosomal dominant manner with variable penetrance (31) and is suspected in families fulfilling the same criteria as in hereditary breast cancer (see above), since there is a connection between hereditary breast and ovarian cancer. In particular, hereditary ovarian cancer is suspected when one or more relatives are affected by ovarian/fallopian tube cancers, often in combination with breast cancer (11).

Hereditary ovarian syndromes
There are three hereditary syndromes that predispose to ovarian cancer: 1) “site-specific” ovarian cancer, 2) breast and ovarian cancer syndrome and 3) hereditary non-polyposis colorectal cancer (HNPCC) syndrome (32). The first two groups are related to mutations within the BRCA1 and BRCA2 genes, whilst group 3 is associated with mutations in DNA mismatch repair genes (e.g. hMLH1 and hMSH2). It has been suggested that up to 90% of hereditary ovarian cancers are due to mutations in BRCA genes and the remaining 10% are mainly attributable to HNPCC (33).

The lifetime risk of developing ovarian cancer for a BRCA1/ BRCA2 mutation carrier is 25%-60% (30), whereas the risk of ovarian cancer in HNPCC families is estimated to be between 9%-12% (34). Additionally, studies demonstrate that the proportion of ovarian cancer due to BRCA mutations decreases with age and is estimated to be 14% for women diagnosed in their forties, dropping to 7% for women diagnosed in their sixties (20). The average age at diagnosis for BRCA1 mutation carriers is between 50-55 years and for BRCA2 mutation carriers between 55-65 years (11).

Prevention, treatment and prognosis
Screening for ovarian cancer in families with an increased risk is based on annual or semiannual pelvic examination and transvaginal ultrasound examination (35). However, ultrasound examinations are not completely reliable since tumors can remain undiagnosed (11).

Salpingo-oophorectomy and chemo-prevention are among preventive methods used in association with ovarian cancer. Prophylactic salpingo-oophorectomy or use of the oral contraceptives (combined estrogen-
progestin) are recommended in order to reduce the incidence of ovarian cancer in at-risk women harboring a BRCA1/BRCA2 mutation. For BRCA1/BRCA2 carrier women and women within HNPCC families, annual gynecological follow-up is recommended during the fertile period. However, after child birth prophylactic surgery should be considered (11).

Colon cancer

Colorectal cancer is the second most common cancer in women, the third most common in men, and the second major cause of cancer death for both men and women (3). The average age of patients at diagnosis is 65 years (36). Patients with early stage colorectal cancer usually do not have any symptoms, however, the most common symptoms of colorectal cancer at an advanced stage include rectal bleeding, blood in the stool, alternating hard and loose stools, mucus formation, abdominal discomfort and cramping pain in the lower abdomen (2).

The population risk of developing colorectal cancer is 5 in 100 (37) and the incidence of colorectal cancer increases with age. Colorectal cancer mainly occurs in people older than 50 years (91%), and there is usually no family history of the disease (2).

Risk factors for colon cancer

An increase in the incidence of colorectal cancer is associated with; old age, a male bias, black race, personal history of inflammatory bowel disease and a family history of colorectal cancer (37, 38). The family history is of considerable importance since one-fifth of those who develop colorectal cancer have relatives who have also been diagnosed with colorectal cancer (39).

In addition, several other factors are associated with colon cancer, such as obesity, physical inactivity, an imbalanced consumption of red or processed meat, and an inadequate intake of fat, fruits and vegetables. Studies have also indicated that over consumption of alcohol and smoking increase the risk of developing colon cancer, but this has not been conclusively proven to date (40).

Screening, prevention and treatment of colorectal cancer

In some countries, colonoscopy screening from the age of 50 for both men and women at an average risk for developing colon cancer has been suggested. Such screening may result in the detection of colorectal polyps before they become cancerous, as well as the detection of early stage cancer.

The choice of treatment is dependent on the stage at which the disease is detected. Surgical removal is the most common treatment option for colorectal cancer and is often curative for non-metastasized cancers. In some cases the patient may receive chemotherapy following surgery to reduce the risk of
recurrence. In more advanced stage disease where the cancer has spread, surgery is not performed and in such cases the treatment (e.g. chemotherapy or radiation) aim is not to cure the patient but rather to prevent the disease from spreading further (36).

If detected early, colon cancer can usually be cured; however the prognosis is generally poor if the cancer has spread prior to surgery. The 1- and 5-year relative survival for individuals diagnosed with colorectal cancer is 83% and 64% respectively. However, the 5-year survival may increase to 90% when the cancer is detected at an early, localized stage. Over the past two decades, mortality rates for colorectal cancer have declined in both men and women (2) and the 10-year relative survival is 50% for the entire group of patients diagnosed with colorectal cancer (36).

Hereditary colon cancer
Approximately 3-15% of patients with colorectal cancer carry an inherited mutation (2). Several hereditary cancer syndromes are associated with colorectal cancer and the two most common inherited syndromes are familial adenomatous polyposis (FAP), which is caused by mutations within the APC gene, and HNPCC, or Lynch syndrome. Approximately 1% of all colorectal cancers are estimated to be due to FAP, and 3%-5% due to HNPCC. Experience of early-onset disease and premature death is not unusual among families with either of these hereditary cancer syndromes (41).

As this thesis does not include FAP, only a description of HNPCC/Lynch syndrome is presented below.

Lynch syndrome
Lynch syndrome/HNPCC is suspected when the following criteria, defined by the Amsterdam criteria (42), are fulfilled:

- At least 3 close relatives have been diagnosed with colorectal cancer and HNPCC associated cancer. One of these relatives must be a first-degree relative of the other two.
- The cancer must have been observed in at least two generations.
- At least one affected relative has been diagnosed before the age of 50.
- FAP must have been excluded.

HNPCC can be caused by inherited mutations in a number of different genes, however, the most common mutations occur within four DNA-mismatch-repair genes (MSH2, MLH1, MSH6 and PMS2) (43).

Tumors that develop due to defects in DNA-mismatch-repair have a tendency to undergo a higher level of genetic changes, potentially leading to micro-satellite instability (41). High micro-satellite instability is evidenced in almost all colorectal cancer tumors in patients with Lynch syndrome. HNPCC tends to begin with the development of a few polyps in the colon
and rectum when people are relatively young. However, at a later stage these polyps become cancerous (44).

Individuals with a HNPCC related mutation carry a 60-80% lifetime risk for developing colon cancer (37) but an evaluate risk for developing other types of cancer; for instance cases of stomach and urothelial cancer have also been reported. Women harboring mutations within these genes also have an increased risk for developing endometrial cancer and ovarian cancer (32). A recent population-based study of carriers of \textit{MSH2} and \textit{MLH1} mutations reported a mean age of 54 years at diagnosis for men and 60 years for women, which is lower than the median age of diagnosis of 64 years for colorectal cancer within the general population (45). Additionally, results from several studies have indicated a higher colorectal cancer risk for men compared to women (46, 47).

For at risk individuals belonging to a family with Lynch syndrome, colonoscopy every 1-2 years is recommended from 25 years of age (36). Frequent colonoscopy is performed due to the higher cancer risk and given the risk for endometrial cancer and ovarian cancer, women are also recommended to have an annual gynecological examination and are informed about the options of prophylactic hysterectomy and oophorectomy (47).

\textbf{Empiric risk estimation}

In families where, after examining the family history, a pattern of dominant inheritance is suspected, but neither a genetic test is feasible nor any mutations have been detected, the risk of developing cancer can be estimated empirically.

In such cases, colonoscopy is recommended 5-10 years before the earliest age of onset of the colorectal cancer within the family and every 3-5 years depending on the estimated risk (41).
Genetic counseling

Cancer genetic counseling background

Clinical genetics involves the diagnosis and management of hereditary disorders as well as counseling of individuals with genetic disorders (23). Offering genetic counseling services for hereditary cancer forms a part of the services offered by clinical genetics, for instance the management of hereditary breast, ovarian and colorectal cancer (45, 48). As the focus of this thesis is on hereditary cancer, a more detailed explanation about genetic counseling in this field is presented below.

Due to rapid developments in human genetics, the rising availability of both genetic testing and genetic risk information, and an overall increase in public awareness of familial risk, the number of individuals seeking information about their genetic susceptibility for developing cancer has risen significantly. Thus, professional organizations recommend that individuals who want to learn about their options concerning genetic testing should be referred to specialists such as clinical geneticists, oncologists or genetic counselors (49). Consequently, the demand for clinical genetic counseling has increased and become an integral part of the specialized health care system. In previous decades, genetic counseling was predominantly practiced by physicians who were specialists in clinical genetics or oncology. However, in some clinics physicians were supported in their role as genetic counselors by psychologists. More recently, additional health-care staff such as nurses have entered the field of genetic counseling. In Sweden and Norway, genetic counseling is offered by clinical geneticists (a physician who trained in clinical genetics), oncologists and genetic counselors (ancillary medical professionals such as genetic nurse specialists or microbiologists trained by the master’s degree program in genetic counseling). Throughout this thesis the term “counselor” covers all of these categories.

Genetic counseling may be described as a “psycho-educational process” centered on genetic data which provides information that is crucial not only to the individuals undergoing counseling, but also for their close relatives, due to their potential risk of developing cancer (49, 50). Cancer genetic counseling also comprises a consulting session during which issues regarding genetics, family history of cancer and risks of inheriting a mutated cancer gene or developing hereditary cancer are discussed with individuals affected by cancer or at risk of developing hereditary cancer. The main objec-
tive of these sessions is that the counselees and his/her relatives are provided with information that enables them to not only understand the disease and associated risk, but also make rational decisions regarding, for instance, surveillance programs and genetic testing (49).

Goals of genetic counseling for hereditary cancer

The overall goal of genetic counseling for hereditary cancer is to enable the detection of cancer at an early stage by identifying high-risk individuals. This is expected to lead to earlier treatment, and therefore decrease the risk of dying from the disease. In addition, cancer genetic counseling aims to:

- Educate counselees about their risk of developing cancer.
- Increase counselees’ realistic risk perception.
- Provide them with adequate information so that they have the opportunity to use genetic counseling to their personal benefit.
- Empower them to make educated and informed decisions about issues such as mutational testing, cancer screening and surveillance programs.
- Minimize psychological distress and increase the sense of personal control (51).

Since biological relatives of cancer patients in families with hereditary cancer have an increased risk of cancer, a further goal of genetic counseling is to motivate the counselees to inform their at-risk relatives about their potential genetic risk for developing cancer (52).

Cancer genetic counseling in Sweden and Norway

In both Sweden and Norway, cancer genetic counseling has been offered at major university hospital clinics since the early nineties. Counselees referred for suspected hereditary cancer, receive genetic counseling prior to genetic testing or participation in surveillance programs (53). During the first counseling session a counselor provides medical information regarding topics such as the differences between sporadic cancer and hereditary cancer and basic genetic concepts e.g. how genes are inherited and the risk of inheriting a mutated gene. The counselor estimates non-affected counselees’ risk of cancer and provides information about genetic testing and surveillance programs. In addition, the counselor explains the importance of communicating this information to certain at-risk relatives (54). Counselees who undergo genetic testing will attend an additional session during which the results will be disclosed and discussed. All counselees are offered further contact with a counselor should they have questions or require additional support.
The risk of developing cancer

Risk perception

Risk assessment and risk communication are major components of genetic counseling and both are of fundamental importance (55). Cancer genetic risk assessment is the process of identifying and counseling individuals at risk for familial or hereditary cancer (52). Understanding counselees’ perception of their risk for developing cancer may give us a better insight into how risk-related messages are interpreted, and thereby facilitate the communication of such information in a more effective manner.

Definition of risk

Numerous definitions for risk have been proposed and each varies due to its specific application and situational context, however, in most instances, risk is defined as “the possibility of a loss or an injury” (56). Another definition of risk states that “risks are the future issues which can be avoided or moderated, rather than present problems that must be immediately addressed” (57). Risk can also be defined as “the unwanted subset of a set of uncertain outcomes” (57).

The term “risk” is open to interpretation and as a consequence, people have different understanding of this term and also of the phrase “level of risk” (e.g. a 40% risk can be viewed as positive by some people and negative by others). On the other hand, the concept of risk has qualitatively different meanings for professionals and lay-pers ons (58). Risk for a patient is a qualitative explanation of a future state of health, whilst for the physicians risk is an objective, quantifiable concept (59). Probability is a means of expressing either the expected frequency of a random outcome, or the degree of reliability of estimation in a situation lacking the information required to be certain. Therefore, even objective probabilities are to some extent dependent on someone’s subjective estimation.

In the context of genetic counseling, risk is a statistical estimation of an individual’s life time risk of developing cancer. The counselor’s task when communicating the risk, is to try to merge these different perspectives i.e. quantitative, qualitative and individual (60). According to previous studies, this is not an easy task and realization of the accurate risk by an individual is not always straightforward (54, 61), since risk information is interpreted by counselees rather than just recalled as neutral facts (62).

Risk assessment

Cancer genetic risk assessment involves the use of pedigree analysis (Figure 1). A number of tabular and computer models are available to quantitate the
non-affected individuals’ risk of either developing cancer or carrying a mutation, and also determine whether a family history is suggestive of sporadic or hereditary cancer (41, 63).

Risk estimation can be made by assessing aspects of the family history (e.g. number of affected relatives, ages of onset and types of cancer), and pathological features of the disease. In addition, it is possible to assess the probability that the cancers within a family are caused by mutations within specific genes (64). Consequently, individuals who are at an increased risk of carrying a mutation are usually also offered genetic testing.

Figure 1. Pedigree illustrating a family with a history of hereditary cancer

Genetic testing

Genetic testing for mutations that predispose individuals to hereditary cancer syndromes was made possible in the nineties following the discovery of genes associated with an increased risk of these cancers (65, 66). In general, the initial gene screening is offered to cancer patients (67), whilst carrier testing is offered to healthy relatives in families where a mutation has been detected (66). Initial gene screening of unaffected individuals is not common. A positive mutation test result indicates a significantly elevated risk of cancer that is either a higher risk of developing an initial cancer for non-affected individuals, or a recurrence for patients already known to be af-
fected. However, it is important to mention that not all individuals carrying a mutation develop cancer (68).

Risk management

One of the goals of genetic counseling is to improve counselees’ understanding of their risk for developing an inherited cancer and of their options for risk management. However, appropriate health behavior is not conducted solely based on facts, i.e. the knowledge of being at risk of developing cancer (69). Consequently, receiving risk estimation does not necessarily guarantee changes in behavior. Carrying an increased risk for developing a disease can be seen as a state somewhere between being healthy and being sick, and individuals’ perception of this state and risk management behaviors result from the culmination of a number of mental processes such as thinking, reasoning and expectations. Perceived susceptibility to disease is a factor central to several theories of health behavior and has been utilized to explain cancer screening behavior (70). One such theory addressing individuals’ health behavior is the theory of the health belief model (HBM) which is briefly described later.
Psychological consequences of being at risk of cancer

In previous studies, emotional aspects analyzed included general anxiety, cancer-specific distress, depression, emotional reactions to genetic counseling and testing and a general cancer worry etc. Cognitive aspects included risk perception, reasons to apply for testing, knowledge about genetics, risk perception for carrying a mutation, satisfaction with genetic counseling and willingness to attend genetic counseling/testing etc.

Emotional aspects of attending genetic counseling

Due to the increasing attendance to genetic counseling and undergoing genetic testing, a substantial amount of research has been conducted on the psychological and behavioural consequences of learning of one’s own or a family member’s risk for developing cancer (71, 72).

According to Harpers definition, genetic counseling comprises three crucial elements: to provide a diagnosis, to provide an actual risk estimation and to play a supportive role (73). Each of these aspects of genetic counseling should be performed without causing the counselees unnecessary anxiety (62). That notwithstanding, there is an inherent stigma associated with genetic information in that it can lead to distress, which in turn can cause psychological and emotional difficulties (74).

Psychological distress

Each person attending genetic counseling or undergoing genetic testing reacts individually to the process. In such circumstances, it is not surprising that genetic counseling and testing may generate psychological distress among some counselees (75), with anxiety and depression being the most common emotional reactions observed in cancer patients (72). Several factors such as a family history and intrusive thoughts or cancer-specific worries, play a major role in the development and persistence of anxiety and depression in affected patients or individuals at an increased risk for cancer. Studies in this field suggests that if any distress is to occur, it will most like-
ly correspond to specific testing-related periods, such as when genetic counseling is initially sought (76) or whilst waiting for the test results (77).

Anxiety

Anxiety is often characterized by emotions of fear and worry about everyday life events, culminating in a state of excessive and exaggerated anxiety where no clear reasons for such worry exists. Individuals displaying symptoms of generalized anxiety disorder tend to anticipate disaster and cannot stop worrying about health, money, family, work, or school.

According to the Diagnostic and Statistical Manual of Mental Disorders 4th ed. (DSM-IV), generalized anxiety disorders (GDA) are characterized by excessive feelings of anxiety and worry that are difficult to control, persist for a period of at least 6 months, and are accompanied by extreme fatigue, sleeping difficulties, irritability, restlessness, and concentration difficulties (78).

Depression

According to the DSM-IV, depressive disorders are classified as a type of mood disorder, however, to define depression is rather complex. It is characterized by a low mood accompanied by low self-esteem, restlessness or being slowed down, concentration difficulties, and by a loss of interest or pleasure in normally enjoyable activities (79). Beck described depression as a negative view of oneself, the world and the future. Furthermore, he stated that a feeling of hopelessness about the future was a key feature of depression (80).

In this thesis, anxiety and depression are defined according to the Hospital Anxiety and Depression Scale (HADS) (81), where the term anxiety is defined as a state of fearful emotion, hesitant thoughts and restlessness, whilst depression refers to negative emotions, a sense of hopelessness and loss of interest or pleasure in normally enjoyable activities.

Cognitive aspects of attending genetic counseling

Informational needs and expectations

Several studies have explored counselees’ expectations before attending cancer genetic counseling and the provision of information during genetic counseling. Results indicate that counselees are not adequately prepared before attending genetic counseling and that they are unsure about what to expect (82, 83). At the same time their knowledge and experience regarding hereditary cancer varies greatly. Some individuals expect to be informed
about the level of their own and/or their relatives’ risk (83) whilst others expect to be offered a DNA-test regardless of their susceptibility status or risk profile (84, 85). On the other hand, it seems that counselees do not always discuss their informational needs or preferences with their counselor (86). Hallowell and colleagues suggest that an increased insight into counselees’ informational needs may help the counselor to address these issues better and hence achieve a more successful counseling session for all involved (87). However, it is not easy for the counselor to know what the counselees expect if they do not communicate it clearly to her/him. Experience has shown that if counselees are free to choose and consider all matters relating to genetic counseling, all issues are regarded as very important (88) and specific issues are not prioritized.

When conducting Study IV, the information above together with the facts mentioned earlier relating to communication in genetic counseling (see above) were considered, and Q-methodology was subsequently chosen as the data collection method. When applying Q-methodology, counselees were forced to prioritize what was most important to them during the genetic counseling session (see data collection methods).

Satisfaction with genetic counseling

Patients’ satisfaction can be difficult to measure, as it is a complex variable of numerous functions, such as treatment effectiveness (89) or staffs’ communication skills (90). This satisfaction may be influenced by many factors such as patient characteristics (89), informational needs and coping strategies (91).

Patient satisfaction has been considered as a measure of high quality care (92). Many studies suggest that meeting patients’ expectations is associated with higher levels of satisfaction (93-95). Thus, it may be assumed that if the information given at genetic counseling is tailored to the patients’ needs, expectations and coping styles, they not only suffer less distress, but are also more satisfied (96).
Research findings on psychological and behavioral outcomes

Psychological outcomes

Emotional aspects

The literature indicates that 10%-40% of cancer patients, at some point after receiving their diagnosis, experience clinical depression or suffer from an anxiety disorder (97, 98). However, studies on the impact of genetic counseling report a mixture of findings (99). For example, a number of studies have reported that women from families with several breast cancer cases display elevated levels of both breast cancer specific and general distress (100-102). On the contrary, studies also exist that claim that women at risk for inheriting \textit{BRCA1/BRCA2} gene mutations have average levels of depression and anxiety (103, 104). In Sweden, a prospective study on the psychosocial consequences of pre-symptomatic testing for breast/ovarian and colon cancer reported that tested women displayed similar levels of anxiety as the normative Swedish group both before testing and at the 12-month follow-up (105). Furthermore, all women, irrespective of the type of cancer they were tested for or of carrier status, demonstrated a statistically significant decrease in their HADS anxiety mean scores (105). Moreover, women tested for the \textit{BRCA1/BRCA2} mutations, scored significantly lower than normative Swedish samples on the HAD depression subscale (105).

In summary, studies investigating the impact of genetic counseling in breast, ovarian and colorectal cancer cases on emotional outcomes, have revealed two categories of results. The first category reports that genetic counseling does not have any adverse impact on affective outcomes such as an individual’s mood or well-being (106, 107). It also reports that the mean levels of general anxiety, distress, and depression pre-and post- counseling do not show any increase (61, 108-110). The second category suggests that genetic counseling leads to a statistically significant decrease in generalized anxiety and a trend towards a statistically significant reduction in psychological distress (111) and a short-term reduction in cancer-specific worries (76, 77).
Cognitive aspect

Evidence from controlled trials (112, 113) suggests that receiving genetic counseling leads to an increased knowledge of cancer genetics but does not change counselees’ risk perception. In contrast, the results from prospective studies report a consistent statistically significant increase in the accuracy of risk perception (114-116). Furthermore, high levels of satisfaction with genetic counseling among counselees have been reported (91, 117).

The results of studies related to the impact of genetic counseling in breast, ovarian and colorectal cancer cases on cognitive outcomes, can be summarized in two categories. The first category indicates that genetic counseling improves cognitive outcomes such as knowledge of cancer genetics (112, 113), accuracy of risk perception (61, 114-116, 118), and compliance with surveillance programs (119). A vast body of evidence also indicates that the majority of patients are highly satisfied with the counseling they receive (61, 91, 117).

The second category indicates that genetic counseling does not change counselees’ understanding of certain concepts (cognitions) such as their perception of risk (112, 113).

Behavioral outcomes

The focus of much research in the field of genetic counseling has been on the behavioural consequences of recognizing one’s own or a family member’s risk for developing cancer (71, 72). These studies have explored numerous risk reducing behaviors such as surveillance behaviors (e.g. breast-examination, mammography, and colonoscopy), prophylactic surgery (e.g. bilateral mastectomy or oophorectomy) and other preventive behaviors (e.g. chemotherapy, diet, exercise) or lifestyle changes (120).

Several studies investigating behavior outcomes suggest that many women belonging to families with hereditary cancer do not follow the recommended breast/ovarian cancer screening programs despite learning that they are mutation carriers, and hence, at a higher risk of developing the disease (121, 122). However, other studies report that cancer screening (both mammography and colonoscopy) rates are high among both carriers and non-carriers (120, 123). Nevertheless, the reported rate of prophylactic surgery varies between studies (120, 124). Reports on lifestyle changes such as alterations in physical activity, weight control, food consumption, smoking and/or drinking behaviors, indicate various levels of healthier lifestyle amongst individuals attending genetic counseling (125-127). Notably, changes in priorities and an increased appreciation of life were also evidenced amongst those who had received genetic counseling (128, 129).
Adherence to surveillance programs

Health-related behaviors, such as adherence to surveillance programs, are important for cancer patients because such behaviors may affect prognosis, morbidity and survival (127). A primary area of concern in cancer genetic counseling is conveying the importance of early screening in aiding the detection of a possible malignancy (130). Considering the early-onset of breast cancer (131), surveillance behaviors among this subgroup of women are crucial (101). Counselors who adhere to recommended surveillance programs, for example mammography, may reduce mortality from cancer compared to those who do not participate in regular screening (132).

Perceived susceptibility to disease is a central factor in many health behavior theories such as the health belief model (see the section on theoretical framework), and has been used to explain cancer screening behavior (133). Throughout the last decade, an association between psychological variables - such as distress, health beliefs and health related behaviors such as adherence to surveillance programs has been observed (134). One hypothesis is that individuals’ general beliefs about the causes of health outcomes influence their health-related behaviors. Another hypothesis is that there is an association between psychological distress or anxiety and non-adherence to guidelines such as mammography screening (101, 134). A number of studies have reported that high levels of worry about risk can act as an obstacle to some women, and consequently delay or prevent them from attending mammography screening (100, 135).

Studying the level of adherence to recommended surveillance programs and identifying the factors that may impact adherence to such programs is of utmost importance and hence, formed one of the study questions in Study I of this thesis.

Life-style changes

Cancer is caused by both internal factors such as inherited mutations and environmental/acquired factors such as tobacco or diet. The importance of lifestyle factors, such as smoking, alcohol consumption, imbalanced diet, obesity and lack of physical activity, in the development of cancer has been demonstrated by a number of studies (8, 136, 137). In addition, information about increased genetic risk can have psychological and behavioral consequences and change the relations within families (74, 138). Furthermore, genetic counseling/testing can influence health-related behaviors and the well-being of individuals and families who are at an increased risk (139).

Naturally, when exploring the effects of attending genetic counseling on individuals, an important question concerns their perception about changes in their life and relations.

One of the aims in Study I was to explore counselees’ perceived changes in their lives and relations with family members due to genetic counseling.
However, the focus was mainly on aspects such as future views and plans, priorities in work and leisure time, and relations with family members.

**Communication of information in cancer genetic counseling**

Genetic counseling consists of a very special interaction between the counselor and the counselee, and is characterized by a number of specificities that accounts for its complexity. Genetic counseling is supposed to be non-directive and counselors should strive to create an atmosphere of equality between counselees and themselves (111), as is advocated in modern medical care. One such approach is termed “patient-centered” medical care and as described by Mead and Bower (112), a patient-centered approach is based on mutual participation by both the patient and the care giver, which hopefully leads to an autonomous informed decision being made. “Patient-centered” care has been reported to enhance the interaction between physicians and patients and to improve health outcomes (140).

Communication in genetic counseling should be considered from various perspectives. One important perspective is the counselee-counselor communication, another perspective is the communication between the counselee and at-risk relatives and finally there is the ethical perspective combined with potential conflicts which can arise in association with disclosure of genetic information.

A potential dilemma occurs when, on the one hand, counselees feel a moral obligation to inform their relatives about their risk, yet on the other hand, are concerned about the potential harm in disclosing such genetic information. In addition, a conflict may arise between counselees’ right to autonomy versus their at-risk relatives’ right to making autonomous informed decisions about their health (141, 142). A further ethical issue concerns the health-care professional’s duty to maintain patient confidentiality while at the same time having an ethical duty to warn at-risk relatives. This issue is particularly complicated since in many countries the responsibility of informing relatives lies solely with the counselees (143).

**Counselor-counselee communication**

As described by the Ad Hoc Committee of Genetic Counseling in 1975, genetic counseling is a communication process in which one or more specialized persons, try to help an individual person or a whole family (144). Furthermore, according to the National Society of Genetic Counselors (NSGC) definition, genetic counseling is the process of helping people to understand and adapt to the medical, psychological and familial implications of the genetic contribution to disease (145).

During the first counseling session, a substantial amount of information is presented, thus counselees’ active participation and a more interactive discussion may enhance their understanding and recall since studies have demonstrated that passive listening reduces counselees’ comprehension (113).
However, counselees are facing a daunting time and may find coping with this difficult, thus, they may choose what they perceive to be the easier route, and avoid taking an active role. However, it is ultimately the counselees who have to live with the consequences and it should be their decision (146). The same applies regarding the counselees’ informational needs.

Despite trying to adopt a “patient-centered” approach, what tends to actually occur within the clinical settings is that counselors direct the communication and consequently choose most of the discussion topics. It seems that the majority of specialists believe that there are a number of topics which should be discussed during a consultation such as inheritance patterns, cancer risks associated with mutations in different genes, risks, benefits and limitation of testing, clinical examinations and surveillance programs (114).

Studies on communication within the area of oncology suggest that physicians rarely ask about patients’ concerns and questions and do not adapt the counseling to meet counselees’ expectations (147). Counselors provide detailed information about varying aspects of familial cancer but do not address or approach the subject of emotional concerns (148).

On the other hand, study results reveal that patients’ strong desire for medical information does not motivate them to actively engage in seeking information (115). Counselees are often poorly prepared and unsure about what to expect from genetic counseling (113, 116), and hence ask relatively few questions (113).

The aforementioned issue, in addition to facts about the counselees’ informational needs and preferences (see below), constituted the basis for performing Study IV. More specifically, the aim of this study was to explore counselees’ informational needs and expectations in association with genetic counseling and to investigate whether these expectations were fulfilled.

Counselee-relatives communication

Undergoing genetic counseling or testing for hereditary cancer provides information that is important not only for the individuals attending counseling, but also for their relatives who have an increased risk for developing cancer (141). Thus, providing information about genetic risk and test results to at-risk individuals and their families is important. However, inaccurate risk perception remains a problem for many counselees and results from previous studies suggest that counselees experience difficulties in communicating cancer genetic information to their close relatives (119).

According to current policies in Sweden and Norway, as in many other countries, the responsibility of informing at-risk relatives rests solely with the counselees and not with the genetic health professionals.

Disclosing genetic information to relatives is a multifaceted process for counselees and can be affected by many factors such as family history (149), personal understanding, capability to explain genetic concepts and counselees’ expectations of how their relatives will react to such information (150).
In addition, family members’ attention and ability to understand the information will also affect the communication (143).

Whether counselees share genetic information with family members or not, depends also on their perception of the risks and benefits of disclosing the information (151). While people generally do not want to deliver what they consider as “bad news”, they are at the same time concerned about the potential harm in withholding the information from their at-risk relatives (152).

Owing to the difficulties associated with understanding and conveying genetic information (142), it could be anticipated that counselees need greater support to enable communication to occur in an appropriate manner. It has been assumed that when genetic information is received from a family member, adequate attention is not given to the hereditary nature of the cancer and consequently the risk for relatives (153). Thus, more support may be needed for at-risk relatives’ to supplement their understanding of their genetic risk and be aware of the availability of sufficient preventive activities (143, 154).

These observations raised questions about the level of support required by counselees so that information could be conveyed to their at-risk relatives in a comprehensive and concise manner. Consequently, the Buckmans’ “breaking bad news model” (see the section on theoretical framework) was applied as part of the intervention in Study II, whilst the study of both counselees’ and at-risk relatives’ experiences regarding the communication of genetic information was the focus of Study III.
Theoretical frame-work of this thesis

Understanding human behaviour and studying the psychological and familial aspects of an important public health problem such as the risk of developing cancer or being affected by the disease, requires a multidisciplinary approach. The theoretical frame-work behind the studies included in this thesis are derived from several disciplines, namely psychology, communication and education, and are combined with knowledge and experience obtained from clinical genetics.

Outlined below, is a brief description of the theories that inspired Studies I-IV.

Health Belief Model (HBM)

Cognitive psychologists believe that individuals’ beliefs and behavior are crucial factors in improving health. One such cognitive and behavioral theory, the health belief model (HBM), was initially developed in the mid nineties by a group of social psychologists looking to explain why individuals failed to participate in disease screening and prevention programs. The model was later extended to examine individuals reactions to experiencing symptoms and to their behavior in response to being diagnosed with an illness, and more importantly their adherence to recommended medical regimens (69).

The HBM is a value-expectancy theory. According to this theory two important components are: 1) the wish to avoid illness or to get well (value) and 2) the belief that a specific health act available to a person would prevent or (improve) illness (155). It is hypothesized that people will act to prevent, to screen for, or to control ill-health if they consider themselves predisposed to certain conditions, if they believe it would have potentially severe consequences, if they believe that a way of acting would be useful in reducing their susceptibility to or the severity of the disease and if they believe that the predicted barriers are offset by their benefits (155). The HBM (156) emphasizes the importance of risk perception in the implementation of health-protective behavior (157), and it is hypothesized that adherence to recommended health-related behaviors is usually more possible when the perceived risk is in accordance with the actual risk (158).

This theory was applied to questions in Study I which explored counselees’ adherence to recommended surveillance programs and also questions in
Study II relating to counselees’ risk perception and accordingly the transfer of information to their at-risk relatives in Study III.

Information processing

**Cognitive-Social Health Information Processing**

According to the Cognitive-Social Health Information Processing (C-SHIP) theory, individuals possess a relatively stable cognitive and affective structure that is likely to be activated whenever confronted with a life-threatening event (159) or when forced to cope with a health challenge (160). Being predisposed to hereditary cancer or being affected by cancer is one such health challenge. Receiving genetic counseling is an event which engages individuals cognitively and activates their affective responses. During counseling sessions an extensive amount of information is provided which needs to be processed and understood. It is hypothesized that enhanced counseling interventions facilitate the personal processing of genetic information both cognitively and affectively (161).

As detailed within the C-SHIP theory, and based on evidence from the disciplines of education and communication, it has been suggested that providing individuals with educational materials including written information (e.g. brochures, booklets), web sites, and the use of videotapes and/or computer programs results in the increased knowledge, satisfaction and well-being of patients (162). It has also been assumed that such enhanced information is more effective than the standardized information currently provided by cancer genetic out-patient clinics. Thus, the effect of providing enhanced information to counselees using various mediums was investigated in Study II and planned according to the assumptions outlined above (see Figure 2).

**Miller’s information processing theory**

The storage and retrieval of information is a subject that has long been of interest and cognitive psychology is one approach that primarily focuses on memory. Several widely accepted theories and models exist within this discipline all pertaining to cognitions, memory and information processing.

According to Millers’ information processing theory (163), dividing information into smaller segments improves learning since the amount of information that can be processed by the brain is limited (164). Studies have revealed that our short term memory or attention span can only hold between 5-9 pieces of information (163) at any one time. Millers’ theory also describes how we construct meaning about our environment by using information that we gather through our senses and information we have stored within our memory (165). Consequently, introducing information using multiple channels and in various formats increases the likelihood that this newly
acquired knowledge will be understood, retained and able to be recalled (166). This theory formed the basis for investigating the benefit of enhanced information detailed within Study II.

**Perception of information**

It is hypothesized that the recall of information is often selective and is influenced by numerous factors such as an individual’s perception of the information (167), the extent to which the information is related to the person’s expectations (Study IV), and the perceived relevance of the information (168).

Our assumption, relating to risk perception, was that counselees’ perception of the genetic information provided does not entirely depend on the facts which are presented to them during the counseling session but is also influenced by how they interpret them, which in turn is influenced by counselees’ characteristics and previous experiences (see Figure 2).

![Figure 2](image)

*Figure 2.* Components relevant to cancer genetic counseling, and considered to have an impact on the measured outcomes.

**Buckman’s “Breaking Bad News Model”**

Usually, people do not like to inform others of what they consider to be “bad news”. In medical context, bad news has been described as “any news that drastically and negatively alters the patient’s view of his or her future” (169). Nevertheless, within medical settings conveying unfavorable news concerning life-threatening events is inevitable. Unfortunately, sometimes counselees need to inform their relatives about their own cancer diagnosis or cancer susceptibility, as well as informing their biological relatives that they themselves may possess a higher risk of developing cancer. A constructive and effective way of communicating this information is to break it into smaller
pieces and discuss it in a stepwise manner. Employing the six step protocol for “Breaking Bad News”, as described by Buckman (169) is one possible way of performing this task. This model was used within the intervention in Study II and counselees were encouraged to use this model to assist them when conveying the relevant information to at-risk relatives. The 6 steps within this model consist of:

1) Getting started
2) Finding out what the relatives know
3) Finding out how much they want to know
4) Sharing the information
5) Responding to feelings/emotions
6) Planning and follow-up

To briefly summarize the model, during steps 1-3 the counselee deals with introductory activities such as approaching the subject and preparing a private physical location suitable for such conversations, at the fourth step the news is conveyed and the last two steps provide time for responding to the reactions/emotions and planning a constructive follow-up.

Cancer as an important issue in health-care

With just under 3 million new cases of cancer diagnosed every year and almost 2 million deaths annually worldwide (170), cancer remains an important public health problem. At the same time, due to advances in modern medicine, greater numbers of individuals are being referred to genetic counseling based on family history and hence a predisposition to hereditary cancer. As genetic information is predominantly a family affair and can involve several family members, genetic services are placed under increasing pressure. Thus ensuring the provision of an adequate and effective genetic counseling service despite this increased pressure remains an important health-care issue. Finding effective ways to handle this growing demand and improve the service requires continued investigations and scientific suggestions, and hence gave rise to the studies included within this thesis.
Aims

The overall aim of this thesis was to study psychological and behavioral aspects in association with attending cancer genetic counseling for hereditary cancer. The purpose was to investigate how information provided affected counselees’ emotions, cognitions and health-related behaviors. Additionally, we also investigated whether counselees’ expectations and informational needs were met through the consultation.

More specifically, the aims of the studies included in this thesis were:

Study I
The aim was to explore counselees’:

1. Current psychological distress
2. Perceived changes in life
3. Adherence to recommended cancer surveillance programs
4. Satisfaction with cancer genetic counseling

3-7 years after the initial visit at the cancer genetic outpatient clinic.

Study II
The aim was to investigate the effect of an intervention offering enhanced information on:

1. Counselees’ knowledge
2. Risk perception
3. Communication of information to at-risk relatives
4. Satisfaction with the given information
Study III
This study had three aims:

1. To investigate the extent to which counselees disclosed cancer genetic information to their at-risk relatives.
2. To explore counselees’ experiences of sharing genetic information with their at-risk relatives.
3. To study how at-risk relatives were informed and their subsequent reactions having received such information.

Study IV
This study had four aims:

1. To determine the issues that counselees considered as most/least important prior to their first cancer genetic counseling session when they were forced to choose.
2. To determine the issues that counselees considered as important and expected to be discussed during the cancer genetic counseling when they were free to choose.
3. To investigate to what extent counselees perceived that the issues important to them were addressed during the counseling session.
4. To identify whether any relationship existed between counselees’ informational needs/preferences and their demographic characteristics and medical status.
Methods

Design
This thesis consists of four studies:

I A cross-sectional retrospective study.
II A randomized controlled trial (RCT) intervention study comprising 4 measurement time-points.
III A descriptive study based on data obtained from a semi-structured interview.
IV A comparative study based on responses to a survey.

Participants

Study I
Study I was based on a postal survey performed 3-7 years after counselees’ initial visit at the cancer genetic clinic of Uppsala University Hospital. Between 1999 and 2002, 322 counselees with breast/ovarian cancer and/or a family history of breast/ovarian cancer (referred to as “breast cancer group”), or colorectal cancer and/or a family history of colorectal cancer (referred to as “colorectal cancer group”) attended genetic counseling. When the study was conducted (autumn 2005), 301 eligible counselees were alive and were asked to participate in the study. A total of 214 counselees (72%) responded. The mean age of participants was 48.3 years (range = 24-79) and the majority were married/co-habiting females with a family history of breast-/ovarian cancer. Most participants had a university education and were not affected. Non-responders received two reminders. For a detailed description of participants characteristics, see Table 1.
Study II

Study II was a RCT and recruitment of participants began in October 2003 and was completed in January 2007. During this period, 210 counselees attended genetic counseling. A total of 163 counselees (78%) consented and participated in the study. With an attrition rate of 16, a total of 147 counselees, aged between 23-84 years, were randomized to either an intervention (n=73) or control group (n=74). The majority of counselees were non-affected females and mainly referred to counseling due to breast cancer or a family history of breast cancer. Counselees aged 18 years or older who understood Swedish and did not suffer from any documented mental illness were considered eligible to participate.

Outcome measurements were conducted at four different time-points; pre-visit, immediately after counseling, and then at a two-week and eight-month follow-up.

At the first visit, counselees were asked for permission to contact their at-risk relatives. A total of 124 relatives were accessible and were informed about the purpose of the study (Study III) and subsequently invited to participate. Eighty-one relatives (66%) consented and participated in Study III which focused on counselees and their relatives’ experiences about receiving...
and sharing genetic information. Relatives answered the postal questionnaire they had received, but did not receive any intervention. For a detailed description of the study groups, see Table 2.

Table 2. Socio-demographic characteristics of participants in Study II (n=147)

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=73)</th>
<th>Control (n=74)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td><strong>Health status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer patients</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Non-affected counselees</td>
<td>45</td>
<td>48</td>
</tr>
<tr>
<td><strong>Referred due to cancer/family history of</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Breast/ovarian cancer</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level of risk estimated by the geneticist</th>
<th>n1 (%)</th>
<th>n1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-affected counselees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 20%</td>
<td>8 (20)</td>
<td>9 (19)</td>
</tr>
<tr>
<td>21-40%</td>
<td>29 (72.5)</td>
<td>37 (77)</td>
</tr>
<tr>
<td>&gt; 40%</td>
<td>2 (5)</td>
<td>2 (4)</td>
</tr>
<tr>
<td><strong>Affected counselees’ relatives</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 20%</td>
<td>5 (15)</td>
<td>6 (23)</td>
</tr>
<tr>
<td>21-40%</td>
<td>23 (70)</td>
<td>17 (65.5)</td>
</tr>
<tr>
<td>&gt; 40%</td>
<td>3 (9)</td>
<td>1 (4)</td>
</tr>
</tbody>
</table>

1. Data was not available for all participants

Study III

Study III was a descriptive exploratory study which focused on the extent to which counselees shared the cancer genetic information with their at-risk relatives. Participants in Study II and their relatives were included in this study.

As previously mentioned, at their initial visit to the clinic, counselees were asked for permission to contact their at-risk relatives. A total of 126 at-risk relatives, confirmed as at-risk by a genetic counselor, were identified.
According to the geneticists’ estimations, the majority of relatives (75%) carried a high risk (>20%) of developing cancer. At-risk relatives, whom the researcher was permitted to contact, were contacted in writing and invited to participate in the study. Eighty-one relatives (66%) comprising 24 males (brothers and sons) and 57 females (daughters and sisters) provided written consent and answered the questionnaires which were mailed to them.

In total, 228 individuals (147 counselees; 133 females and 14 males, and 81 relatives; 57 females and 24 males) formed the study group. Table 3 details the characteristics of the participants within this study. Of the 147 participating counselees in this study, 128 (87%) were interviewed and answered the questionnaire, their relatives only had to answer the questionnaire.

Study IV

Study IV was based on a survey conducted at two cancer genetic out-patient clinics in Sweden (Uppsala and Linköping), and two in Norway (Bergen and Trondheim). The consecutive recruitment of participants began in spring 2009 and was completed in early spring of 2010. In total, 334 counselees affected by breast, ovarian, colorectal cancer, or a family history of these cancers, and attending genetic counseling for the first time, were eligible to participate. Inclusion criteria were as follows: age of 18 years or older, understanding of the Swedish/-Norwegian language and no documented mental illness. Of all eligible counselees, 31 declined participation. The reasons for non-attendance (n=55) were due to poor psychological health, a death in the family, not being available, failure to attend the genetic counseling session, cancellation of appointments, opting to receive telephone counseling or rescheduling of appointments. In total, 248 individuals (74%) provided informed consent. Following the first visit, 3 counselees died and 10 withdrew from the study. Therefore, a total of 235 counselees (70% of all those eligible) were included in the study group. The mean age of participants was 45.6 years (range, 19-77), and the majority were married or co-habiting females (84%) who had biological children (84%). The majority of counselees were not-affected and did not carry any known mutation within their families. Detailed information about participants’ characteristics is presented in Table 4.
Table 3. Characteristics of the participants in Study III (n= 228)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Counselees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>73</td>
<td>49.6</td>
</tr>
<tr>
<td>Control</td>
<td>74</td>
<td>50.4</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Female</td>
<td>133</td>
<td>90</td>
</tr>
<tr>
<td><strong>Health status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer patients</td>
<td>62</td>
<td>40</td>
</tr>
<tr>
<td>Non-affected</td>
<td>94</td>
<td>60</td>
</tr>
<tr>
<td><strong>Family history of cancer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>Breast/ovarian cancer</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

| **At-risk relatives**    |    |     |
| Intervention             | 44 | 55  |
| Control                  | 37 | 45  |
| **Gender**               |    |     |
| Male                     | 24 | 30  |
| Brother                  | 15 | 19  |
| Son                      | 9  | 11  |
| Female                   | 57 | 70  |
| Daughter                 | 23 | 28  |
| Sister                   | 34 | 42  |
Table 4. Socio-demographic characteristics of participants in Study IV (n= 235)

<table>
<thead>
<tr>
<th></th>
<th>Sweden (n=113)</th>
<th>Norway (n=122)</th>
<th>Total (n= 235)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n¹ (%)</td>
<td>n¹ (%)</td>
<td>n¹ (%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16 (14)</td>
<td>22 (18)</td>
<td>38 (16)</td>
</tr>
<tr>
<td>Female</td>
<td>95 (86)</td>
<td>102 (82)</td>
<td>197 (84)</td>
</tr>
<tr>
<td><strong>Health status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer patients</td>
<td>51 (45)</td>
<td>28 (31)</td>
<td>79 (38)</td>
</tr>
<tr>
<td>Non-affected</td>
<td>64 (55)</td>
<td>87 (69)</td>
<td>151 (62)</td>
</tr>
<tr>
<td><strong>Referred due to</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cancer/family history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>57 (53)</td>
<td>29 (24)</td>
<td>86 (38)</td>
</tr>
<tr>
<td>Breast/ovarian cancer</td>
<td>24 (22)</td>
<td>49 (40.50)</td>
<td>73 (32)</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>26 (24)</td>
<td>43 (35.5)</td>
<td>69 (30)</td>
</tr>
<tr>
<td><strong>Known mutation in</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the family</td>
<td>(according to the counselees)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35 (33)</td>
<td>26 (22)</td>
<td>61 (27)</td>
</tr>
<tr>
<td>No</td>
<td>61 (57)</td>
<td>92 (78)</td>
<td>153 (68)</td>
</tr>
<tr>
<td>Unsure</td>
<td>11 (10)</td>
<td>0 (0)</td>
<td>11 (5)</td>
</tr>
<tr>
<td><strong>Biological children</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>101 (91)</td>
<td>95 (77)</td>
<td>196 (84)</td>
</tr>
<tr>
<td>No</td>
<td>10 (9)</td>
<td>28 (23)</td>
<td>38 (16)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compulsory schoolinga</td>
<td>27 (24.5)</td>
<td>18 (15)</td>
<td>45 (19)</td>
</tr>
<tr>
<td>High school</td>
<td>44 (40)</td>
<td>44 (35)</td>
<td>88 (38)</td>
</tr>
<tr>
<td>College/University</td>
<td>39 (35.5)</td>
<td>61 (50)</td>
<td>100( 43)</td>
</tr>
<tr>
<td><strong>Marital statusb</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabiting</td>
<td>95 (86)</td>
<td>97 (79)</td>
<td>192 (82)</td>
</tr>
<tr>
<td>Single</td>
<td>9 (8)</td>
<td>14 (12)</td>
<td>23 (10)</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>5 (4)</td>
<td>9 (7)</td>
<td>14 (6)</td>
</tr>
<tr>
<td>Widowed</td>
<td>2 (2)</td>
<td>2 (2)</td>
<td>4 (2)</td>
</tr>
</tbody>
</table>

1. Data is not available for all participants.

a Nine years of education in Sweden and 10 years in Norway

b Data are missing for some participants

The intervention in Study II

Based on results from Study I, which indicated that genetic counseling did not have any adverse psychosocial effect on counselees, and bearing in mind
the complexity of the situation regarding risk perception and the need for support when communicating genetic information to at-risk relatives, Study II was conducted as an intervention study. As the main aim of genetic counseling is to inform, the focus of this intervention was on information. The main objective was to increase counsellee's realistic risk perception with the hope that this would lead to the adoption of appropriate health behaviors (171), improve their ability to disclose such information to at-risk relatives and also raise their awareness of current risk management strategies. This intervention was based on ideas from the disciplines of health education and communication, which suggest that information material should be presented in various formats, such as using printed material, video tapes, and/or computer programs (162, 164, 172). Furthermore, in accordance with Miller's information processing theory (163) and Buckman's “Breaking Bad News” model (169), the information was broken into smaller pieces and presented through multiple channels (164).

Figure 3. Components of enhanced information

In addition to the counseling session with the genetic counselor, a specialist nurse met with the counsellee in the intervention group and again went through the information provided. Counselees in the intervention group were also asked to estimate their risks and identify their at-risk relatives. Furthermore, the nurse discussed the intention to inform relatives and in those cases where the counsellee were unsure the nurse tried to determine the reason and help them (where possible) to overcome the barriers. The model of “Breaking Bad News” was presented to the counsellee during this session and they also received a pamphlet detailing the basics of genetics and more specific information regarding their type of hereditary cancer. In addition, they re-
ceived a videotape from the counseling session, a copy of their medical record and a copy of the pedigree, all of which were intended to improve their comprehension of the situation and be used when informing relatives (Figure 3). For more detailed information see paper II.

Data collection

Standardized tools utilized throughout these studies have been used in several previous studies and proven to have a high validity and reliability. Psychometrics of these instruments are reported in papers I-IV. For an overview of data collection methods and the measures utilized within each study, see Table 5 and 6 respectively.

Table 5. Data collection methods

<table>
<thead>
<tr>
<th>Methods</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantitative methods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Background data</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Q-sort method</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Qualitative methods</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi structured interview</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

The following standardized tools were used in Studies I-IV (see Table 6)

The Hospital anxiety and depression scale (HADS) (92): The Swedish version of HADS was applied for assessment of anxiety and depression. It consists of 2 subscales, one assessing depression (7 items) and one assessing anxiety (7 items). Subscale scores range from 0 (no distress) to 21 (maximum distress).

Satisfaction with genetic counseling scale (SCS): SCS (157) consists of 12 items including three subscales and three individual items. The choices of response for these items ranged from “not at all satisfied” = 1, to “as satisfied as possible” = 4. In Study II, the Swedish version of SCS, translated by Nordin and co-workers (130), was applied.
The Multidimensional health locus of control scale (MHLC) (158): This is a self-report instrument measuring individuals’ perceived (internal and external) locus of control over their health. The MHLC contains three, six-item subscales that range from 6-36. Higher scores indicate a greater belief in that subscale domain in relation to health.

QUOTE-GENE¹ (ca) (159): This questionnaire investigates issues that counselees regard as the most important prior to their initial consultation and measures whether their expectations were met during the counseling session. The scale contains a set of generic items pertaining to genetic counseling (25 items) and a set of disease-specific items concerning hereditary cancer (19 items). The generic set refers to what a counselee expects a counselor to do during the counseling session and the cancer-specific part consists of items related to receiving specific explanations about hereditary cancer. Responses are recorded prior to the genetic counseling session and after having attended the session. There are four response options pre-visit: 1 = not important, 2 = of little importance, 3 = important and 4 = extremely important, post-visit: 1 = too little, 2 = a little but not enough, 3 = adequate, and 4 = generally acceptable.

The scale was adapted and designed to take into consideration national circumstances, hence items judged to be irrelevant were removed. Thus, the set of generic items in the Swedish and Norwegian versions of QUOTE-GENE (ca) contained 23 statements and the set of disease-specific items contained 18 statements.

The following study specific questionnaires were used in Study I

Background data: In addition to demographics and medical background, 18 questions were used to investigate the following: family history of cancer, frequency of breast self-examination, adherence to recommended cancer surveillance programs, desire for additional support and experience of and satisfaction with genetic counseling.

The Perceived changes in life scale: This questionnaire consisted of 15 questions and assessed perceived changes in both life and relations with family members following the genetic counseling session. The questionnaire was based on the 15 Visual Analogue Scale (VAS) and responses to each item ranged from 0 (totally disagree) to 10 (totally agree).

¹ Quality of care through the patients’ eyes
The following study specific questionnaires were used in Study II

Risk perception: Counselees completed a risk perception form for developing cancer based on the work of Evans and colleagues (101). Non-affected counselees estimated their own risk and cancer-affected counselees estimated the risk for a specific close relative. The perceived risk was firstly rated in percentage (e.g. 0-10%), and secondly in comparison to the risk of other people of the same age and gender, on a five-point scale (lower = 1, much higher = 5). The counselor completed a corresponding form concerning the risk for the counselee or the specific relative chosen by the counselee.

Knowledge: Knowledge about genetics was assessed by a questionnaire whereby respondents indicated whether certain statements about hereditary cancer and genetics were true or false. Three versions of the questionnaire were developed, one for breast cancer (11 items), one for ovarian cancer (13 items) and one for colorectal cancer (9 items).

Satisfaction with the given Oncogenetic Information Scale (SOIS): A 6 item questionnaire was developed for Study II in order to specifically evaluate the counselees’ satisfaction with the information provided. Respondents were asked to indicate their answer on a five-point scale ranging from “not at all satisfied” = 1 to “totally satisfied” = 5.

The following data collection methods and study-specific instruments were used in Study III

Structured interview with counselees: Information regarding communication with family members including counselees’ feelings about sharing the information in addition to relatives’ reactions to the given information were investigated by means of a telephone interview using ten preset questions (e.g. “What did you tell your relatives?” or “How did you feel to be the one who passed on the information?”).

Counselees’ questionnaire: Demographics, medical data and information regarding counselees’ intention to inform at-risk relatives were collected prior to genetic counseling by means of a questionnaire.

Relatives’ questionnaire: Relatives’ reactions to both the genetic information disclosed and the means by how it was communicated was assessed by a questionnaire developed by the research team. This questionnaire was based on clinical experience regarding genetic counseling and research findings (154, 160), and consisted of 14 questions. Data from a selected number of questions was presented.
The following data collection method was used in Study IV

**Q-sort method**

Q-methodology (161) involves constructing a Q-set that includes statements covering various aspects of the field to be studied. Each Q-statement is written onto a card and randomly numbered. Participants are required to assign each statement a ranking position according to how important they perceive them to be (162). The responses can be forced into a quasi-normal distribution by defining the number of items allocated to each ranking position (Figure 4). The forced choice method was chosen for Study IV, since we were interested in finding possible variations in counselees’ viewpoints.

For Study IV, a Q-set of 30 statements was generated by reviewing the relevant literature and available questionnaires in this particular field (Table 7). In addition, discussions with counselors and interviews with a sample of counselees were conducted. Statements concerned procedural, medical, individual, familial and emotional aspects of cancer genetic counseling.

![Figure 4. Quasi-normal distribution of statements and ranking values in Study IV.](image-url)
Table 6. Overview of instruments used in Studies I-IV.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Hospital Anxiety and Depression Scale (HADS)</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>The Multidimensional Health Locus of Control (MHLC)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Perceived Changes in Life Scale</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Risk Perception</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with Genetic Counseling Scale (SCS)</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with Given Oncogenetic Information Scale (SOIS)</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Counselees’ Questionnaire</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Relatives’ Questionnaire</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUOTE-GENE (ca)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-visit form</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Post-visit form</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Statistical analysis

Study I

Descriptive statistics were performed for all variables. For the HADS and MHLC measurements, mean values and standard deviations were calculated according to the instructions for the respective instrument. Group differences in continuous variables were assessed by student’s t-tests. In order to protect against errors in inferences due to family-wise error rates, Bonferroni correction was applied, where necessary.

The VAS scale responses were analyzed as ordinal outcomes. All reported p values (p ≤ 0.05 or p ≤ 0.01) were associated with 2-tailed tests of significance.
Study II

Descriptive statistics were computed for socio-demographic and medical variables, satisfaction with the counseling and knowledge. Correct answer scores on the knowledge test were summed to constitute a measure of knowledge about hereditary cancer and genetics. The comparison of counselees’ scores on HADS in the 3 measurement occasions was performed using two-way ANOVA repeated measure analysis. The risk perception measure was dichotomized to reflect a correct/incorrect answer (the counselors’ estimation was considered as the correct answer). Group differences in risk perception (categorical variables) were assessed by the Mann-Whitney U test, and the McNemar test was used to compare changes that occurred in these variables over time. All reported p values were associated with two-tailed tests of significance.

Study III

In Study III, counselees’ answers to a semi structured interview and relatives’ responses to the open ended requests were analyzed using quantitative manifest content analysis. Responses were reviewed for the content by the first author (AR) and categorized based on the respondents’ explicit verbal expressions about an emotional reaction. Categories were mutually exclusive and reflected the central message in the responses. Double coding was subsequently carried out independently by both the first author and a colleague. The level of concurrence between the two coders was between 83%-92%. In the few discordant cases, discrepancies were discussed until a consensus was reached.

For presentation of the data, each recording unit was calculated only once, regardless of how many times it was mentioned by a respondent. In almost all cases counselees expressed only one reaction/feeling regardless of how many at-risk relatives they had informed. These responses were placed in a single category. However, in the few cases where the counselee’s response regarding at-risk relatives’ reactions to received information included more than one reaction/feeling, different reactions/feelings from each counselee’s response were placed in various categories. However, a single statement was never placed in several categories. Where only one participant expressed a particular experience, which did not fit in any category, this was noted but not categorized.

Although the interview and open-ended questions were analyzed qualitatively, results were quantified to provide an overview.
Study IV

In order to determine the dimensions of the generic and cancer-specific items of the QUOTE-GENE (ca) questionnaire, principal component analysis (PCA) was performed on the importance scores. The suitability of the factor analytic model was tested using the Kaiser-Meyer-Olkin measures of sampling adequacy (KMO=0.91) and Bartlett’s test of sphericity. To assess internal consistency Cronbach’s alpha was calculated for each dimension (0.68—0.86). The importance scores were determined by counting the mean of the item scores for each dimension.

To assess the possibility of predicting counselee’s informational needs (calculated by importance scores attached to the QUOTE-GENE (ca) factors), based on counselee’s demographic characteristics, personal/family history of cancer and citizenship, regression analysis (stepwise) was performed.

PCA was performed on Qsorts (counselee’s distribution of the statements). In the PQ-method\textsuperscript{2} emerged factors represented the relationship between Qsorts (the shared viewpoint) rather than between items, and describe how the group of counselees who cluster on one factor have sorted the statements. In organizing the data, Qsorts loading less than 0.40 were excluded. To identify Qsorts that exemplify each factor, that is Qsorts that load highly (at least at $p \leq 0.05$) on one factor, the “pre-flagging” algorithm within the PQ-method was used. To produce a combined or synthetic Qsort for the factor a weighted average of the ranks given to each Q-statement by like-minded people was calculated (i.e. the extreme polar statements weight most in comparison to the statements near the centre). For interpretation of the factors particular attention was paid to the placing of the “most important” (-2) and “least important” (+2) items and distinguishing statements for each factor (see paper IV).

\textsuperscript{2} A software for analyzing Qsorts
Table 7. Example of cancer related statements used in Study IV

1. To receive information about the causes of breast/breast ovarian cancer
2. To find out the risk that I'll get cancer
3. To know the risk of me/my closest relative(s) to get cancer
4. To receive general information on genetics
5. To know what a mutation means
6. To receive information on genetic tests
7. To understand the significance of my family history for the risk of getting cancer
8. To know what you can do in everyday life to reduce cancer risk
9. To receive regular clinical examinations and information about such procedures (e.g. mammography)
10. To be supported when communicating the information to concerned relatives
11. To obtain subsequent support calls
12. To receive detailed information about medical procedures, including their pros and cons
13. To know the probability of inheriting a cancer gene if it has been found within my family
14. To know the probability of developing cancer having inherited a cancer gene
15. To receive information about the possibility of insurance companies’ finding out about genetic assessments
16. To receive information about the possibility of an employer finding out about genetic assessments
17. To get the opportunity to express my true feelings
18. To be understood
19. That my problems are taken seriously
20. That the doctor spends enough time with me

3 The statement was adjusted for colorectal cancer counselees:
   “To receive information about the causes of colorectal cancer.”
Results

Study I
In Study I, cancer genetic counselees’ self-reported psychological distress, changes in life, and adherence to recommended surveillance programs were investigated 3-7 years post-counseling.

Psychological distress
No significant differences in distress were observed among counselees 3-7 years post-counseling with regard to the type of cancer or family history of cancer. Furthermore, no significant differences in reported distress were found between affected and non-affected counselees or between carriers and non-carriers.

However, higher levels of distress were found among participants who had been recommended additional mammography by the geneticist, and those who wished for help to inform relatives. Counselees who practiced breast self examination (BSE) reported significantly lower levels of anxiety ($t=2.8$, df=151, $p \leq 0.01$) and depression ($t=2.8$, $p \leq 0.01$) compared to non-practitioners.

No significant differences were observed within the “colorectal cancer group” with regard to the variables studied, with the sole exception being higher levels of depression in affected counselees ($t=3.5$, df=45, $p \leq 0.05$).

Perceived changes to life and family relations
At follow-up in Study I, participants reported changes in family relations, priorities and appreciation of daily life activities (Figure 5).
More detailed analysis revealed that affected patients in the “breast cancer group” reported significantly more changes in priorities in leisure time (t=2.6, df =160, p ≤ 0.05), appreciation of daily life activities (t=2.4, df =162, p ≤ 0.05), and changes in a close relationship (t=2.3, df =161, p ≤ 0.05) compared to non-affected counselees. On the other hand, carriers in this group reported less change in family relations and to a lesser extent reported a decreased pre-occupation with health. No significant differences were observed between affected/non-affected individuals and carriers/non-carriers within the “colorectal cancer group”.

**Adherence to surveillance programs and health locus of control**

The majority (85-89%) of participants in Study I had followed their physicians’ recommendations for further surveillance programs. However, regular self-examination of breasts in the “breast cancer group” was less common (36%).

Counselees in the “breast cancer group” who had attended mammography reported a significantly stronger belief in external control over their health (MHLC, “powerful others externality” subscale) than non-attendees (t=3.3, df=152, p ≤ 0.05). Furthermore, women who performed BSE, compared to those who did not, reported a significantly stronger belief in internal control over their health (higher scores on MHLC internality subscale, t=2.2, df=137, p ≤ 0.05). In addition, counselees who had undergone a
colonoscopy scored significantly higher on external health locus of control (MHLC, externality subscale) than non-attendees \((t=2.5, df =41, p \leq 0.05)\).

**Satisfaction with genetic counseling**

The reported level of satisfaction with the information provided regarding surveillance programs was high among participants in Study I \((M\_b.c\_gr.=7.0, Sd=2.8; M\_c.c\_gr. =6.4, Sd=3.7, Range= 0-10)\).

Approximately half of the counselees expressed a desire for further help concerning how best to convey genetic information to family members and also indicated that they would have accepted additional counseling sessions if offered. Additionally, about half of the participants in the “breast cancer group” \((47%, n=78)\) and one-third in the “colorectal cancer group” \((33%, n=16)\) would have accepted contact with a psychologist at the time they had attended genetic counseling.

**Study II**

Study II was a randomized intervention study and investigated the effect of enhanced cancer genetic information on counselees’ knowledge, risk perception, satisfaction and communication of information to at-risk relatives.

**Knowledge**

The majority of participants in Study II had a high level of knowledge about hereditary cancer and genetics prior to the counseling session \((M\_{intervention}= 8.6., M\_{control} = 8.5)\). Overall, the level of counselees’ knowledge increased over time (Figure 6a-c) with the exception of a slight decrease for the controls in the “colorectal cancer group” (Figure 6c). However, this increase was not significant in all groups, although an exception was a significant increase in the breast cancer group, at both the 2-week and 8-month follow-up compared to baseline.

No significant difference in knowledge was observed between the intervention and the control group in any of the subgroups or at any time-point.
Figure 6a. Level of knowledge within the “breast cancer group”

Figure 6b. Level of knowledge within the “breast/- ovarian cancer group”

Figure 6c. Level of knowledge within the “colorectal cancer group”
Perceived risk of cancer (presented as percentage values)

Non-affected counselees
At baseline, about half of the non-affected counselees in both the intervention and the control group had estimated their personal risk for developing cancer correctly (presented as percentage values). However, immediately after the counseling session, a significant difference was observed between the intervention and the control group, with the control group giving a more accurate estimation (Mann-Whitney U test, $p \leq 0.01$). At the 2-week follow-up, the correct risk estimation was significantly increased in both groups (intervention group = 82%, McNemar test, $p \leq 0.005$ and control group = 92%, McNemar test, $p \leq 0.001$), and at the 8-month follow-up it was reduced to approximately 60% in both the intervention and control group (Table 8).

Affected counselees
At baseline, one third of the cancer patients in both the intervention and the control group estimated their relatives’ risk correctly. Immediately after counseling, and at the 2-week follow-up, a significant increase in the number of individuals’ estimating the risk correctly (67% and 73%, respectively) was observed in the intervention group (McNemar test, $p \leq 0.001$).

At the 8-month follow-up, the number of counselees (73%) who predicted their relatives’ risk correctly showed a significant increase compared to baseline in both groups (McNemar test, $p \leq 0.01$). Nevertheless, no significant difference between the intervention and control group was observed at any of the time-points during the assessment.

Comparative risk perception

Non-affected counselees
Prior to genetic counseling, a low proportion of counselees within the intervention and control groups, 19% and 28% respectively, rated their own risk of developing cancer correctly compared with a person of the same age and gender.
Table 8. Counselees risk estimation expressed in percentages

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total n</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Number of non-affected counselees who estimated their own risk correctly</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-counseling</td>
<td>39</td>
<td>18 (47) a</td>
</tr>
<tr>
<td>Post-counseling</td>
<td>38</td>
<td>21 (55) *</td>
</tr>
<tr>
<td>Two-week follow-up</td>
<td>34</td>
<td>28 (82) a</td>
</tr>
<tr>
<td>Eight-month follow-up</td>
<td>35</td>
<td>21 (60)</td>
</tr>
<tr>
<td><strong>Number of affected counselees who estimated their relatives’ risk correctly</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-counseling</td>
<td>34</td>
<td>10 (29) a</td>
</tr>
<tr>
<td>Post-counseling</td>
<td>33</td>
<td>22 (67)a</td>
</tr>
<tr>
<td>Two-week follow-up</td>
<td>30</td>
<td>22 (73)a</td>
</tr>
<tr>
<td>Eight-month follow-up</td>
<td>26</td>
<td>19 (73)a</td>
</tr>
</tbody>
</table>

a Significant difference within subjects over time.

* Significant difference between groups.

The fraction of correct rating had risen significantly to 39% immediately after the counseling in the intervention group (McNemar test, p ≤ 0.05), but decreased slightly to 31% at the 8-month follow-up.

In the control group, the number of counselees who predicted their own risk correctly increased significantly to 58% at the 2-week follow-up (p ≤ 0.01), but decreased to 20% at the 8-month follow-up. In addition, at the 2-week follow-up, the control group demonstrated a significantly better estimation of their own risk for developing cancer compared to their peers in the intervention group (Mann-Whitney U test, p ≤ 0.05).

Affected counselees
At baseline, about a third of counselees estimated their relatives’ risk of developing cancer correctly, compared with an individual of the same age and gender. At the 2-week follow-up, the number of counselees who estimated their relatives’ risk correctly increased to 39% in the intervention group and to 43% in the control group. However, at the 8-month follow-up, only 20% of individuals in each group estimated their relatives’ risk correctly. Therefore, no significant difference was observed between the intervention and the control group, with regards to the subjects in either group or the time-point at which the measurement was taken.
Satisfaction with genetic counseling as measured by the SCS
The level of satisfaction with the quality of the genetic counseling received was very high, and almost all of the counselees were satisfied with the information provided.

No significant difference was observed between the intervention and the control group for any of the subscales or single items with the exception of the participants in the intervention group who were significantly more satisfied with the information provided (Table 9).

Satisfaction with the information provided during the genetic counseling as measured by the SOIS
The mean scores of all items within the SOIS (see paper II) were at the upper end of the scale range (M\textsubscript{intervention} = 3.5-3.9, M\textsubscript{control} = 3.1-3.8).

No significant differences were found between counselees in the intervention and control group, except for the item “How to inform relatives”, which had a significantly higher level of satisfaction in the intervention group (p ≤ 0.01).

Informing relatives
Prior to the counseling session, the majority of counselees reported that they intended to inform their at-risk relatives about the information received at the genetic counseling and about their own risk level. The intention to inform relatives was equally high at the 2-week follow-up. Furthermore, when asked at the 8-month follow-up, the majority of at-risk relatives reported that they were informed about counselees attending cancer genetic counseling and about the content of the information provided.

Psychological distress
Overall, the level of anxiety and depression (HADS) declined in both the intervention (M\textsubscript{anxiety} =6.3-5.3; M\textsubscript{depression}=3.1-2.7) and control groups (M\textsubscript{anxiety} = 5.6-4.8; M\textsubscript{depression}=3.4-2.5). Time had a significant effect on anxiety and depression in both groups (F\subscript{anxiety} =5.052, df = 1,736, p ≤ 0.01; F\subscript{depression} =4.134, df = 1.725, p ≤ 0.01).

No significant differences between the intervention and the control group were observed.
Table 9. Satisfaction with Genetic Counseling as measured by the SCS

<table>
<thead>
<tr>
<th>Dimensions (Min-Max = 0-9)</th>
<th>Intervention (n=73)</th>
<th>Control (n=73)(^a)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Instrumental satisfaction</td>
<td>7.07 1.48</td>
<td>6.77 1.60</td>
<td>1.18</td>
</tr>
<tr>
<td>Affective satisfaction</td>
<td>8.33 1.13</td>
<td>8.40 0.93</td>
<td>0.43</td>
</tr>
<tr>
<td>Procedural satisfaction</td>
<td>8.36 1.00</td>
<td>8.25 0.92</td>
<td>0.69</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items (Min-Max = 0-3)</th>
<th>Intervention (n=73)</th>
<th>Control (n=73)(^a)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Fulfillment of expectations</td>
<td>2.78 0.45</td>
<td>2.67 0.53</td>
<td>1.35</td>
</tr>
<tr>
<td>Content of the information</td>
<td>2.78 0.42</td>
<td>2.62 0.59</td>
<td>1.94*</td>
</tr>
<tr>
<td>Direct level of satisfaction</td>
<td>2.84 0.37</td>
<td>2.83 0.44</td>
<td>0.03</td>
</tr>
</tbody>
</table>

\(^a\) Data is missing for some participants

\(*p<0.05\)

Study III

Study III was based on cross-sectional quantitative data obtained from study questionnaires and qualitative data obtained from responses to both the open-ended and interview questions.

Disclosure of genetic information to at-risk relatives

Results demonstrated that almost three-quarters (73%) of the counselees shared the information they had received at the genetic counseling session with their at-risk relatives. The information was generally communicated personally and mainly influenced by gender with a greater number of counselees disclosing information to female rather than to male relatives. Additional comments provided by the counselees indicated that loss of contact or relatives’ young age were important barriers to conveying the genetic information.

Counselees’ experiences of sharing genetic information with at-risk relatives

According to counselees’, the informed at-risk relatives were mainly sisters, mothers and brothers. Only three counselees in each group reported that they did not inform any of their at-risk relatives. Following the analy-
sis of 128 counselees’ answers to the question “How did you feel about communicating genetic information to your at-risk relatives?” five categories of responses were identified (see Table 10). Counselees generally did not report negative feelings about sharing the information to at-risk relatives (Table 10), and mainly perceived their relatives’ reactions as positive or neutral (Table 11).

Having analyzed relevant replies to the interview question “How did you perceive that your relative reacted?” six categories of responses were identified (Table 11).

Thirty-six percent of counselees stated that their relatives reacted positively and thought it was good to know about the existing risks and having access to regular surveillance programs or taking genetic testing. Other family members reacted neutrally and in a few cases negatively. Negative feelings expressed included unease/apprehension, sadness, anxiety or fear (Table 12).
<table>
<thead>
<tr>
<th>Categories</th>
<th>Quotes/statements received</th>
<th>No. of statements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intervention</td>
</tr>
<tr>
<td>Neutral reactions</td>
<td>“Nothing special. It doesn’t become any more uncomfortable just because you talk about it.”</td>
<td>26</td>
</tr>
<tr>
<td>Positive reactions</td>
<td>“It was fine, felt good to inform.”</td>
<td>20</td>
</tr>
<tr>
<td>Mixed reaction</td>
<td>“Although difficult, overall it went well.”</td>
<td>9</td>
</tr>
<tr>
<td>Negative reactions</td>
<td>“It was difficult for me. It is not easy to know that my children may get cancer.”</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>“I wanted to be the one who conveyed the information. My sisters were also present, so it was not too bad.”</td>
<td>4</td>
</tr>
<tr>
<td>Categories/subcategories</td>
<td>Quotes/ statements received</td>
<td>No. of statements</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Reacted positively</td>
<td>“My daughters thought it was good that we had checked it out, it is good to know.”</td>
<td>Intervention: 21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reacted neutrally</td>
<td>“Nobody reacted in such a way they became depressed or anything like that.”</td>
<td>Intervention: 19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unspecified reactions</td>
<td>“We have not got the opportunity to discuss this with our mother in any detail.”</td>
<td>Intervention: 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reacted negatively</td>
<td>“My mother became really upset and felt guilty. The children [they] became sad, too, and one of my sons got very worried about his risk of getting cancer.”</td>
<td>Intervention: 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed reactions</td>
<td>“My daughter is upset, but she is clever and thinks positively, and feels that it is better to know.”</td>
<td>Intervention: 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reacted indifferently</td>
<td>“My sister is young and does not think that it concerns her. My brother and my aunt don’t want to understand.”</td>
<td>Intervention: 4</td>
</tr>
<tr>
<td>Categories/subcategories</td>
<td>Quotes/ statements received</td>
<td>No. of statements</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Neutral reactions/ already aware</td>
<td>“Since I already had an idea, it didn’t come as too much of a surprise to me.”</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Negative reactions</td>
<td>“My initial reaction was worry and I started to cry. Afterwards I felt that I should wait for the test results and needed to receive more information.”</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Positive reactions</td>
<td>“It is better to be informed, prepared and to attend the control programs.”</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Mixed reactions</td>
<td>“It felt difficult, but at the same time good, because you can prevent the disease from spreading.”</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Wished for more information</td>
<td>“It has been a while since mom has been diagnosed with cancer, so the idea has settled, but I am considering if I should go and check my risk level.”</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Unsatisfied</td>
<td>“It is unlikely and strange that there is not an elevated risk. Both she, her mother, and her aunt have had breast cancer.”</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
At-risk relatives’ experience of receiving genetic information

Most at-risk relatives (75% of relatives of counselees in the intervention group and 67% in the control group) indicated that the amount of genetic information received was sufficient and that they were satisfied with the way in which this information was shared. However, a few relatives indicated that they had not received adequate information in order to make an educated decision relating to issues such as prophylactic surgery. The majority of at-risk relatives (96% in the intervention group and 89% in the control group) also reported that they were informed about counselees attending counseling, about the content of the information received and about the counselees risk level for developing cancer.

Following the analysis of 73 relatives’ responses to the request “Explain how you reacted to the given information”, six categories of responses were identified (Table 12).

A third of relatives stated that the information about heredity was not new to them and had neutral reactions (34%) whilst 1/5 relatives expressed negative or positive reactions (22% and 20% respectively). A selection of quotes illustrative of each category of response is presented in Table 12.

Study IV

Study IV was cross-sectional and based on data obtained using two different data collection methods. Important issues which counselees expected the counselor to discuss with them during the counseling session were investigated. The first data collection method consisted of a multiple choice questionnaire. The second collection method was based on a forced choice method (Q-sorting) where counselees had to prioritize what they considered was most important to them.

Informational needs/counselees’ preferences prior to the visit

The results of Study IV demonstrated that the majority of counselees attending cancer genetic counseling for hereditary cancer considered counsellors’ skillfulness, care and consideration and the need to be taken seriously as very important issues. They expected to be provided with risk estimations, medical and genetic information, and information about clinical examinations. Furthermore, having the opportunity to be involved in the decision-making process and knowing whether the disease may present as a hereditary cancer within their families were considered as very important by the majority of participants.
The association between QUOTE-GENE (ca) dimensions and background variables

From QUOTE-genes’ generic and cancer-specific items four dimensions were extracted (Table 13). All of the dimensions were identified as being very important by counselees, and the majority reported that all important issues to them were satisfactorily addressed during the counseling session. Results of the regression analyses revealed that there were associations between citizenship, health status, and having biological children and the mean importance assigned to certain dimensions. However, a very minor portion of the variance (2%-5%) was explained by these variables (for more details see paper IV).

Table 13. Factors highlighted in QUOTE-GENE (ca)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean importance</th>
<th>Scale (1-4)</th>
<th>Sd</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respectful communication</td>
<td>3.48</td>
<td>0.38</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>Procedural aspects of counseling</td>
<td>3.05</td>
<td>0.66</td>
<td>232</td>
<td></td>
</tr>
<tr>
<td>Medical aspects of counseling</td>
<td>3.43</td>
<td>0.43</td>
<td>234</td>
<td></td>
</tr>
<tr>
<td>Supporting aspects</td>
<td>3.40</td>
<td>0.44</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td><strong>Cancer-specific</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hereditary of cancer in general and the emotional aspects</td>
<td>3.09</td>
<td>0.60</td>
<td>232</td>
<td></td>
</tr>
<tr>
<td>Medical aspects of the counseling</td>
<td>3.32</td>
<td>0.49</td>
<td>218</td>
<td></td>
</tr>
<tr>
<td>Familial aspects of the counseling</td>
<td>3.67</td>
<td>0.41</td>
<td>234</td>
<td></td>
</tr>
<tr>
<td>Individual aspects of the counseling</td>
<td>3.71</td>
<td>0.39</td>
<td>167</td>
<td></td>
</tr>
</tbody>
</table>

1. Sample size varies due to missing data
Informational needs/preferences assessed by Q-methodology

Performing PCA on assigned rank scores to the 191 correctly sorted Q-sorts (198 available), resulted in a five factor solution indicating the presence of five different viewpoints about the most important issues that counselees needed to discuss during the counseling session (Table 14).

Factor 1 specified that emotional support was rated less important than facts. Factor 2 highlighted the need for caring communication beyond appreciation of the information. Factor 3 stated interest in finding out the reasons for being in the current situation and in receiving support in communication with relatives. Factor 4 identified a need for clinical care such as receiving regular examinations and follow-ups and other practical topics. Factor 5 showed appreciation of information only in case a risk for developing cancer existed for the counselee and a need for receiving extensive explanations and provision of clinical examination (for detailed description of the factors see paper IV). Counselees characteristics associated with each factor are presented in Table 15.

In summary, the majority of counselees considered the information about the risk of developing cancer (their own or their relatives), as the most important issues. Information about basic genetics was ranked as least important, next to least important or neutral in all 5 factors by the majority of counselees. The employer’s or insurance companies’ possibility to find out about counselees’ genetic assessment was regarded as unimportant in factors 1,2, 3, and 4, and to receive more visits at the clinic was ranked as next to least important in all five factors.

---

4. In order to conduct the analysis the software demands that all statements are sorted.
5. Other factor solutions were examined, but this solution appeared to be most sufficient.
Table 14. Summary of issues assessed by Q-sorting

<table>
<thead>
<tr>
<th>Factors</th>
<th>Needs</th>
<th>Important issues</th>
<th>Least important issues</th>
<th>Characteristics of the counselees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need for facts</td>
<td>The level of risk</td>
<td>Supportive care</td>
<td>More non-affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information about risk reducing actions</td>
<td></td>
<td>More men compared to other groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practical care</td>
<td></td>
<td>1/3 known mutation among families</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/3 self-referred</td>
</tr>
<tr>
<td>2</td>
<td>Need for caring communication and medical information</td>
<td>The level of risk</td>
<td>General information about genetics</td>
<td>Mostly non-affected compared to other groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caring communication</td>
<td></td>
<td>89% women</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practical care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Need for understanding and support in sharing genetic information</td>
<td>The level of relatives’ risk</td>
<td>Supportive care</td>
<td>More affected, Older than average</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reason for being in this situation</td>
<td></td>
<td>85% women</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support in informing relatives</td>
<td></td>
<td>Few known mutation in families</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less proportion of high education</td>
</tr>
<tr>
<td>4</td>
<td>Need for practical care</td>
<td>Practical care</td>
<td>General information about genetics</td>
<td>Equal proportion of affected and non-affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information about risk reducing actions</td>
<td></td>
<td>The majority attended genetic counseling due to others initiative (relatives or physician)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caring communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Need for medical/practical information</td>
<td>The level of risk</td>
<td>To be understood</td>
<td>The youngest group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical/ practical information</td>
<td></td>
<td>Only women</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practical care</td>
<td></td>
<td>Equal proportion of affected and non-affected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Highest proportion of high education</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Few known mutations in the family</td>
</tr>
</tbody>
</table>
Table 15. Counselees’ characteristics in each Q-sort factor

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor 1 (n=78)</th>
<th>Factor 2 (n=54)</th>
<th>Factor 3 (n=13)</th>
<th>Factor 4 (n=40)</th>
<th>Factor 5 (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean age</strong></td>
<td>44.5</td>
<td>46.1</td>
<td>53.4</td>
<td>47.4</td>
<td>39</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20 (25%)</td>
<td>6 (11%)</td>
<td>2 (15%)</td>
<td>6 (15%)</td>
<td>1 (7%)</td>
</tr>
<tr>
<td>Female</td>
<td>58 (75%)</td>
<td>48 (89%)</td>
<td>11 (85%)</td>
<td>34 (85%)</td>
<td>13 (93%)</td>
</tr>
<tr>
<td><strong>Health status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected</td>
<td>22 (27.5%)</td>
<td>14 (25.5%)</td>
<td>9 (69%)</td>
<td>18 (45%)</td>
<td>7 (47%)</td>
</tr>
<tr>
<td>Non-affected</td>
<td>58 (72.5%)</td>
<td>41 (74.5%)</td>
<td>4 (30%)</td>
<td>22 (55%)</td>
<td>8 (53%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to high school</td>
<td>43 (56%)</td>
<td>30 (56%)</td>
<td>10 (77%)</td>
<td>23 (59%)</td>
<td>6 (40%)</td>
</tr>
<tr>
<td>University education</td>
<td>34 (44%)</td>
<td>24 (44%)</td>
<td>3 (23%)</td>
<td>16 (41%)</td>
<td>9 (60%)</td>
</tr>
<tr>
<td><strong>Known mutation in the family</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22 (31%)</td>
<td>12 (25%)</td>
<td>2 (17%)</td>
<td>13 (34%)</td>
<td>4 (27%)</td>
</tr>
<tr>
<td>No</td>
<td>48 (69%)</td>
<td>36 (75%)</td>
<td>10 (83%)</td>
<td>25 (66%)</td>
<td>11 (73%)</td>
</tr>
<tr>
<td><strong>Path way to the genetic counseling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own initiative</td>
<td>29 (37%)</td>
<td>19 (37%)</td>
<td>5 (38%)</td>
<td>11 (27.5%)</td>
<td>3 (20%)</td>
</tr>
<tr>
<td>Others initiative</td>
<td>49 (63%)</td>
<td>32 (63%)</td>
<td>8 (62%)</td>
<td>29 (72.5%)</td>
<td>12 (80%)</td>
</tr>
</tbody>
</table>
Discussion

The current thesis focuses on the psychological and behavioral aspects of being at risk of hereditary cancer and consequently, receiving cancer genetic counseling.

In terms of psychological aspects, the focus has been on cognitive and emotional consequences such as the level of anxiety and depression experienced, emotional experiences as a result of sharing genetic information to at-risk relatives, knowledge about genetics, risk perception, satisfaction with the counseling and counselee informational priorities. When investigating the behavioral aspects, the focus was on adherence to recommended surveillance programs, changes in life and communication of information to at-risk relatives.

Having examined the emotional state of counselees, 3 to 7 years after their initial genetic counseling session, participants reported a relatively high level of anxiety and a low level of depression compared to the general population. No significant difference in the level of distress experienced by affected and non-affected or carriers and non-carrier counselees was observed. However, women who were recommended to attend for additional mammograms displayed a significantly higher level of anxiety compared to those who were not required to attend regular screening. In addition, the level of depression was significantly higher among counselees that felt the need for more assistance for informing at-risk relatives compared to those who did not feel a need for additional support. However, there was no indication that the distress experienced was solely due to attending genetic counseling.

The majority of counselees reported positive or neutral feelings about communicating genetic information to their relatives with only a few stating negative feelings (Study III). Counselees mainly interpreted their relatives’ reactions to the information as positive or neutral.

Regarding the cognitive aspects analyzed in Study II, the level of counselees’ knowledge increased over time. After two weeks, the correct estimation of personal risk increased significantly in both the intervention and control groups, but declined at the 8-month follow-up.

The results of Studies I, II and III indicated a high level of satisfaction with genetic counseling among participants. The observed effect of the intervention was a significantly greater level of satisfaction among counselees in the intervention group with regards to the content of the information provided, and also with the procedure for informing relatives. Counselees in
Study IV also reported that the issues most important to them were satisfactory addressed by the counselors. Notably, most relatives were satisfied with the information received (Study III).

In addition, the results from Study IV highlighted that the attributes that counselees deemed necessary for a counselor to possess when conveying such genetic information were skillfulness and thoughtfulness. Counselees expected to be taken seriously, be provided with risk estimations and medical information, and be involved in the decision making process. When counselees were forced to prioritize the issues most important to them, it became apparent that counselees from different backgrounds rated issues differently. Analyzing counselees Q-statement sorting revealed five viewpoints about the most important issues relating to genetic counseling or phrased differently, five categories of needs.

On the subject of behavioral aspects, the majority of at-risk individuals reportedly adhered to recommended surveillance programs (Study I-II). Overall, participants reported no negative effect on their relations due to attending genetic counseling (Study I). They reported moderate changes in family relations and in their priorities and appreciation of daily life activities (Study I). Most counselees had shared both the information they had received at genetic counseling and the risk estimations they were given with their at-risk relatives (Studies II-III).

Psychological consequences

Emotional aspects

Psychological distress

Despite a number of studies reporting high levels of distress among individuals attending genetic counseling (173-175), overall, it appears that genetic counseling does not cause any adverse emotions among counselees. Results from studies included in this thesis did not provide any evidence that counselees suffered additional psychological burden due to attending genetic counseling. Although the level of anxiety and depression observed in participants in Study I was higher than the general population (163) - which is not strange given the fact that they have an elevated risk for developing a life threatening disease - the results of Study II suggested that the level of reported anxiety and depression decreased significantly over time in all participants (paper II, Figure 6). Similar findings have been reported in other studies (88). This could be perceived as a natural development or the positive effect of receiving information at genetic counseling which reassures counselees. Nevertheless, this result could be influenced by the type of individuals who accept to participate in such a study i.e. perhaps those that are less anxious or depressed are more willing/likely to participate.
**Counselees emotional experience in association with sharing genetic information**

The results from Study III demonstrate that by and large counselees disclose genetic information to at-risk relatives. This information was mostly communicated personally, and generally without experiencing any negative feelings. Reasons affecting the reactions received may relate to circumstances such as whether cancer has existed in these families for a while and therefore the concept of being predisposed to cancer was not new or strange to them. However, a number of relatives did report negative feelings and indicated that they had not received adequate information to allow them make fully informed decisions about issues such as prophylactic surgery. Considering the complexity of the information to be conveyed (122), difficulties experienced by counselees in trying to understand the accurate risk for developing cancer (their own/at-risk relatives) (60, 171), and the burden of trying to process the received information this result is not unexpected. In addition, relatives’ feelings may be affected by other factors such as their characteristics, the quality of their relationship with the counselee or their previous experiences. However, it is not strange to think that people may need more accurate information from a reliable source when faced with the prospect of having to make a major decision about one’s health.

**Cognitive aspect**

**Knowledge**

Participants demonstrated a high level of knowledge about genetics and hereditary cancer prior to their counseling sessions (Study II). This was not unexpected as individuals with a family history of cancer are generally aware of their situation. Thus it was not possible to greatly improve genetic counselees’ basic genetic knowledge. Results did not demonstrate any significant differences between the intervention and the control group at follow-ups. This may be due to the current level of knowledge (the ceiling effect). Consequently, it can be questioned if additional information would really have an effect or is it even necessary since many other factors such as experiencing numerous deaths due to cancer within the family or individuals’ characteristics can have an even stronger effect on risk perception than knowledge; as has been reported in previous studies (see theoretical framework section).

**Risk perception**

The results of Study II are in agreement with other studies (15, 60, 167) and emphasize the difficulties associated with communicating the risk of developing cancer to counselees. In Study II, the number of counselees who estimated their risk correctly increased significantly over time. However, a more
accurate risk estimation was observed in the control group immediately after the counseling session. This result was unexpected considering that the education and communication theories hypothesize that receiving information through multiple sources and in various forms results in an improved understanding and greater recall of the information (see section on theories about information processing). A possible explanation for this result could be that the information was provided from various sources (both the counselor and the specialist nurse) to counselees within the intervention group. There was no control to monitor whether the nurse and the counselor communicated exactly the same information. Consequently, differences in conveying such information has the potential to confuse counselees even further and hence result in a more inaccurate risk perception. On the other hand, it may be influenced by the counselees perceiving their risk as very high since an emphasis is being placed on the information. However, as previously mentioned there is a complex array of cognitive and emotional factors which contribute to an individuals’ sense of personal risk (see Figure 2).

Satisfaction with genetic counseling
In accordance with previous study results (60, 172), the level of satisfaction with the genetic consultation (measured by SCS in Study I & II) and the information provided (measured by SOIS in Study II) was generally high among participants. Additionally, counselors were perceived as being professional and competent (the dimension of Instrumental satisfaction in SCS, Study II), had treated the counselees in a satisfactory way showing both empathy and respect (Study IV), and fulfilled the counselees’ expectations (Study II, Table 9 and Study IV, data not shown).

However, it should not be forgotten that on the one hand measuring patient satisfaction is considered to be problematic, both conceptually (173) and methodologically (174), and on the other hand it is assumed that the counselees attending genetic counseling for first time do not really know what to expect (85). Thus, with regard to non-response bias (174), and limited support for the reliability and validity of all used instruments within the current studies, one should be cautious in concluding that the level of satisfaction is actually high. Nevertheless, it is obvious that no system is perfect and there are always some aspects which may be improved upon. That notwithstanding, even though the level of satisfaction reported is high, a few counselees indicated that they were not satisfied. It is important to try to find out what aspects these counselees were unhappy with in order to rectify any possible problems. As a final note, it should not be forgotten that most people -especially those who are dependent on health care - are often grateful and do not want to upset people who have helped and taken care of them.
Informational needs and expectations
The results of Study IV were in agreement with previous reports (88), and highlighted the fact that identifying the informational needs of cancer genetic counselees and their preferences in terms of the issues they consider most important is not easy. Our findings corroborated several previous findings (116, 159), but were in contrast to those reported by Zebiene and colleagues’ (176). In that study, the authors suggested that counselees expectations depend on their health status and social and demographic characteristics; however, we did not find any association between counselees’ needs/preferences and background variables using a free choice method (Study IV). What we did observe was that when counselees were free to choose between a number of items and allowed to rank each item according to importance, they regarded each item as being equally important; thereby rendering the identification of needs almost impossible. Since one of the aims in Study IV was to pinpoint differences in counselees’ informational needs and expectations, using a forced choice method was necessary. This appeared to be achievable by applying Q-methodology. Hence, different viewpoints, concerning the most important issues or different categories of needs could be identified amongst counselees with different background variables. It should be noted that this finding is based on a rather small group and needs to be confirmed using a larger study. However, it is not unexpected that individuals attending genetic counseling for different reasons and with various backgrounds and previous experiences require different types of care. Nevertheless, to be confident about what care should be offered and to whom, we need to acquire more evidence through further studies.

Most counselees in Study IV considered core components of the patient-centered communication style (175) such as the counselors’ skillfulness and consideration, and the need to be taken seriously as very important issues prior to attending counseling. Bearing in mind the main reason for attending genetic counseling, which is a predisposition to hereditary cancer, one would assume that the medical aspect of genetic counseling would be the most important issue to the counselees. However, our results indicated that although the majority of counselees in Study IV considered that knowing their own/relatives risk for developing cancer was a very important issue, other counselees ranked knowing the level of their risk for developing cancer and information regarding mutations within their family, as neither important nor unimportant. This may strengthen the idea that for some counselees other aspects of counseling such as supportive aspects, is more important. Consequently, the main findings of Study IV relate to the finding that counselees differ in what they view as being important. For example a number of counselees ranked receiving regular clinical examination, regular follow-up and being informed about the symptoms they should be attentive to and seek care for as the most important issues, another group indicated the need for more
emotional support, whilst some counselees were more interested in receiving facts and medical information. Consequently, the standard genetic information may not be the most appropriate information for everybody.

Behavioral consequences

Perceived changes in life and family relations

The results from Study I suggested few changes were made to counselees’ lives due to receiving genetic counseling. This was not unexpected as the aim of genetic counseling is not to alter counselees’ lives, but rather to improve counselees’ risk perception and adherence to necessary medical controls.

Adherence to recommended surveillance programs

The results of Study I also demonstrated that the majority of participants had followed physicians’ recommendations regarding surveillance programs. Even if regular self-examination of breasts in the “breast cancer group” was practiced less frequently, this could not be considered as non-adherence. However, it should be noted that in Sweden or Norway, this is not considered as one of the key areas of genetic counseling.

The relationship between adherence to surveillance programs and Health Locus of Control

As in previous studies (165, 166), results from Study I indicated that regular BSE corresponded to a stronger belief in MHLC internal control over one’s own health, and attending control programs such as mammography screening or colonoscopy, was associated with higher scores on external control over health. These results are not surprising since individuals with higher scores on internal control regard their own behavior as being most important for their health whereas those who believe more in external control, reason that their health is dependent on what the specialists do. In general, the results suggest that the level of adherence to the advice and recommendations provided by cancer genetic counseling is good. Thus, it could be assumed that genetic counseling is performed in an appropriate manner and that the counselors are successful in delivering the desired medical message.

Communication of information to at-risk relatives

The results from Study III demonstrate that a large proportion of the counselees had disclosed the genetic information to their at-risk relatives. Therefore, it seems that counselees realize the importance of sharing genetic in-
formation to relatives that may be affected, which could be interpreted as a favorable result of genetic counseling.

Nevertheless, in the few cases where the genetic information was not conveyed, counselees claimed that loss of contact or the young age of the relatives were obstacles which prevented such knowledge from being transferred. This finding is in line with previous results suggesting that the major reasons for not disclosing genetic information within at-risk families are loss of contact (168), lack of closeness (169), perceiving the information to be less relevant to at-risk relatives and considering individuals too young to be told (170).

A noteworthy finding in Study III was that counselees within the intervention group presented more at-risk relatives than the control group, and that more relatives of this group agreed to participate in the study. In addition, a large percentage of relatives to the counselees in the intervention group, as compared to those in the control group, commented that the genetic information should be given by the person who had attended genetic counseling rather than by health care professionals, and they stated positive reactions to the given information at a greater frequency. Taken collectively, these findings could be interpreted as a display of more confidence and better communication skills among counselees within the intervention group in comparison to the control group. This interpretation provides some support for the effectiveness of the intervention within Study II, which presented the information through different channels and in various forms. Counselees within the intervention group had the benefit of being familiarized with the Buckman’s breaking bad news model, and hence applying it when communicating the genetic information to at-risk relatives.

A less advantageous finding in Study III was that only 53% of relatives, fewer than was expected, planned to attend genetic counseling, despite being aware of their high level of risk for developing hereditary cancer. This result may partly be due to counselees’ difficulties in perceiving relatives’ risk accurately (171), since as mentioned earlier the risk perception is not only a result of facts (i.e. risk estimations or knowledge) but is also affected by a number of factors such as perceived susceptibility (see HBM), expectations, previous experiences etc (see Figure 2). In addition, difficulties in conveying the importance of the information and convincing relatives that the information concerns them as well, may be a contributing factor to the lower than expected attendance at genetic counseling by at-risk relative. Considering that one of the main goals of genetic counseling is to detect cancer at an early stage and thereby reduce the mortality rate, it is of utmost importance that the genetic information is clearly explained by the counselors, properly understood by the counselees and then sufficiently communicated to the at-risk relatives.
Methodological considerations

Study design

In theory, most study designs may be either prospective or retrospective. These terms commonly refer to the timing of assessment in relation to the outcomes. The study is called prospective if the data is collected before the occurrence of the outcome, and retrospective if it is the other way around.

In this thesis both types of studies have been used. A key issue in retrospective study design refers to the assessment, and in general, retrospective studies allow the investigator to identify correlates, such as the recall of a past event. However, due to the nature of retrospective studies caution should be exercised when interpreting results since selective recall, inaccurate recall, and recall biased by the outcome, may interfere with the ability to draw valid conclusions about past events (177). To exemplify this drawback of retrospective studies, in the cross-sectional retrospective study within this thesis (Study I), the counselees were asked to recall their emotional status, their need for additional support, how satisfied they were with the genetic counseling service they received and the changes that occurred in their life due to having attended genetic counseling. Counselees were asked these questions 3-7 years after attending the counseling service. Consequently, the retrospective nature of this study could have affected the results, since the time that had elapsed may have diminished the immediate effects of receiving genetic information about one’s own or relatives’ increased risk of cancer. Therefore, it is impossible to be completely sure about the accuracy of what counselees remember after such a long period of time. Furthermore, the time period that had elapsed since the initial counseling varied across the sample. Despite all this, analysis of the influence of time elapsed yielded no statistically significant differences for major study variables.

In contrast, Studies II, III and IV were prospective since the data was collected before the outcome was analyzed.

Study II was a randomized intervention (RCT) study with a pre-test-/post-test design including both an intervention and a control group. An important feature of this design is that the effect of the intervention is reflected in the changes from pre- to post intervention assessment. One of the strengths of this type of study is that it controls for the typical threats to internal validity such as history, maturation, repeated testing and instrumentation. Furthermore, the random assignment of participants to each group reduces the like-
lihood that group differences are the result of a selection bias (177). Thus, it could be concluded that the differences found in Study II - in this case greater satisfaction with the content of the information given at genetic counseling within the intervention group - was based on the intervention rather than initial differences between the counselees. Additionally, the pre-test-/post-test design of the study permitted identification of individuals who had improved their understanding of certain issues such as their perception of their own risk or in predicting their relatives’ risk.

Validity

Internal and external validity

When the results of a study can be attributed to the effects of the independent variable, the “experiment” is considered to be internally valid. Internal validity refers to the extent to which a study eliminates other explanations for the results and is a requirement for external validity. External validity refers to the extent to which the results of a study can be generalized to other populations, settings and circumstances (177).

Internal validity

Study I

The retrospective design of Study I could be regarded as a threat to the internal validity of the study, since it is possible that other events or confounding factors rather than receiving genetic counseling, had affected the results regarding life changes, satisfaction with the genetic counseling and/or the reported need for support. No controlling data is available in this respect.

Study II

In Study II the randomized design of the study diminishes the majority of factors which might have accounted for the differences found between the study groups. Hence, it is possible to postulate with a high level of confidence that this study is internally valid.

Study III

In Study III a number of confounding factors such as the family structure, lack of contact or the counselees and/or at-risk relatives’ characteristics could have had an impact on counselees or their relatives’ reactions when sharing the information and not necessarily the content of the genetic information.
Study IV

One threat to the internal validity of Study IV concerns the counselees Q-sorting. Since this task was performed at home it is possible that the presence of other people may have affected the counselees’ prioritization.

External validity

The external validity of Study I, II and IV is good owing to the consecutive recruitment and large number of participants. In particular, Study IV which has been conducted in two different Scandinavian countries and in four separate settings provides the possibility of applying these results to counselees with similar diagnoses or family histories. At the same time, these studies contain considerably more female patients than males and more individuals with hereditary breast and ovarian cancer or a family history of these cancer forms than with colorectal cancer, which can subsequently limit the applicability of the results. However, considering the proportion of risk for these diseases within the general population this limitation does not seem to be of major consideration.

Findings within Study III should be interpreted with caution since only a limited number of at-risk relatives were involved.

In all four studies it is probable to assume that participants, compared to those who declined to participate within the study, had a better condition, experienced a lower level of distress and anxiety, were more motivated or had better contact with their relatives. These facts would introduce a selection bias which may restrict and consequently impact the ability to make generalizations from these results.

Reliability

Instruments

One of the strengths of the data collection methods applied throughout this thesis was that in three of the four studies, a number of well-established questionnaires with good psychometrics were used. These instruments have been tested in previous studies worldwide and on different groups of subjects and have reported good validity and reliability. However, for certain research questions examined within this thesis, for instance within Study I, II and III, no standardized questionnaires were available. Nonetheless, we are aware of this limitation and the ambiguity that this may create in relation to reliability of the results. However, to minimize this threat the face and content validity of these questionnaires have been checked.

One consideration in Study III is that different interviewers from different disciplines have conducted the interviews and that in some cases follow-up questions are missing. It is impossible to rule out the effect of this short com-
ing on study results. It is feasible that had the interviews been conducted differently, similar data may not have been attained. In addition, had more statements been available or had such statements been phrased differently and more precisely, results presented within Tables 10, 11 and 12 may have looked different.

In Study IV, two different data collection methods (QUOTE-GENE questionnaire and Q-methodology) were used thereby increasing the reliability of the findings.
Conclusion

In summary, it appears unlikely that genetic counseling causes any adverse psychosocial conditions for counselees and consequently, does not affect their life or relations in a negative manner. Counselees report a high level of satisfaction with the genetic counseling service and the content of information provided. However, a wish for more support is duly noted according to the counselees’ reports.

Counselees’ level of knowledge about genetics is good, however their ability to accurately perceive their risk of disease (their own/their relatives) is not optimal. Nevertheless, despite this sub-optimal perception of risk, counselees largely adhere to the recommended surveillance programs. Importantly, they also share the genetic information with their at-risk relatives to an acceptable extent and without experiencing any major difficulties or a significant level of negative feelings. Notably, counselees who received the intervention within Study II appeared to be more successful in communicating the necessary information.

Investigating counselees needs and expectations in Study IV, indicated that counselees expectations were fulfilled and that most issues that were of importance to them were addressed in a satisfactory manner during the consultation. Nevertheless, the results disclosed some difficulties in terms of measuring the most important issues that counselees wished to be discussed during the counseling session based on a free choice alternative. However, applying an alternative complementary method, such as the Q-sorting forced choice method, compensated for this difficulty. The results from using this method suggested that not all counselees wish to receive the standard information.

Future considerations

Knowledge about genetics improves on a daily basis and it can be assumed that in the not so distant future, more diseases with a genetic predisposition will be identified. This will increase the pressure on a health care system which is already highly pressurized and experiencing difficulties in taking care of sick people. In Sweden and Norway there is currently a long waiting time prior to meeting with specialists. It is reasonable to assume that in the near future, and with a larger number of attendees to the health care system, it would be even more difficult and very likely not possible to offer one hour counseling sessions to all individuals who require such services. Thus mak-
ing the genetic counseling more effective, by identifying counselees’ needs and expectations prior to their visit is vital.

Individuals seeking genetic counseling today are mostly motivated, self-referred, high educated resourceful people who are able to seek genetic counseling. Future generations of counselees may not be as strong as their predecessors and may seek counseling based on reasons such as their relatives or physicians suggestions, and therefore require a different type of assistance.

A further complication is that many individuals who attend genetic counseling are healthy people who need care. It could be anticipated that the kind of help they need differ considerably from the type of care that health care staff are used to giving. Consequently, keeping health care professionals updated about current research and more specifically, providing knowledge about individuals’ reactions to genetic counseling is pivotal to improving the system.

A feasible suggestion for optimizing the provision of genetic counseling services could be the use of tailored information. Tailored information is adapted to the relevant characteristics of a person such as age, gender, risk profile, mutations status etc (178) and may be more effective since it caters to each counselee’s needs and can focus attention on the exact message being conveyed, enhance its perceived relevance and limit the amount of needless content (179, 180). A number of reviews have reported that individuals are more likely to respond to tailored print materials (TPMs) than non-tailored print materials (NPMs), hence TPMs are more likely to be read and recalled (74, 181). Furthermore, computer-tailored interventions are more likely to be read and remembered in comparison to non-tailored generic materials (182-184). Thus, computer-tailored information can be considered as one way to facilitate communication between genetic counselors and counselees. Results from a previous intervention study demonstrated that providing physicians with patients’ pre-visit expectations reduces unmet expectations by 50% (185). Furthermore, some counselees express a need for counselors’ sensitive communication. Considering the counselors limited time, providing counselees with individually tailored pre-visit printed and/or web based information may save some of the time counselors’ spend on providing general information and give them the opportunity to be more attentive to counselees’ needs. In addition, the pre-visit information may help counselees to be better prepared and know what to request from the counseling session and get involved more actively.

To summarise, whether defining counselees pre-counseling expectations and informational needs, and the amount of information they prefer to receive, is useful in making genetic counseling more effective and should be studied further. In addition in order to explore the impact of tailored information on counselees’ involvement and satisfaction, randomized intervention studies are required.
Denna avhandling innehåller fyra delstudier som handlar om personer som kommer till genetisk vägledning för att få information om ärftlig cancer. Studierna omfattar tre av de vanligaste cancersjukdomarna bröst-, ovarial- och kolorektal cancer.


I Sverige har genetisk vägledning erbjudits sedan mitten av 90-talet, men de psykologiska och beteendemässiga konsekvenserna av att få genetisk vägledning har inte studerats i någon större omfattning.

Syftet med denna avhandling var att studera effekter av att få genetisk vägledning med avseende på emotionella, kognitiva och beteendemässiga aspekter.

Studie I

Syftet med studie I var att 3-7 år efter genetisk vägledning för ärftlig cancer, studera probandernas oro och nedstämdhet, upplevda förändringar i livet och familjerelationerna, följsamheten till kontrollprogram, samt tillfredsställelse med vägledningen.

I studie I deltog 218 personer som mellan 1999 och 2002 hade sökt genetisk vägledning vid onkogenetiskmottagning i Uppsala. Resultatet visade en relativ hög nivå av oro och låg nivå av depression bland deltagarna jämfört

---

6 Proband kallas de personer som söker genetisk vägledning oavsett om de är friska eller cancer drabbade.

Studie II

Huvudsyftet med studie II var att undersöka effekten av en intervention, baserad på utökad information, på probandernas kunskap, riskperception, kommunikationsförmåga och grad av tillfredsställelse.

Resultatet visade att deltagarnas kunskap och korrekta skattning av risk, både i interventionsgruppen och i kontrollgruppen förbättrades signifikant med tiden, men korrekt risk skattning minskade i båda grupperna efter åtta månader.

Direkt efter vägledningen var dock probanderna i kontrollgruppen bättre på att skatta sina/sina släktingars risk för att utveckla cancer.

Interventionen visade inte sig ha någon större effekt förutom vad gäller probandernas tillfredsställelse med innehållet av informationen och hur de ska informera sina släktingar. Överlag var alla deltagare mycket nöjda med vägledningen.

Studie III

Syftet med studie III var att studera i vilken omfattning berörda släktingar informeras och att studera probandernas upplevelse av att förmedla genetisk information. Dessutom studerades släktingarnas upplevelse i samband med att de fick informationen.

Resultatet av studie III visade att de flesta av probanderna hade informerat sina släktingar personligen eller per telefon. De rapporterade positiva eller neutrala känslor i samband med kommunicerandet av genetisk information med sina berörda släktingar och de flesta uppfattade släktingarnas reaktioner som positiva eller neutrala. Nästan hälften av släktingarna rapporterade positiva eller neutrala reaktioner i samband med att de fick genetisk information. Dock upplevde nästan var femte negativa känslor i samband med detta.

Probanderna var nöjda med vägledningen och deras släktingar med den information de hade erhållit.
Studie IV

Syftet med studie IV var att studera vilka aspekter probanderna tyckte var mest eller minst viktiga att få information om i samband med genetisk vägledning. Ett annat syfte var att ta reda på om probandernas behov av information och förväntningar på vägledning uppfylldes.

Det visade sig inte vara möjligt att identifiera de viktigaste aspekterna för probanderna genom att använda ett standardiserat frågeformulär då alla aspekter skattades som viktiga. Att ”tvinga” probanderna att prioritera, med hjälp av en metod som kallas Q-sortering, var nödvändigt för att kunna identifiera vad som var viktigast för probanderna.

Resultatet visade att probanderna skattade vägledarnas kunnighet och omtanke som mycket viktiga aspekter. De förväntade sig att den genetiska vägledaren ska ta dem på allvar, att informera om deras egen/deras släktingars risk för att utveckla cancer och att ge medicinsk information. Dessutom ville de vara delaktiga i de beslut som fattas.

Resultatet av Q-sorteringsanalysen visade att probander med olika bakgrundsvärden och olika karaktäristiska (t.ex. att vara cancerpatient eller att ha risk att utveckla cancer) prioriterar olika aspekter av vägledningen. Fem kategorier av behov identifierades: behov av fakta, behov av vårdande kommunikation och medicinsk information, behov av information och stöd i att förmedla informationen till berörda släktingar, behov av praktisk vård och behov av att diskutera medicinsk och praktisk vård.

De flesta probander tyckte att de viktigaste frågorna på ett tillfredsställande sätt diskuterades under vägledningen och de var nöjda med den genetiska vägledningen.

Slutsatser baserad på dessa studier är:

- Genetisk vägledning verkar inte ha några negativ psykologiska konsekvenser för probanderna.
- De flesta av probanderna har goda kunskaper om ärlig cancer, men inte en optimal riskuppfattning. Trots det, följer de medicinska rekommendationer och försöker förmedla informationen till sina släktingar. De upplever inga större problem eller negativa känslor i samband med att informera sina släktingar.
- Att satsa på utökad information i samband med genetiska vägledningen verkar inte vara nödvändigt. Däremot kan det vara nödvändigt att göra genetisk vägledning mer individanpassad. Alla individer behöver inte samma typ och mängd av information och att anpassa informationen till varje enskild person kan göra vägledningen ännu mer effektiv och tillfredsställande.
Acknowledgments

This work was performed at the Department of Public Health and Caring Sciences and the Department of Genetics and Pathology, Uppsala University. This study was supported by grants from the Swedish Cancer Society.

I wish to express my deepest gratitude to those who have been at my side and supported and inspired me throughout my research work. I particularly will thank the following people:

First of all, a sincere thank you to all the counselees who participated in these studies, for sharing their perceptions and experiences during their visit to the cancer genetic clinics that for many of them, was undoubtedly a challenging time. Without their help, this research would never have been possible.

**Karin Nordin**, my main supervisor and my dear friend. I am grateful to you for guiding me with optimism, good humor and excellent knowledge. I appreciate your support at all times and your positive attitude, our fruitful discussions at my kitchen table, in your garden, on our way to the gym, during our long walks or on the plane when heading to scientific conferences. Thanks also for all help, good advice and your friendship. You have been much more than a supervisor to me and I guess you know how much you mean to me and how much I appreciate our friendship. It is truly an honor to have you as my supervisor and my friend.

**Richard Rosenquist**, my co-supervisor. Thank you for your brilliant knowledge, accuracy and scientific guidance, your critical review of my text, constructive criticism, and for all your support, especially during the last period, and because you put up with my poor knowledge in cancer and non-functioning lap top in Germany.

**Gunilla Berglund**, I feel honored to get to know you and I am always grateful to you for believing in me and giving me the opportunity to work as a research assistant on yours and Karin’s project which opened the way to my doctoral education. For being my first main supervisor in my first research project and for generously sharing your brilliant scientific knowledge and for encouragements and your warmth. I never forget our late nights at the institute and our lively discussions about every topic from world politics to cultural traditions. I hope you know how precious you are to me.
Claudia Lampic, I am grateful to you for accepting to be my co-author and reviewing my text, for your constructive criticism, comments and discussions based on your great knowledge and your scientific experience. Your help has been of great value to me.

Birgitta Edlund and Barbro Wadensten, for reviewing this thesis and providing valuable feedback and advice for improving the “Kappa” on your last day before summer vacation.

Annika Ludquist, For your generosity and invaluable help in everything, your warmth and care. You have been so precious both as a colleague and as a friend. I never forget your advice as a real estate either, and your delicious breads and cakes that I love.

Charlotta Ingvoldstad, My colleague and friend. Your knowledge and experience in genetic counseling and your help in studies III-IV and our discussions about our results have been so valuable to me. I am happy to have you as a friend. I appreciate your humor and your unbeatable talent in finding excellent cheap 50-century clothes. You are a good friend.

Karin Eriksson, Annika Lidén and Kristina Thorsén, for practical management of Study II-III. Without your accurateness and enthusiasm these studies would never have been possible.

Lesley Ann Sutton and Åsa Johansson Hakim, for reviewing different parts of my text and providing valuable feedback for improving the language of the thesis.

Marianne Carlsson, head of the Department of Public Health and Caring Sciences for your excellent leadership and being supportive and Per Lindberg, former and Inger Holmström, present deputy principal for your engagement and support.

All former and present colleagues, teachers, administrative staff and friends at the department of Public Health and Caring Sciences, especially Ulrika Pöder, Cecilia Arving, Elisabet Matsson and Camilla Fröjd, for friendship and support, many laughs and creative chats and discussion about serious matters and research questions as well as about what make us human: literature, culture, religion, love, marriage, child-rearing, cooking and a little bit of gossip when we shared the same corridor. Josefina Westerberg Jacobsson, for your friendship, genuine positive attitude, thoughtfulness and your wonderful smile. Ingrid Demmelmaier, Åsa Muntlin Athlin, Kjerstin Larsson, Marianne Hedström, Elisabeth Wastesson, Maria Sandborgh, Jeanette Winterlig, Maria Magnusson, Helena Lindstedt, Eva
Landström, Gunn Engvall, Maria Lindberg, Magnus Lindberg, Gunilla Mårtesson, Marie Höyer, Ritva Rissanen, Stina Isaksson, Elenor Kaminsky and everyone else who I may just have forgotten to mention, but it only means bad memory and nothing else.

Sören Jonasson, for all the practical help, Maj-Britt Sundelin, Rose-Marie Marcusson, Catarin Olsson, Georg Wahlberg and Håkan Jansson, for all administrative and technical support during my studies.

Pari-Rokh Dadsetan, professor in cognitive psychology at Tehran University, Iran. My first teacher in psychology. I am grateful to you forever for leading me to the wonderful world of science and inspiring me to do research. You have always been my role model. You brought the wonderful world of Piaget, in a vivid manner, to our new born scientific lives as young psychology students and that has shed the light on my whole academic career. Thank you for your excellent deep scientific knowledge and your wide experience that you generously shared with us. I never forget your wonderful humor and priceless lessons and discussions at your office or your home.

Mehri N. Tavoosi, Mohammad T. Delkhamosh and Forouzandehe Davarpanah, my best friends during my B.S education at Tehran University. Your intelligence and care for science has inspired me and has reinforced my desire to be a good student and later on a professional psychologist and researcher. You are my best friends throughout my life. Hamid-Rez Sohrabi and Zinat Esbati, you have also been very dear friends and a source of inspiration in my clinical work as a psychologist and in my academic life.

To all my friends and colleagues at Uppsala municipality, for your engagement, interest in my research and support during all these years.

To my friends, Ann Wernegren, Vija Bjelvenfeldt and Lisa Pontén for your friendship, support and being there for me all the time. Ann thank you for always believing in me, for your friendship, all laughs, gossip and enjoyable time at lunch, coffee breaks and our pleasant moments together in Helsingborg (Malmö), and Saint Petersburg.

Britt-Inger Olsson, my dearest friend. I am so grateful and happy for having you as my chosen sister, the one I never had and I always have missed. You are just great. I am happy and grateful that you and Tomas have not given up on me considering my choice of home, partner or artisans and my relationship with money. You have always been there for me, in my hardest moments and my most pleasurable ones. I appreciate your genuine warmth, generosity and friendship. Thank you for all laughs and tears. I love you with all my heart.
Banou, my mother, for being the best mother in the world. Thank you for all your support, care and love. Without you I would never have come so far. You have always been by my side, made me coffee and kept me company in order to help me continue my study. I love you from the bottom of my heart and I am proud of you.

Farokh, my son, my love and the most precious person in my life. I never forget when you, at 3 or 4 years of age, wanted to play with me and I had to study for my exam the next day and you told me “Mum, didn’t you know that one finishes her studies first, and then have children?” You make my life worth living and I love you unconditionally from the bottom of my heart.
References


87. Hallowell N. 'You don't want to lose your ovaries because you think 'I might become a man". Women's perceptions of prophylactic surgery as a cancer risk management option. Psychooncology. 1998 May-Jun; 7(3):263-75.


156. Rosenstock IM. "Historical origins of the Health Belief Model." Health Education Monographs 2; 1974.
163. Miller GA. The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information [Internet]: Originally published in The


A doctoral dissertation from the Faculty of Social Sciences, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences. (Prior to January, 2005, the series was published under the title “Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences”.)