
The Danish Twin Registry: Past and Present

Bent Harvald, Gudrun Hauge, Kirsten Ohm Kyvik, Kaare Christensen, Axel Skytthe, and Niels V. Holm

The Danish Twin Registry, Epidemiology, Department Of Public Health, University of Southern Denmark, Odense, Denmark

The Danish Twin Registry was established formally in 1954 and thus celebrates its 50th anniversary in 2004. Here we give an account of its founding and the early years, and a brief summary of more recent progress.

Early History¹

Tage Kemp and the Institute of Human Genetics and Eugenics

The creation of the Danish Twin Registry was part of a general build-up in Danish human genetics research. The Rockefeller Foundation had a great impact, especially economically, on this development in Denmark. In 1929 the head of the Rockefeller Foundation's science department, Warren Weaver, introduced "A New Science of Man" to coordinate the social, medical, and natural sciences. As part of this program, the foundation gave very considerable grants, among other things, to psychiatric and genetic research, such as Lionel Penrose's Colchester studies of oligophrenia. The foundation's link to Danish genetics research was the vice-managing director of the foundation's European branch in Paris, Daniel O'Brien. In 1930 he visited the professor of general pathology, Oluf Thomsen (1878–1940), in Copenhagen to discuss research plans for genetics and took an interest in Oluf Thomsen's young assistant, Tage Kemp (1896–1964), whose main area of interest was genetics. This resulted in some very generous research grants to Kemp, including a long stay at the Cold Spring Harbor Record Office of Eugenics, whose registry held information on approximately 750,000 persons. Kemp was inspired to some extent by this huge register, but was also rather critical of the research at the registry. His scientifically-based criticism was considered valid and in 1934 resulted in the Rockefeller Foundation financing a tour for Kemp to several genetic research centres in Western Europe and the Soviet Union with a view to evaluating the quality of ongoing research. For Kemp personally, the tour provided the opportunity to build a very considerable network of colleagues.

Danish human genetics research gained momentum after the establishment of an Institute of Human Genetics and Eugenics (usually called the Institute of Human Genetics) in 1938 at the University of Copenhagen, with Tage Kemp as director and then from 1948 as professor. The financing of the Institute was based on funds provided by the Rockefeller Foundation on condition that the University of Copenhagen contributed to the running costs. The Rockefeller Foundation's sponsorship must be seen in the light of the personal respect in which Tage Kemp was held in the American research community.

It was clear to Tage Kemp that Denmark could fill a niche in human genetics research by virtue of the high degree of demographic stability of the Danish population, its high educational level and the intensive public registration in various registries: parish records since ca. 1650; census papers since 1769; national registers since 1924; conscription registers since 1701; and criminal registers since 1896.

A special register of various, mostly hereditary, diseases and defects had been established by the anthropologist Søren Hansen (1857–1946), who in 1904 was a founding member of the Anthropological Committee. This committee had among its members a number of influential and outstanding researchers. The register of this committee received reports from the Danish psychiatric reception centres. In connection with the establishment of the Institute of Genetics the register and its secretary, Annelise Betke, of the Anthropological Committee were transferred to the Institute, and the committee closed down.

This register was the basis for the registration of genetic diseases that Tage Kemp built up in the following decades, drawing on reports from a majority of the country's psychiatric wards and reception centres (Kemp, 1951). The register was run on a daily basis by a staff of 30 unemployed office workers who

Received 18 May, 2004; accepted 19 May, 2004.

Address for correspondence: Kirsten Ohm Kyvik, The Danish Twin Registry, Epidemiology, Institute of Public Health, University of Southern Denmark, Sdr. Boulevard 23A, DK-Odense C, Denmark. Email: kkyvik@health.sdu.dk



Figure 1

From left to right: Professor Tage Kemp, Mogens Hauge and Bent Harvald engaged in conversation during a break in the First International Congress of Human Genetics, Copenhagen, 1956.

had been referred to the Institute as part of an employment program. During the course of the 1950s the register covered 100,000 persons, but the reports were very inhomogeneous. It was most likely Kemp's vision that the registration of the total Danish population would become an important and unique research resource. The information on individuals and families was of considerable importance to the clinical genetic counselling function and also to some of the scientific projects of the Institute, but it was not until the psychiatric part of the register had been transferred to Psychiatric Hospital in Aarhus that this part of the register — being the basis of the Central Psychiatric Register — became the core of psychiatric epidemiological and demographic research activities in Denmark.

Psychiatric Epidemiology

Two psychiatrists influenced the initiation of the Danish Twin Registry, Erik Strömngren (1909–93) and Kurt Fremming (1908–2003), through their population-based studies. During World War II, Fremming carried out a so-called catamnestic investigation of the prevalence and incidence of the major psychiatric diseases in some well-defined, almost complete birth cohorts (1885–89) (Fremming, 1947). Throughout a period of 50 years, Fremming's results stood the test of time as valid values of reference; only the change in psychiatric diagnostics of recent years has necessitated a revision. Fremming demonstrated how the existing Danish patient registers could be utilized in follow-up studies “from the cradle to the grave”.

Kurt Fremming's investigations had an indirect impact on the establishment of the Danish Twin Registry in two ways. They demonstrated the possibilities of following a person through various registers,

developing the most appropriate methods for this purpose, and indicated the lowest boundary for the birth cohorts for which such a follow-up was profitable.

Cancer and Genes

From his early years Tage Kemp had been interested in the study of human chromosomes. He had attempted to count the chromosomes in tissue culture studies, but arrived at the wrong number: 48 instead of 46. Kemp was able to confirm the frequently very deviant chromosome numbers in malignant cells, and he was among the first to point out the probability that cancer is caused by somatic mutations.

Kemp's interest in cancer resulted in a number of studies of chromosomes in irradiated cells, as well as the series of epidemiological cancer studies of a very high quality coming from the Institute in the first decade after its start: breast cancer, cervical cancer and leukaemia. The studies came to a common conclusion of sorts: compared to the general population there was a slightly increased cancer incidence among relatives of cancer patients, both in the same type of tumour and in the number of malignant tumours as such. Apart from a few families it was not possible, however, to detect any obvious Mendelian inheritance pattern. The financing of the investigations in the post-war years was based chiefly on the generous grants of the National Cancer Institutes in Bethesda, Maryland. Tage Kemp had the trust of these institutes as a consequence of his former wide-ranging contact with the American research community.

A later addition to these cancer studies was a study of the well-known connection between gastric cancer and pernicious anaemia carried out by Aage Videbæk (1914–90), later professor of haematology, and Johannes Mosbech (1922–), later a consultant. These studies were completed in the fall of 1953, placing Tage Kemp in the rather exceptional situation where the Institute was financed for another two years by the National Cancer Institutes, but had no major cancer project on which to spend the money.

Cancer in Twins — the Establishment of a Twin Register

Kemp now called for proposals for a cancer-related project. In this connection Bent Harvald (1924–) and Mogens Hauge (1922–1988), who at this time were both on the staff of the Institute as research assistants, put forward a plan to investigate cancer in twins in order to throw light on the relative aetiological importance of genes and environment on the occurrence of cancer. Johannes Clemmesen (1908–), who in 1942 had been the leader in initiating the Cancer Register under the Danish Cancer Society, noticing new incidences of cancer, made enquiries into whether the patients were twins. The material collected in this way had been published in 1948 by Busk, Clemmesen, and Nielsen. The material revealed a significantly higher concordance in identical than in



Figure 2

A pair of monozygotic female twins born 1889, to the left at their confirmation, to the right at the age of 50.

fraternal twins, but it had to be taken into account that the process of data collection involved a considerable risk of over representation of concordant pairs, especially among the identical twins. Therefore, it was reasonable to collect a more representative twin sample.

Kemp was immediately in favour of the idea. A twin register which considered all theoretical demands of representativeness would be a valuable research tool as well as constituting a logical supplement to the eugenics register of the Institute. Furthermore, the project's relevance to cancer research was indisputable.

The American sponsors, the National Cancer Institutes, accepted the project, which they subsequently supported until 1960 with a very substantial donation that covered the salary of two secretaries, three part-time physicians plus very considerable costs for travel and equipment. Almost from the beginning of the project Gudrun Hauge (1931–) occupied one of the secretarial positions. With a few brief interruptions, she held this position for more than 45 years, which was of great importance to the continuity of the Danish Twin Registry.

The start of the Danish Twin Registry can thus be seen as a result of several lucky coincidences:

1. A “ripe” scientific problem. So many former twin studies had shown remarkably high concordance

rates compared to what was expected from family studies. At the same time the twin series in question did not fulfil basic methodological requirements.

2. The research model the Institute had used up until then, proband-wise family studies of several cancer forms, had “run out of steam”. It was not expected that further use of the model would yield surprising results apart from those already demonstrated — increased familiar occurrence of cancer with the same or another localization.
3. An economic basis for the start and provisional running of the registry. The money was earmarked for cancer alone, but it was possible to extract information on other diseases from the material collected as an inexpensive “spin-off”.
4. Bent Harvald and Mogens Hauge, at the time in question, both had the opportunity to involve themselves in the project. Both were engaged in genetic research and together they had completed several quite extensive projects. With regard to expertise they complemented each other. Bent Harvald was taking his clinical education in internal medicine, while Mogens Hauge worked with linkage analyses of serological markers, thus having special qualifications for zygosity diagnostics that are central to twin studies.

The Work Begins

Based on Fremming's experiences, the starting point for the twin registry was the parish registers. The registers for the past fifty years were in the hands of the vicars, while the older registers were kept in the regional archives. To begin with we chose the cohorts 1870–1910. We were interested in cohorts old enough to show a fairly high cancer frequency, but we could not go further back than 1870, due to difficulties in tracking down the twins. Jutland south of the Kongeaa border (the border between Denmark and Germany 1864–1920) had to be left out, as the older parish registers from these parts could not be found in the parish or local Danish archives.

Over the course of the first couple of years contact was made with all Danish vicars north of the Kongeaa border, a total of 800. What we asked the vicars to do was not a little:

We kindly ask you to help us by copying out the twins from your parish for the period 1870–1910. We are interested in the following information for each pair of twins (whether they are of the same or opposite sexes):

- full name and date of birth of the twins
- name and address of the parents

If it appears that one or both twins died immediately after they were born, you don't have to inform us of them, as we are only investigating twins where both reached at least 5 years of age.

We are fully aware that what we ask may cause you much inconvenience and can only be regarded as a very great favour that you are doing us. However, we have a limited grant at our disposal, which enables us to give you some compensation. We therefore ask you to enclose your charge.

Yours sincerely
M. Hauge B. Harvald
Physicians

The response rate was very high indeed. We only met with two refusals to participate: a rural dean in Lolland and the parish clerk for the Danish National Hospital (for reasons of discretion). A characteristic answer from a North Jutland rural parish, which was accompanied by information on a total of six pairs of twins, read as follows:

This is the meagre harvest from two parishes. There were many twin pairs, but babies died like flies in the period you are investigating. The pairs copied out here did all reach the age of five years at least.

As we all have to cut down our expenses — and we have not seen the end of that — I appreciate that I have to limit myself to a microscopic hourly rate: send me 10 Dkr. for my parish magazine. That will not ruin your budget, I hope.

Yours sincerely
— —
Vicar



Figure 3

A pair of monozygotic male twins born 1912. These twins were so alike no one could tell them apart, something they took advantage of when taking the intermediate school exam where one took the German language examination twice, for both of them, the other the English language examination twice.

The majority of the vicars found the project interesting and sent us their registrations free of charge.

The Twin Registry secretaries made extracts of the parish registers that had already been filed in the regional archives, with indispensable assistance from the archives' staff. The country's national registration offices also made a considerable contribution during the further tracking down of twins. The probate courts must also be commended in this connection. For all deceased twins we collected information on cause of death and possible related diseases in the death certificate file of the National Health Service of Denmark with the enthusiastic help of its staff.

The First Results

Right from the start of the project it was clear that it would be a long time before we could begin reaping the results from the register. After two years it was possible to publish some preliminary results concerning a few, very frequently occurring conditions. After the twins had been traced we sent them a questionnaire if they were still alive, or, if they had died, to their closest living relative. All information about hospitalizations was followed up by the loan and examination of medical records — all in all a rather time-consuming process that provided very comprehensive information on each twin.

A substantial obstacle to the feasibility of the entire project was the large loss of twin pairs as a consequence of the high rate of infant mortality in the early days. It was especially high for twins because of their low birthweight. Twin pairs in which one or both had died before the age of five were considered unimportant to the planned analyses. More than half of the total number of twins registered in the parish registers were left out of the material for this reason. In addition there was the loss of pairs that it had not been possible to trace.

In 1956, the first proper summing up gave just under 2000 finished pairs, concluding that genetic factors play a very modest role in connection with cancer and myocardial infarction, while a significantly higher concordance rate in identical than in same-sexed, fraternal twins was found for hypertension, apoplexy, intelligence defects, epilepsy, manic-depressive psychosis, tuberculosis, rheumatic fever, rheumatoid arthritis, asthma and diabetes (Harvald and Hauge, 1956).

These very early results were confirmed in essence in later analyses: in 1958, of 3000 fully finished pairs; and in 1963 of just under 7000 pairs. In a count in 1964 of pairs in which both twins in a pair had died after the age of five, we were able to demonstrate that the difference in age at death was significantly less for identical than for same-sexed fraternal twin pairs. The heritability factor for life expectancy was found to be .29.

It is amazing how these early results agree with later results, which had the benefit of a growing twin sample and more sophisticated statistical methods. The results were published in the *Journal of the American Medical Association* (Harvald and Hauge, 1963) and in the US Public Health Service Publication No. 1163 "Genetics and the Epidemiology of Chronic Diseases" (Harvald and Hauge, 1965). Despite their deficiencies these publications served in those days as publicity for the international propagation of the Danish Twin Registry.

Separated Twins

An important collaborator in these early years of the registry was the psychiatrist, Niels Juel-Nielsen (1920–1986), who from 1970 was professor of psychiatry at Odense University. He was engaged as a research assistant at the Institute of Human Genetics in 1955. He came from a position with the Psychiatric Hospital in Aarhus, where he had initiated a tracing of identical twins who had been parted at birth or in the first year of life and had been reared apart.

One of the most frequent objections to the classic twin method is that identical twins are more concordant than fraternal twins, not only because they have identical genes, but also because their environmental circumstances are more similar, because of, among other things their physical likeness which makes those around them treat them more alike. This objection cannot be raised against identical twins reared

apart. Unfortunately twins reared apart are "as rare as hens' teeth".

Juel-Nielsen found 12 such pairs; 8 pairs through the Danish Twin Registry and 4 pairs more or less by chance. Juel-Nielsen told a story of a twin pair who had contacted him. One of the twins was spoken to in the streets of Sonderborg, where she had never been before, by persons unknown to her who took her to be her twin sister, whom she did not know and who happened to live in Sonderborg. In this way the twins were brought together for the first time.

Every one of the 12 pairs who had been reared apart was put through a thorough psychiatric evaluation and a psychological investigation including various psychometric tests. In a measurement using non-verbal methods, level of intelligence showed a high degree of concordance between the twins of each pair. Personality structures also showed considerable similarities with regard to character and emotions, but the twin partners displayed large differences in their attitude towards and interaction with their environment, as well as differing in the form their interaction took and their level of need for contact.

Juel-Nielsen's studies, resulting in his 1965 thesis, aroused considerable international interest. Juel-Nielsen was asked to make a reinvestigation of the surviving twin pairs, and a revised edition of his book was published in New York in 1980.

Cooperation with the Criminological Institute

In 1955 the Institute of Human Genetics started collaboration with Doctor of Laws Karl O. Christiansen (1908–1976) from the Criminological Institute at the University of Copenhagen. Through Karl O. Christiansen the Danish Twin Registry also started collaborating with Professor Irving I. Gottesman from the Behavioral Genetics Center at the University of Minnesota. After Karl O. Christiansen's death in 1976, the contact between the Danish Twin Registry and the Criminological Institute drew to a close, while the collaboration with the American partners, especially Gottesman, continued. In the long term, this collaboration became a stimulus to the modernization of the Danish Twin Registry. At the Institute in Minnesota the Danish data had been computerized and put through various advanced analyses that demonstrated the clear superiority of using computers in data processing. At that time in the mid-1970s, the Danish Twin Registry still used manual sorting of data.

Tobacco and Twins

From the beginning of the 1960s, the status of the Danish Twin Registry gradually declined in line with Tage Kemp's failing health. The generous sponsorship of the National Cancer Institutes was reduced gradually as it became clear that the main conclusion of the study of cancer in twins would hardly change; that genetic factors normally have a very limited impact on the development of cancer.

Alongside the classic twin method, which relies on a comparison of the concordance between identical and fraternal twins, a new perspective began to emerge: the application of the so-called discordance analyses on twin data. In discordant identical twin pairs the environmental differences between affected and non-affected twin partners were investigated, as well as differences in morbidity and mortality between partners of identical pairs who have been subjected to different environmental exposures such as smoking.

At the end of the 1950s, Elisabeth Raaschou-Nielsen MD (1924–) made a thorough mapping of the former and present tobacco consumption of the twins (Raaschou-Nielsen, 1960). She clearly demonstrated the impact of genetic factors on smoking habits. In the 1960s, collaboration with Donald D. Reid, professor at the London School of Hygiene and Tropical Medicine, began. He was also advisor to WHO on prevention of heart and lung diseases. In a comparison of the most smoking partner of each pair with the least smoking partner he demonstrated an increase in mortality from lung cancer, reduced lung function, and myocardial infarct in the group of the most smoking partners. However, the total mortality was close to being the same in the two groups. These studies, which were financed by the English tobacco industry, were unfortunately never followed up.

Intensive studies of twins with peptic ulcer revealed that the affected identical twins had been exposed to more “stress” than their unaffected partners. In a similar study of identical twins with schizophrenia it was not possible to find any specific environmental factor in any of the affected twins compared with the unaffected. Other discordance analyses of the material have not been informative either, maybe because the analyses can normally only take into account such environmental factors that are suspected beforehand.

Jan Mohr Succeeds Tage Kemp

Tage Kemp died in 1964 and was succeeded by the Norwegian Jan Mohr (1921–). At the beginning of the 1950s he had been a research assistant at the Institute, and he had a formal education in genetics. He had worked with Professor L. S. Penrose at the Galton Laboratory in London, and he now applied the linkage analysis method developed at the laboratory to the identification of the localization of genes on the chromosomes. The linkage analyses were used both with normal Danish families characterized by a large number of children, and with a number of families with well-known genetic diseases that had been mapped and filed in the eugenics register. In those days the chance of demonstrating a linkage was modest, primarily because of the very limited number of known markers, such as the ABO system.

In spite of these difficulties Mohr succeeded as the first ever in documenting linkage to an autosomal

chromosome in human beings, namely the linkage between Lutheran (Lu[a]) and Secreter (Mohr, 1954). Jan Mohr's finding was without doubt the largest achievement by a single researcher at the Institute of Human Genetics. It was hardly surprising, therefore, that Jan Mohr was appointed successor to Tage Kemp.

Mohr's leadership meant a radical change to the line of research at the Institute. The classic clinical genetic studies using the register, the clinical family studies, and the twin research were all downgraded.

Since his own appointment to the Institute at the beginning of the 1950s, Mogens Hauge had cooperated closely with Mohr. When Mohr left the Institute in 1953 to continue his scientific work in Oslo in Norway, Hauge carried on the linkage analyses in Copenhagen using the method introduced by Mohr, but added an increasing number of markers and a number of genetic diseases. He did not succeed in finding any other linkage relations other than the one revealed by Mohr. Hauge finished these linkage studies at the beginning of the 1960s.

When Mohr took up his appointment as head of the Institute in 1964, Hauge concentrated his efforts on twin studies and the socio-genetic advisory function of the Institute, which did not hold Mohr's interest. Hauge and Harvald, who had become senior lecturer in clinical genetics and assistant consultant at Bispebjerg Hospital, were both able to spend approximately half of their time on the twin registry.

Work in Progress

Under these conditions the Danish Twin Registry made steady progress. In the course of the 1960s, same-sexed twin pairs of the 1911–30 cohorts were included, so that around 1970 the Danish Twin Registry contained a little over 11,000 same-sexed pairs ready for analysis.

Among studies completed at that time, a clinical and radiological study of twins with peptic ulcer must be mentioned. It was conducted by Kai Gotlieb Jensen (1923–84), later consultant in surgery in Ribe. The study indicated that genetic and environmental factors have almost equal aetiological weight, as well as supporting the established view in the clinic that gastric ulcer and duodenal ulcer are different diseases (Jensen, 1972).

Margit Fischer (1931–83), consultant in psychiatry in Aarhus from 1976, studied twins suffering from schizophrenia, demonstrating a substantial genetic influence (Fischer, 1973). On the other hand, the medical records also revealed how much the schizophrenic phenotype could differ in genetically identical individuals.

An Institute of Medical Genetics in Odense

In 1969 Bent Harvald took up an appointment as professor of internal medicine at the young Odense University. At the same time a controversy about the direction of research and the twin registry was growing between Jan Mohr and Mogens Hauge.

Mogens Hauge applied for and in 1970 was appointed to the chair of medical genetics in Odense.

The Danish Twin Registry Moves to Odense

To whom did the twin registry belong? The original financial basis of the Danish Twin Registry had been Tage Kemp's grants. The registry had been housed at the Institute of Human Genetics and had utilized the Institute's common facilities, among these a considerable amount of secretarial assistance. Although by far the main part of the scientific work in connection with the registry had been made by Mogens Hauge and Bent Harvald, it was not unreasonable to claim that the twin material belonged to the Institute of Human Genetics and therefore the University of Copenhagen. It was feared that a time and resource-consuming "tug-of-war" concerning the intellectual ownership of the twin registry would ensue, but no conflict arose. Jan Mohr never disputed the right of Hauge and Harvald to the twin material. On the contrary, because of a lack of space, he wished to have the registry moved to Odense as quickly as possible. The transfer of the Danish Twin Registry to Odense in 1971 meant that the new Institute of Genetic Pathology had no lack of material, and so it got off to a flying start. From 1973 a continuous flow of publications based on the registry emanated from the Institute.

The transfer of the Danish Twin Registry to Odense took place without any great to-do. The event is neither mentioned in any of the annual reports of Odense University nor in the book *Frugten vokser frem* (The fruits sprout up) that was published in 1991 by Odense University Press to mark the university's 25th anniversary (Boje and Jespersen). Thus it was an unnoticed historical event which nevertheless lived quietly up to the university motto: "fructus increscit opera novo in agro" — fruits sprout up when labouring in a new field.

Later History

After spending productive years at the Twin Registry in Odense, Professor Mogens Hauge died unexpectedly in 1988 as the result of an accident. Niels V. Holm, now chief oncologist at Odense University Hospital, took over responsibility in conjunction with his clinical career. Thanks to Niels V. Holm and the support of Thomas Mack, professor at the University of Southern California, the registry remained in Odense, intact and productive. A computerization of the older cohorts of twins was completed in the 1980s with the purpose of linking the Danish Twin Registry with the nationwide Danish Cancer Register. In the late 1980s and early 1990s, Niels V. Holm directed the computerization of data on the older cohorts of the twin register as part of a twin study on lifespan initiated by James W. Vaupel, professor at Duke University, and later appointed professor in Odense. This computerization was the platform for the longitudinal aging studies of all Danish twins aged 70 and older conducted by Kaare

Christensen, professor of Epidemiology at the University of Southern Denmark, over the last decade in close collaboration with James W. Vaupel and Matt McGue, professor at the University of Minnesota.

In the early 1990s, the Danish Twin Registry was extended to include the 1953–1982 cohorts, thanks to Kirsten O. Kyvik, now associate professor of Epidemiology, University of Southern Denmark. This cohort was ascertained as part of her PhD project on type 1 diabetes in young twins, conducted with the support of Anders Green, now professor at the University of Aarhus, and Henning Beck-Nielsen, professor at Odense University Hospital. This twin cohort has been used especially for studies of somatic diseases with debut in young age.

As part of his PhD project on mortality in twins conducted in the mid-1990s, Axel Skytthe, now associate professor of Epidemiology, University of Southern Denmark, filled the gap in the Danish Twin Registry by ascertaining the 1931–1952 twin cohorts with the support of Kaare Christensen. This resource is now being used for both aging studies and studies of younger twins.

These two cohorts, 1931–52 and 1953–82, were both ascertained from the Danish Civil Registration System, although because of different technological possibilities, not in the same way. The possibility of linking to the Civil Registration System meant great progress with regard to completeness of the two cohorts as well as to the follow-up of the whole twin registry. At present the Danish Twin Registry receives regular updates from the Medical Birth Registry. It covers 131 birth cohorts totalling more than 67,000 pairs of twins (Skytthe et al., 2002). Furthermore, the register comprises a bio-bank established during the late 1990s.

In 1995 the Danish Twin Registry obtained permission to operate as one of the University of Southern Denmark's registries. This has ensured especially good data security as well as support in the form of materials and tenure, and extended the possibilities for linkage with other Danish civil and health registers. The registry is a research resource of the Faculty of Health Sciences at the University of Southern Denmark with the Dean as Head and a scientific board consisting of Kaare Christensen, Kirsten O. Kyvik, Niels V. Holm, and Axel Skytthe. Kirsten O. Kyvik is the daily administrative leader, the bio-bank is headed by Lise Bathum MD, PhD, while database manager Lars Hvidberg and Jacob Mortensen PhD are responsible for data management in collaboration with Axel Skytthe, all with secretarial support from Jytte Duerlund (Bachelor of Business Language).

Endnote

Early history by Bent Harvald and Gudrun Hauge, from *Dansk Medicinhistorisk Aarbog*. (1999). pp. 81–106, translated from the Danish by Kirsten Pagh.

APPENDIX

**The Danish Twin Registry: Established in 1954
Complete List of Publications**

- Harvald, B., & Hauge, M. (1956). A catamnestic investigation of Danish twins, a preliminary report. *Danish Medical Bulletin*, 150–158.
- Harvald, B., & Hauge, M. (1958). A catamnestic investigation of Danish twins. A survey of 3100 pairs. *Acta Genetica et Statistica Medica*, 8, 287–294.
- Juel-Nielsen, N., Nielsen, A., & Hauge, M. (1958). On the diagnosis of zygosity in twins and the value of blood groups. *Acta Genetica et Statistica Medica*, 8(3/4), 256–273.
- Dencker, S. J., Hauge, M., & Kaij, L. (1959). An investigation of the ptc taste character in monozygotic twin pairs. *Acta Genetica et Statistica Medica*, 9, 236–244.
- Raaschou-Nielsen, E. (1960). Smoking habits in twins. *Danish Medical Bulletin*, 7, 82–88.
- Dencker, S. J., Hauge, M., Kaij, L., Nielsen, A. (1961). The use of anthropological traits and blood groups in the determination of the zygosity of twins. *Acta Genetica et Statistica Medica*, 11, 265–285.
- Hauge, M., & Harvald, B. (1961). Malignant growth in twins. *Acta Genetica et Statistica Medica*, 11, 372–378.
- Harvald, B., & Hauge, M. (1963). Heredity of Cancer Elucidated by a study of Unselected Twins. *The Journal of the American Medical Association*, 186, 749–753.
- Harvald, B., & Hauge, M. (1963). Selection in diabetes in modern society. *Acta Medica Scandinavica*, 173, 459–465.
- Hauge, M., Harvald, B., & Degnbol, B. (1963). Hereditary Factors in longevity. In P. Hansen (Ed.), *Age with a Future. Proceedings of the Sixth International Congress of Gerontology*. Copenhagen: Munksgaard.
- Mansa, B., Nerstrøm, B., & Hauge, M. (1963). The Gc-Types in a Twin Material. *Acta Genetica et Statistica Medica*, 13, 247–251.
- Harvald, B., & Hauge, M. (1965). Hereditary factors elucidated by twin studies. In J. V. Neel, M. W. Shaw and W. J. Schull (Eds.), *Genetics and the Epidemiology of Chronic Diseases* (Public Health Service Publication No. 1163, pp. 61–76). Washington, D.C.: US Public Health Service.
- Hauge, M. (1965). The study of Genetic Components in the Aetiology of malignant growth. In G. Wagner (Ed.), *Krebs -Dokumentation und Statistik maligner Tumoren*. Stuttgart, Germany: F.K.Schattauer-Verlag.
- Juel-Nielsen, N. (1965). *Individual and Environment*. Copenhagen: Munksgaard.
- Allen, G., Harvald, B., & Shields, J. (1967). Measures of twin concordance. *Acta Genetica et Statistica Medica*, 17, 475–481.
- Harvald, B. (1967). Genetic perspectives in diabetes mellitus. *Acta Medica Scandinavica Supplementum*, 476, 17–27.
- Harvald, B. (1967). Twins in clinical genetics. *Tidsskrift for den Norske Lægeforening*, 87(5), Suppl, 475–477.
- Hauge, M., Herrlin, K. M., & Heiken A. (1967). The Distribution of blood groups in a series of triplets. *Acta Genetica et Statistica Medica*, 17, 260–274.
- Herrlin, K. M., Hauge, M. (1967). Determination of triplet zygosity. *Acta Genetica*, 17, 81–95.
- Hauge, M., Harvald, B., Fischer M., Gotlieb-Jensen, K., Juel-Nielsen, N., Raebild, I., Shapiro, R., & Videbech, T. (1968). The Danish Twin Register. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 17, 315–332.
- Herrlin, K. M., Hauge, M. (1968). Some anthropological traits in an unselected series of triplets. *Acta Genetica et Statistica Medica*, 18(5), 496–510.
- Fischer, M., Harvald, B., & Hauge, M. (1969). A Danish twin study of schizophrenia. *British Journal of Psychiatry*, 115, 981–990.
- Gunderson, J., & Hauge, M. (1969). Hereditary factors in venous insufficiency. *Angiology*, 20(6), 346–355.
- Hauge, M., & Gunderson, J. (1969). Genetics of varicose veins of the lower extremities. *Human Heredity*, 19(5), 573–580.
- Philip, J., Andersen, C. H., Dreyer, V., Freiesleben, E., Gurtler, H., Hauge, M., Kissmeyer-Nielsen, F., Nielsen, L. S., Pers, M., Robson, E. B., Svejgaard, A., & Sorensen, B. (1969). Colour vision deficiency in one of two presumably monozygotic twins with secondary amenorrhoea. *Annals of Human Genetics*, 33(2), 185–195.
- Fischer, M. (1970). Genetic of schizophrenia. *Lancet*, 1(7643), 424.
- Harvald, B., & Hauge, M. (1970). Coronary occlusion in twins. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 19(1), 248–250.
- Harvald, B., & Hels, J. (1970). Congenital malformations in Greenland. A follow-up study of 757 children born in Godthåb 1957–1964. *Ugeskrift for Læger*, 132(20), 919–924.
- Hauge, M., Harvald, B., & Reid, D. D. (1970). A twin study of the influence of smoking on morbidity and mortality. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 19(1), 335–336.

- Herrlin, K. M., Hauge, M., & Erikson, S. A. (1970). Finger print patterns in an unselected series of triplets. *Human Heredity*, 20(3), 336–355.
- Schiøttz-Christensen, E. (1970). Computer selection of twin pairs. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 19, 341–343.
- Fischer, M. (1971). Psychoses in the offspring of schizophrenic monozygotic twins and their normal co-twins. *British Journal of Psychiatry*, 118(542), 43–52.
- Fischer, M. (1972). Environmental factors in schizophrenia. Comparative studies in identical twins. *Nervenarzt*, 43(5), 230–238.
- Jensen, K. G. (1972). *Peptic Ulcer, Genetic and Epidemiological Aspects Based on Twin Studies*. Copenhagen: Munksgaard.
- Schiøttz-Christensen, E. (1972). Genetic factors in febrile convulsions. An investigation of 64 same-sexed twin pairs. *Acta Neurologica Scandinavica*, 48, 538–546.
- Andreasen, P. B., Froland, A., Skovsted, L., Andersen, S. A., & Hauge, M. (1973). Diphenylhydantoin half-life in man and inhibition by phenylbutazone: The role of genetic factors. *Acta Medica Scandinavica*, 193(6), 561–564.
- Fischer, M. (1973). Genetic and environmental factors in schizophrenia. A study of twins and their families. *Acta Psychiatrica Scandinavica Supplementum*, 238, 9–142.
- Schiøttz-Christensen, E. (1973). Role of birth history in the aetiology and course of febrile convulsions. A twin study. *Neuropadiatrie*, 4, 238–244.
- Schouboe, K., & Hauge, M. (1973). The application of twin methods in orthodontic research. *Scandinavian Journal of Dental Research* 1973, 81(7), 563–566.
- Bertelsen, A., Harvald, B., & Hauge, M. (1977). A Danish twin study of manic-depressive disorders. *British Journal of Psychiatry*, 130, 330–351.
- Fischer, M. (1977). Twin studies and diagnostic issues in schizophrenia. In E. S. Gershon et al. (Eds.), *The impact of biology on modern psychiatry* (pp. 261–270). New York: Plenum Press, QV 77 I34.
- Hauge, M. (1977). The aetiology of MS-genetic aspects. *Acta Neurologica Scandinavica Supplementum*, 63, 49–53.
- Nielsen, J., Homma, A., & Bertelsen, A. (1977). Cytogenetic investigation in twins with manic-depressive disorders (22 monozygotic and 27 dizygotic twin pairs). *British Journal of Psychiatry*, 130, 352–354.
- Bertelsen, A. (1978). A Danish twin study of manic-depressive disorders. *Progress in Clinical and Biological Research*, 24A, 119–124.
- Brandrup, F., Hauge, M., Henningsen, K., & Eriksen, B. (1978). Psoriasis in an unselected series of twins. *Archives of Dermatology*, 114, 874–878.
- Møller, M., Horsman, A., Harvald, B., Hauge, M., Henningsen, K., & Nordin, B. E. (1978). Metacarpal morphometry in monozygotic and dizygotic elderly twins. *Calcified Tissue Research*, 25(2), 197–201.
- Nielsen, J., Homma, A., Isaksen, B., & Bertelsen, A. (1978). Incidence of twin birth in Denmark from 1911 to 1974. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 1978, 27, 45–49.
- Essen-Møller, E., & Fischer, M. (1979). Do the partners of dizygotic schizophrenic twins run greater risk of schizophrenia than ordinary siblings? *Human Heredity* 1979, 29(3), 161–165.
- Holm, N. V., Hauge, M., & Harvald, B. (1980). Etiologic factors of breast cancer elucidated by a study of unselected twins. *Journal of the National Cancer Institute*, 65(2), 285–298.
- Mennè, T. (1980). Relationship between cobalt and nickel sensitization in females. *Contact Dermatitis*, 6(5), 337–340.
- Rachootin, P., & Olsen, J. (1980). Secular changes in twinning rate in Denmark 1931 to 1977. *Scandinavian Journal of Social Medicine*, 8, 89–94.
- Brandrup, F., Holm, N. V., Grønnet, N., Henningsen, K., & Hansen, H. E. (1981). Psoriasis in monozygotic twins — variations in expression in individuals with identical genetic constitution. *Acta Dermato-Venerologica* 62, 1982, 229–236.
- Hauge M. (1981). The Danish twin register. In S. A. Mednick, A. E. Baert, & B. P. Bachmann (Eds.), *Prospective Longitudinal Research. An empirical basis for the primary prevention of psychosocial disorders* (pp. 217–221). Oxford: Oxford University Press.
- Holm, N. V. (1981). Studies of cancer etiology in the Danish twin population. I. Breast cancer. In L. Gedda, P. Parisi, W. E. Nance (Eds.), *Twin Research Part C. Epidemiological and Clinical Studies* (pp. 211–216). New York: Alan R. Liss Inc.
- Mennè, T. (1981). Nickel allergy-reliability of patch test. Evaluated in female twins. *Dermatosen in Beruf und Umwelt*, 29(6), 156–160.
- Brandrup, F., Green, A., & Holm, N. V. (1982). Prævalensen of psoriasis i Danmark. *Ugeskrift for Læger*, 144, 3538–3541. (In Danish.)
- Hansen, H. E., Mennè, T., & Olesen-Larsen, S. (1982). HLA antigens in nickel sensitive females: based on a twin and patient population. *Tissue Antigens*, 19(4), 306–310.
- Heltberg, A., & Holm, N. V. (1982). Concordance in twin and recurrence in sibships in multiple sclerosis [Letter to the Editor]. *Lancet*, 1068.
- Holm, N. V., Hauge, M., & Jensen, O. M. (1982). Studies of cancer etiology in a complete twin population. Breast cancer, colorectal cancer and leukemia. *Cancer Survey* 1, 17–32.
- Holm, N. V. (1983). A note on ascertainment probability in the Allen/Hrubec twin model. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 32, 37–47.

- Menné, T., & Holm, N. V. (1983). Hand eczema in nickel-sensitive female twins. Genetic predisposition and environmental factors. *Contact Dermatitis*, 9, 289–296.
- Menné, T., & Holm, N. V. (1983). Nickel allergy in a female twin population. *International Journal of Dermatology*, 22, 22–28.
- Schultz Larsen, F., & Holm, N. V. (1983). Evaluation of an identification method of twin pairs based on the personal numbering system in Denmark. *Danish Medical Bulletin*, 30, 424–427.
- Brandrup, F. (1984). Psoriasis in first-degree relatives of psoriatic twins. *Acta Dermato-Venereologica*, 64(3), 220–226.
- Bertelsen, A. (1985). Controversies and consistencies in psychiatric genetics. *Acta Psychiatrica Scandinavica Supplementum*, 319, 61–75.
- Holm, N. V. (1985). Population Based twin studies: An irreplaceable tool in etiologic cancer research. In Müller H. & Weber W. (Eds.), *Familial Cancer* (pp. 208–209). 1st International Research Conference, Basel, Karger.
- Holm, N. V., Hauge, M., & Jensen, O. M. (1985). Cancer in the Danish Twin Population: A population-based twin study. In Müller H. & Weber W. (Eds.), *Familial Cancer* (pp. 190–191). 1st International Research Conference, Basel, Karger.
- Holm, N. V., Hauge, M., & Jensen, O. M. (1985). Completeness and validity of the Danish Cancer Register evaluated by a population based twin study. In S.A. Birkeland (Ed.), *Vævsdykningslaboratoriet. Forskning* (pp. 1971–1986). Odense, Denmark: Odense University.
- Kendler, K. S., & Holm, N. V. (1985). Differential enrolment in twin registries: Its effect on prevalence and concordance rates and estimates of genetic parameters. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 34, 125–140.
- Schultz Larsen, F., & Grunnet, N. (1985). Lymphocyte transformation tests and subpopulations of lymphocytes in population-based material of atopic dermatitis in twins. *Scandinavian Journal of Immunology*, 21(4), 375–381.
- Schultz Larsen, F., & Holm, N. V. (1985). Atopic dermatitis in a population based twin series. Concordance rates and heritability estimation. *Acta Dermato-Venereologica Supplementum (Stockholm)*, 114, 159.
- Menné, T., & Holm, N. V. (1986). Genetic susceptibility in human allergic contact sensitization. *Seminars in Dermatology*, 5, 301–306.
- Olsen, J., & Knudsen, L. B. (1986). Twinning rates by residence in Denmark 1978–1982. *Scandinavian Journal of Social Medicine*, 14, 147–150.
- Schultz Larsen, F., Holm, N. V., & Henningsen, K. (1986). Atopic dermatitis. A genetic epidemiologic study in a population-based twin sample. *Journal of the American Academy of Dermatology*, 15, 487–494.
- Bønnelykke, B., Sogaard, J., Nielsen, J. (1987). Seasonality in twin birth rates, Denmark, 1936–84. *Journal of Epidemiology and Community Health*, 41, 305–313.
- Husby, S., Schultz-Larsen, F., & Petersen, P. H. (1987). Genetic influence on the serum levels of naturally occurring human IgG antibodies to dietary antigens. Quantitative assessment from a twin study. *Journal of Immunogenetics*, 14(2–3), 131–142.
- Schultz Larsen, F., & Grunnet, N. (1987). Genetic investigations in atopic dermatitis. *Tissue-Antigens*, 29(1), 1–6.
- Bønnelykke, B., Hauge, M., Holm, N. V., Kristoffersen, K., & Gürtler, H. (1989). Evaluation of zygosity diagnosis in twin pairs below age seven by means of a mailed questionnaire. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 38, 305–313.
- Gottesman, I. I., & Bertelsen, A. (1989). Confirming unexpressed genotypes for schizophrenia. Risks in the offspring of Fischer's Danish identical and fraternal discordant twins. *Archives of General Psychiatry*, 46(10), 867–72.
- Husby, H., Holm, N. V., Gernow, A., Thomsen, S. G., Kock, K., & Gürtler, H. (1991). Zygosity, placental membranes and Weinberg's rule in a Danish consecutive twin series. *Acta Geneticae Medicae et Gemellologiae (Roma)*, 40, 147–152.
- Menné, T., & Holm, N. V. (1991). Genetic aspects to nickel sensitization. In H. Maibach & T. Menné (Eds.), *Nickle and the skin: "Immunology and toxicology"* (pp. 101–107). Florida: CRC Press.
- Anderson, J. E., Louis, T. A., Holm, N. V., & Harvald, B. (1992). Time dependent association measures for bivariate survival distributions. *Journal of the American Statistical Association*, 87, 641–650.
- Hougaard, P., Harvald, B., & Holm, N. V. (1992). Genetic determination of life times elucidated by adult Danish twins born 1881–1930. *Journal of the American Statistical Association*, 87, 17–24.
- Hougaard, P., Harvald, B., Holm, N. V., & Harvald, B. (1992). Assessment of dependence in genetics: Danish twin data applied to a gerontological question. In J. P. Klein and P. K. Goel (Eds.), *Survival Analysis: State of the Art* (pp. 77–97). the Netherlands: Kluwer Academic Press.
- Hougaard, P., Harvald, B., Holm, N. V. (1992). Models for multivariate failure time data with application to the survival of twins. In P. G. M. van der Heijden, W. Jansen, B. Francis & G. V. H. Seeber (Eds.), *Statistical Modelling* (pp. 159–173). Elsevier Science Publishers B.V.
- Vaupel, J.W., Yashin, A. I., Xiu, L., & Holm, N. V. (1992). Survival analysis in genetics: Danish twin data applied to a gerontological question. In J. P. Klein and P. K. Goel (Eds.), *Survival Analysis: State of the*

- Art*, pp. 121-140, the Netherlands: Kluwer Academic Press.
- Christensen, K., & Fogh-Andersen, P. (1993). Cleft lip (+/- Cleft Palate) in Danish twins, 1970-1990. *American Journal of Medical Genetics*, 47, 910-916.
- Christensen, K., & Fogh-Andersen, P. (1993). Isolated Cleft palate in Danish multiple births, 1970-1990. *The Cleft Palate-Craniofacial Journal*, 30, 469-474.
- Konradsen, H. B., Henrichsen, J., Wachmann, H., & Holm, N. V. (1993). The influence of genetic factors on the immune response as judged by pneumococcal vaccination of mono and dizygotic twins. *Clinical Experiments in Immunology*, 92(3), 532-536.
- McGue, M., Vaupel, J. W., Holm, N. V., & Harvald, B. (1993). Longevity is moderately heritable in a sample of Danish twins born 1870-1880. *Journal of Gerontology*, 48(6), B237-244.
- Schultz Larsen, F. V. (1993). Atopic dermatitis: a genetic-epidemiologic study in a population-based twin sample. *Journal of the American Academy of Dermatology*, 28, 719-723.
- Vaupel, J. W., Yashin, A. I., Xue, L., Holm, N. V., & Harvald, B. (1993). Strategies for modelling genetics in survival analysis: Alternative frailty models applied to data on the life spans of Danish twins. *Population Studies of Aging #1*, 1-27, Odense University Press.
- Yashin, A. I., Vaupel, J. W., Chervonenkis, A. Y., Iachine, I. A., Harvald, B., & Holm, N. V. (1993). When two are better than one: An inclusive survival model for combining bivariate data sets. *Population Studies of Aging #2*: 1-23, Odense University Press.
- Christensen, K., & Fogh-Andersen, P. (1994). Læbe-ganespalte. Arv og miljø [Cleft lip and palate. Inheritance and environment]. In K. Viltung (Ed.), *Læbe-ganespalte* [Cleft lip and palate] (pp. 18-29). København: Munksgaard.
- Konradsen, H. B., Hahn-Zoric, M., Nagao, A. T., & Hanson, L. A. (1994). Differences within mono- and dizygotic twin-pairs in spectrotypes and clones of IgG2 antibodies to pneumococcal polysaccharide. type 1 and c-polysaccharide after vaccination. *Scandinavian Journal of Immunology*, 40(4), 423-428.
- Konradsen, H. B., Oxelius, V. A., Hahn-Zoric, M., & Hanson, L. A. (1994). The importance of G1m and 2 allotypes for the IgG2 antibody levels and avidity against pneumococcal polysaccharide type 1 within mono- and dizygotic twin-pairs. *Scandinavian Journal of Immunology*, 40(2), 251-256.
- Bertelsen, A., & Gottesman, I. I. (1995). Schizoaffective psychoses: genetical clues to classification. *American Journal of Medical Genetics*, 60(1), 7-11.
- Christensen, K., Vaupel, J. W., Holm, N. V., & Yashin, A. I. (1995). Mortality among twins after age 6: Fetal origins hypothesis versus twin method. *British Medical Journal*, 310, 432-436.
- Kyvik, K. O., Green, A., & Beck-Nielsen, H. (1995). The new Danish Twin Register: Establishment and analysis of twinning rates. *International Journal of Epidemiology*, 24, 589-596.
- Kyvik, K. O., Green, A., & Beck-Nielsen, H. (1995). Concordance rates of insulin dependent diabetes mellitus: A population based study of young Danish twins. *British Medical Journal*, 311, 913-917.
- Vaag, A., Henriksen, J. E., Madsbad, S., Holm, N. V., & Beck-Nielsen, H. (1995). Insulin secretion, insulin action, and hepatic glucose production in identical twins discordant for NIDDM. *Journal of Clinical Investigation*, 95, 690-698.
- Yashin, A. I., & Iachine, I. (1995). How long can humans live? Lower bound for biological limit of human longevity calculated from Danish twin data using correlated frailty model. *Mechanisms of Ageing and Development*, 80, 147-169.
- Christensen, K., & Fogh-Andersen, P. (1996). Cleft-Twin sets. *The Cleft Palate-Craniofacial Journal*, 33, 530.
- Christensen, K., Holm, N. V., & Vaupel, J. W. (1996). Alzheimer's disease and twins. *Lancet*, 347, 976.
- Christensen, K., & Mitchell, L. E. (1996). Familial recurrence-pattern analysis of nonsyndromic isolated cleft palate — a Danish registry study. *American Journal of Human Genetics*, 58, 182-190.
- Christensen, K., Vaupel, J. W., Holm, N. V., & Yashin, A. I. (1996). Mortalitet blandt tvillinger efter 6-års alderen: Programmeringshypotese versus tvillingmetoden. *Ugeskrift for Læger*, 58, 7415-7419.
- Herskind, A. M., McGue, M., Holm, N. V., Sørensen, T. I. A., Harvald, B., & Vaupel, W. (1996). The heritability of human longevity: a population-based study of 2872 Danish twin pairs born 1870-1900. *Human Genetics*, 97(3), 319-323.
- Herskind, A. M., McGue, M., Iachine, I. A., Holm, N., Sørensen, T. I. A., Harvald, B., & Vaupel, W. (1996). Untangling genetic influences on smoking, body mass index and longevity: a multivariate study of 2464 Danish twins followed for 28 years. *Human Genetics*, 98, 467-475.
- Herskind, A. M., McGue, M., & Sørensen, T. I. A. (1996). Sex and age specific assessment of genetic and environmental influences on body mass index in twins. *International Journal of Obesity Related Metabolic Disorders*, 20(2), 106-113.
- Husby, S., Holm, N., Christensen, K., Skov, R., Morling, N., & Petersen, P. H. (1996). Cord blood immunoglobulin E in like-sexed monozygotic and dizygotic twins. *Clinical Genetics*, 50, 332-338.
- Klänning, U., Mortensen, P. B., & Kyvik, K. O. (1996). Increased Occurrence of Schizophrenia and other Psychiatric Illnesses Among Twins. *British Journal of Psychiatry*, 168, 688-692.

- Kyvik, K. O., Christensen, K., Skytthe, A., Harvald, B., & Holm, N. V. (1996). The Danish twin registry. *Danish Medical Bulletin*, 43(5), 467–470.
- Kyvik, K. O., Green, A., & Beck-Nielsen, H. (1996). Den yngste del af Det Danske Tvillingeregister. Etablering og analyse af zygotisspecifikke tvillingefødselsrater. *Ugeskrift for Læger*, 158, 3456–3460. (In Danish.)
- Løgstrup, N., Sjølie, A. K., Kyvik, K. O., & Green, A. (1996). Lens thickness and insulin-dependent diabetes mellitus: A population based twin study. *British Journal of Ophthalmology*, 80, 405–408.
- Mitchell, L. E., & Christensen, K. (1996). Analysis of the recurrence patterns for nonsyndromic cleft lip with or without cleft palate in the families of 3073 Danish probands. *American Journal of Medical Genetics*, 61, 371–376.
- Beck-Nielsen, H., Vaag, A. A., & Kyvik, K. O. (1997). Genetics of Non Insulin-Dependent Diabetes Mellitus (NIDDM). In B. Draznin & R. Rizza (Eds.). *Clinical Research in Diabetes and Obesity, vol.II: Diabetes and Obesity*. The Humana Press Inc.
- Christensen, K., & Damsbo, N. (1997). Tvillingforskning — potentialer nu og i fremtiden. *Ugeskrift for Læger*, 159, 6083–6084. (In Danish.)
- Kyvik, K. O. (1997). Twin Research: Nature versus nurture in common diseases. In I. Day & S. Humphries (Eds.). *Genetics of Common Diseases: future diagnostic and therapeutic opportunities*. Oxford: Bios Scientific Publishers.
- Løgstrup, N., Sjølie, A. K., Kyvik, K. O., & Green, A. (1997). Long term influence of insulin dependent diabetes mellitus on refraction and its components: a population based twin study. *British Journal of Ophthalmology*, 81, 343–349.
- McGue, M., & Christensen, K. (1997). Genetic and environmental contributions to depression symptomatology: Evidence from Danish twins 75 years of age and older. *Journal of Abnormal Psychology*, 106, 439–448.
- Petersen, J. S., Kyvik, K. O., Bingley, P. J., Gale, E. A. M., Green, A., Dyrberg, T., & Beck-Nielsen, H. (1997). Population based study of prevalence of islet cell autoantibodies in monozygotic and dizygotic Danish twin pairs with insulin dependent diabetes mellitus. *British Medical Journal*, 314, 1575–1579.
- Petrovsky, N., Harrison, L. C., Kyvik, K. O., Beck-Nielsen, H., Green, A., & Bonnevie-Nielsen, V. (1997). Evidence for the viral aetiology of IDDM (Letter to the Editor). *Autoimmunity*, 25(4), 251–252.
- Poulsen, P., Vaag, A. A., Kyvik, K. O., & Beck-Nielsen, H. (1997). Low birthweight associated with non-insulin dependent diabetes mellitus in discordant monozygotic and dizygotic twin pairs. *Diabetologia*, 40, 439–446.
- Rosholm, J. U., & Christensen, K. (1997). Relationship between drug use and self-reported health in elderly Danes. *European Journal of Clinical Pharmacology*, 53, 179–183.
- Brix, T. H., Christensen, K., Holm, N. V., Harvald, B., & Hegedüs, L. (1998). A population based study of Graves' disease in Danish twins. *Journal of Clinical Endocrinology*, 48, 397–400.
- Brix, T. H., Hegedüs, L., & Kyvik, K. O. (1998). Arv og miljø ved Graves sygdom. *Ugeskrift for Læger*, 160, 616–621. [In Danish]
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (1998). What is the evidence of genetic factors of Graves' disease? — A brief review. *Thyroid*, Vol. 8.7, 627–634.
- Christensen, K., Basso, O., Kyvik, K. O., Juul, S., Boldsen, J., Vaupel, J. W., & Olsen, J. (1998). Fecundability of female twins. *Epidemiology*, 9(2), 189–192.
- Christensen, K., Gaist, D., Jeune, B., & Vaupel, J. W. (1998). A tooth per child? *Lancet*, 352, 204.
- Iachine, I. A., Holm, N.V., Harris, J. R., Begun, A. Z., Iachina, M. K., Laitinen, M., Kaprio, J., & Yashin, A. I. (1998). How heritable is individual susceptibility to death? The result of an analysis of survival data on Danish, Swedish and Finnish twins. *Twin Research*, 1, 196–205.
- Leboeuf-Yde, C., & Kyvik, K. O. (1998). At What age does low back pain become a common problem? A study of 29,424 twin individuals aged 12–41. *Spine*, 23(2), 228–234.
- Leboeuf-Yde, C., Kyvik, K. O., & Bruun, N. H. (1998). Low back pain and life-style. Part 1: Smoking. Information from a population-based sample of 29,424 twin individuals. *Spine*, 23(20), 2207–2214.
- Poulsen, P., Vaag, A. A., Kyvik, K. O., Jensen, D. M., Beck-Nielsen, H. (1998). Low birth weight is associated with non-insulin-dependent diabetes mellitus in discordant monozygotic and dizygotic twins. *Ugeskrift for Læger*, 160, 2382–2387. (In Danish.)
- Vaag, A.A., Poulsen, P., & Feinberg, M. R. (1998). Is low birth weight a risk factor for development of non-insulin-dependent diabetes mellitus? *Ugeskrift for Læger*, 160, 2377–2381. (In Danish.)
- Vaupel, J. W., Carey, J. R., Christensen, K., Johnson, T. E., Yashin, A. I., Holm, N. V., Iachine, I. A., Khazaeli, A. A., Liedo, P., Longo, V. D., Yi, Z., Manton, K. G., & Curtsinger JW. (1998). Biodemographic Trajectories of Longevity. *Science*, 280, 855–860.
- Yashin, A. I., Iachine, I. A., Christensen, K., Holm, N.V., & Vaupel, J. W. (1998). The genetic component of discrete disability traits: liability models with age dependent thresholds. *Behavior Genetics*, 28, 207–214.
- Yashin, A. I., Vaupel, J. W., Andreev, K. F., Iachine, I. A., Carotenuto, L., & de-Benedictis, G. (1998). Combining genetic and demographic information in population studies of aging and longevity. *Journal of Epidemiology and Biostatistics*, 3, 289–294.

- Andersen-Ranberg, K., Christensen, K., Jeune, B., Skytthe, A., Vasegaard, L., & Vaupel, J. W. (1999). Activity of daily living among elderly and oldest-old in Denmark. *Age and Ageing*, 28, 373–377.
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (1999). Major role of genes in the etiology of sporadic simple goiter — Results from a population based twin study. *Journal of Clinical Endocrinology and Metabolism*, 84, 3071–3075.
- Christensen, K., Gaist, D., Jeune, B., & Vaupel, J. W. (1999). En tand per barn — myte eller virkelighed? *Ugeskrift for Læger*, 161, 446–447. (In Danish.)
- Christensen, K., Holm, N. V., McGue, M., Corder, L., & Vaupel, J. W. (1999). A Danish population-based twin study on general health in the elderly. *Journal of Aging and Health*, 11, 49–64.
- Christensen, K. (1999). Hvorfor ældes vi så forskelligt? *Ugeskrift for Læger*, 161, 1905–1909. (In Danish.)
- Gervil, M., Ulrich, V., Kyvik, K. O., Olesen, J., & Russell, M. B. (1999). Migraine without Aura: A population-based twin study. *Annals of Neurology*, 46(4), 606–611.
- Hartvigsen, J., Lings, S., & Corder, E. H. (1999). Coding of occupation for the “young cohort” of the Danish twin register. A resource for future epidemiologic research. *Scandinavian Journal of Public Health*, 27, 148–151.
- Kohler, H. P., Rodgers, J. L., & Christensen, K. (1999). Is fertility behaviour in our genes? Findings from a Danish twin study. *Population and Development Review*, 25, 253–288.
- Kyvik, K. O. (1999). Generalisability of twin studies. In T. Spector, H. Snieder, & A. MacGregor (Eds.). *Advances in twin and Sib-pair Analysis*. London: Greenwich Medical Media Ltd.
- Leboeuf-Yde, C., Kyvik, K. O., & Bruun, N. H. (1999). Low back pain and life-style. Part II: Obesity. Information from a population-based sample of 29,424 individuals. *Spine*, 24(8), 779–784.
- Poulsen, P., Kyvik, K. O., Vaag, A. A., & Beck-Nielsen, H. (1999). Heritability of non-insulin-dependent Diabetes mellitus (NIDDM) and abnormal glucose tolerance — a population based twin study. *Diabetologia*, 42, 139–145.
- Rufer, N., Brämmendorf, T. H., Kolvraa, S., Bischoff, C., Christensen, K., Wadsworth, L., Schulzer, M., & Landsdorf, P. M. (1999). Telomere fluorescence measurements in granulocytes and T lymphocyte subsets indicate a high turnover of hemaopoietic stem cells and memory T cells in early childhood. *Journal of Experimental Medicine*, 190, 157–167.
- Skadhauge, L. R., Christensen, K., Kyvik, K. O., & Sigsgaard, T. (1999). Genetic and environmental influence on asthma. A population-based study of 11,688 twin pairs. *European Journal of Lung Medicine*, 13, 8–14.
- Ulrich, V., Gervil, M., Kyvik, K. O., Olesen, J., & Russell, M. B. (1999). Evidence of a genetic factor in migraine with aura: a population-based Danish twin study. *Annals of Neurology*, 45(2), 242–246.
- Ulrich, V., Gervil, M., Kyvik, K. O., Olesen, J., & Russell, M. B. (1999). The Inheritance of Migraine With Aura Estimated by means of Structural Equation modelling. *Journal of Medical Genetics*, 36(2), 225–227.
- Basso, O., Olsen, J., Holm, N. V., Skytthe, A., Vaupel, J. W., & Christensen, K. (2000). Handedness and Mortality. A Follow-up Study of Danish Twins Born Between 1900 and 1910. *Epidemiology*, 11(5), 576–580.
- Bonnevie-Nielsen, V., Martensen, P. M., Justesen, J., Kyvik, K. O., Kristensen, B., Levin, K., Beck-Nielsen, H., Worsaa, A., & Dyrberg, T. (2000). The antiviral 2',5'-oligoadenylate synthetase is persistently activated in type 1 diabetes. *Clinical Immunology*, 96(1), 11–18.
- Brix, T. H., Hansen, P. S., Kyvik, K. O., & Hegedüs, L. (2000). Cigarette smoking and risk of clinically overt thyroid disease — A population based twin case-control study. *Archives of Internal Medicine*, 160, 661–666.
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (2000). A population based study of chronic autoimmune hypothyroidism in Danish twins. *Journal of Clinical Endocrinology and Metabolism*, 85, 536–540.
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (2000). Low birth weight is not associated with clinically overt thyroid disease — A population based twin case-control study. *Clinical Endocrinology*, 53, 171–176.
- Bryld, L. E., Agner, T., Kyvik, K. O., & Menné, T. (2000). Hand Eczema in Twins — A questionnaire investigation. *British Journal of Dermatology*, 142, 298–305.
- Christensen, K. (2000). *Hvorfor ældes vi forskelligt?* [Why do we age differently?]. Copenhagen: Gyldendal.
- Christensen, K., Kristiansen, M., Hagen-Larsen, H., Skytthe, A., Bathum, L., Jeune, B., Andersen-Ranberg, K., Vaupel, J. W., & Ørstavik, K. H. (2000). X-linked genetic factors regulate hematopoietic stem-cell kinetics in females. *Blood*, 95(7), 2449–2451.
- Christensen, K., McGue, M., Yashin, A. I., Iachine, I. A., Holm, N. V., & Vaupel, J. W. (2000). Genetic and Environmental Influence on Functional Abilities Among Danish Twins Aged 75 Years and older. *Journal of Gerontology: Medical Sciences*, 55A(8), M446–M452.
- Gaist, D., Bathum, L., Skytthe, A., Jensen, T. K., McGue, M., Vaupel, J. W., & Christensen, K. (2000). Strength and antropometric measures in identical and fraternal twins: no evidence of masculinization of females with male co-twins. *Epidemiology*, 11(3), 340–343.

- Harvigsen, J., & Kyvik, K. O. (2000). Idiopathic scoliosis in twins studied by DNA fingerprinting [Letter to the Editor]. *Journal of Bone and Joint Surgery*, 82-B(2), 308.
- Jeanclos, E., Schork, N. J., Kyvik, K. O., Kimura, M., & Aviv, A. (2000). Telomere length inversely correlates with pulse pressure and is highly familial. *Hypertension*, 36, 195–200.
- Kohler, H. P., & Christensen, K. (2000). Genetic influences on fertility behavior: Findings from a Danish twin study. In J. C. Rodgers, D. C. Rowe, & W. B. Miller (Eds.), *Genetic Influences on Fertility and Sexuality* (pp. 67–84). Kluwer Academic Publishers.
- Kyvik, K. O., Bache, I., Green, A., Beck-Nielsen, H., & Buschard, K. (2000). No association between birth weight and Type 1 (insulin dependent) diabetes mellitus. A twin-control study. *Diabetic Medicine*, 17, 158–162.
- Leboeuf-Yde, C., & Kyvik, K. O. (2000). Is it possible to differentiate people with or without low-back pain on the basis of tests of lumbopelvic dysfunction? *Journal of Manipulative and Physiological Therapeutics*, 23(3), 160.
- Lichtenstein, P., Holm, N. V., Verkasalo, P.K., Iliadou, A., Kaprio, J., Koskenvuo, M., Pukkala, E., Skytthe, A., & Hemminki, K. (2000). Environmental and Heritable Factors in the Causation of Cancer. Analyses of Cohorts from Sweden, Denmark, and Finland. *New England Journal of Medicine*, 343, 78–85.
- Orholm, M., Binder, V., Sørensen, T. I. A., Rasmussen, L. P., & Kyvik, K. O. (2000). Concordance of inflammatory bowel disease among Danish twins. Results of a nationwide study. *Scandinavian Journal of Gastroenterology*, 10, 1076–1081.
- Skadhauge, L. R., Christensen, K., Kyvik, K. O., & Sigsgaard, T. (2000). Genetiske og miljømæssige faktorer betydning for asthma. Et populationsbaseret studie af 11.688 danske tvillingpar. *Ugeskrift for Læger*, 162/26, 3726–3729.
- Whiteman, D. C., Murphy, M. F. G., Verkasalo, P. K., Page, W. F., Floderus, B., Skytthe, A., & Holm, N. V. (2000). Breast cancer risk in male twins: Joint analyses of four twin cohorts in Denmark, Finland, Sweden and the United States. *British Journal of Cancer*, 83, 1231–1233.
- Wienke, A., Christensen, K., Holm, N. V., & Yashin, A. I. (2000). Heritability of death from respiratory diseases: An analysis of Danish twin survival data using a correlated frailty model. In Hasman et al. (Eds.), *Medial Infobahn for Europe* (pp. 407–411). Amsterdam: IOS Press.
- Bathum, L., Christiansen, L., Nybo, H., Andersen-Ranberg, K., Gaist, D., Jeune, B., Petersen N. E., Vaupel, J. W., & Christensen, K. (2001). Association of mutations in the hemochromatosis gene with shorter life expectancy. *Archives of Internal Medicine*, 161, 2441–2444.
- Bathum, L., Pedersen, H. C., Rosholm, J. U., Petersen, P. H., Vaupel, J. W., & Christensen, K. (2001). Evidence for a substantial genetic influence on biochemical liver function test: Results from a population-based Danish twin study. *Clinical Chemistry*, 47, 81–87.
- Brix, T. H., Kyvik, K. O., Christensen, K., & Hegedüs, L. (2001). Evidence for a Major Role of Heredity in Graves' Disease: A Population-Based Study of Two Danish Cohorts. *Journal of Clinical Endocrinology and Metabolism*, 86(2), 930–934.
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (2001). Validity of Self-Reported Hyperthyroidism and Hypothyroidism: Comparison of Self-Reported Questionnaire Data with Medical Record Review. *Thyroid*, 11(8), 769–773.
- Christensen, K., Frederiksen, H., & Hoffman, H. J. (2001). Genetic and Environmental Influences on Self-Reported Reduced Hearing in the old and oldest old. *Journal of the American Geriatrics Society*, 49(11), 1512–1517.
- Christensen, K., Ørstavik, K-H., & Vaupel, J. W. (2001, December). The X Chromosome and the Female Survival Advantage: An Example of the Intersection between Genetics, Epidemiology and Demography. *Population Health and Aging: Strengthening the Dialogue Between Epidemiology and Demography*, Annals of the New York Academy of Sciences, Vol. 954, 175–183
- Christensen, K., Wienke, A., Skytthe, A., Holm, N. V., Vaupel, J., & Yashin, A. I. (2001). Cardiovascular mortality in twins and the fetal origins hypothesis. *Twin Research*, 4, 344–349.
- Kjeldsen, M. J., Kyvik, K. O., Christensen, K., Friis, M.L. (2001). Genetic and environmental factors in epilepsy: A population-based study of 11,900 Danish twin pairs. *Epilepsy Research*, 44, 167–178.
- McGue, M., & Christensen, K. (2001). The heritability of cognitive functioning in very old adults: Evidence from Danish twins aged 75 and older. *Psychology and Aging*, 16, 272–280.
- Poulsen, P., Vaag, A., Kyvik, K., & Beck-Nielsen, H. (2001). Genetic versus environmental aetiology of the metabolic syndrome among male and female twins. *Diabetologia*, 44, 537–543.
- Rodgers, J. L., Kohler, H. P., Kyvik, K. O., & Christensen K. (2001, February). Behavior genetic modeling of human fertility: Findings from a Contemporary Twin Study. *Demography*, 38(1), 29–42.
- Tomassini, C., Billari, F. C., Rosina, A., & Christensen, K. (2001). Born together – die together. Live together – die together. The role of the partner and of the co-twin on longevity at very old ages. *Genus*, Vol. LVII (3–4), 63–82.
- Wienke, A., Holm, N. V., Skytthe, A., & Yashin, A. I. (2001). The heritability of mortality of heart diseases. A correlated frailty model applied to Danish twins. *Twin Research*, 4, 266–274.

- Bak, S., Gaist, D., Sindrup, S. H., Skytthe, A., & Christensen, K. (2002). Genetic liability in stroke. A long-term follow-up study of Danish twins. *Stroke*, 33, 769–774.
- Brix, T. H., Kyvik, K. O., & Hegedüs, L. (2002). Association Between Birth Weight and Adult Disorders in Twins: Validity of Self-reported Birth Weight. *Twin Research*, 5(4), 308–310.
- Christensen, K., Gaist, D., Vaupel, J. W., & McGue, M. (2002). The genetic contribution to rate-of-change in functional abilities among Danish twins aged 75 years and older. *American Journal of Epidemiology*, 155(2), 132–139.
- Frederiksen, H., Gaist, D., Petersen, H. C., Hjelmberg, J., McGue, M., Vaupel, J. W., & Christensen, K. (2002). Hand Grip Strength — A phenotype suitable for identifying genetic variants affecting mid- and late-life physical functioning. *Genetic Epidemiology*, 23, 110–122.
- Hjöllund, N. H. I., Storgaard, L., Ernst, E., Bonde, J. P. E., Christensen, K., & Olsen, J. (2002). Correlation of scrotal temperature in twins. *Human Reproduction*, 17(7), 1837–1838.
- Iachina, M., Jørgensen, B., Christensen, K., & Iachine, I. (2002). Analysis of functional abilities for elderly Danish twins using GEE models. *Twin Research*, 5(4), 289–293.
- Johnson, W., McGue, M., Gaist, D., Vaupel, J. W., & Christensen, K. (2002). Frequency and heritability of depression symptomatology in the second half of life: evidence from Danish twins over 45. *Psychological Medicine*, 32(7), 1175–1185.
- Kessel, L., Hougaard, J. L., Sander, B., Kyvik, K. O., Sørensen, T. I. A., & Larsen, M. (2002). Lens ageing as an indicator of tissue damage associated with smoking and non-enzymatic glycation — A twin study. *Diabetologia*, 45, 1457–1462.
- Kjeldsen, M. J., Kyvik, K. O., Friis, M. L., & Christensen, K. (2002). Genetic and environmental factors in febrile seizures: A Danish population-based twin study. *Epilepsy Research*, 51, 167–177.
- Leboeuf-Yde, C., v.Dijk, J., Franz, C., Hustad, S. A., Olsen, D., Pihl, T., Röbech, R., Vendrup, S. S., Bendix, T., & Kyvik, K. O. (2002). Motion Palpation Findings and Self-reported Low Back Pain in a Population-based Study Sample. *Journal of Manipulative and Physiological Therapeutics*, 25: 80–87.
- Lyhne, N., Sjølie, A. K., Kyvik, K. O., & Green, A. (2002). The importance of genes and environment for ocular refraction and its determiners, a population based study among 20–45 year old twins. *British Journal of Ophthalmology*, 85, 1470–1476.
- McGue, M., & Christensen, K. (2002). The heritability of level and rate-of-change in cognitive functioning in Danish twins aged 70 years and older. *Experimental Aging Research*, 28(4), 435–451.
- Rasmussen, B. B., Brix, T. H., Kyvik, K. O., & Brøsen, K. (2002). The interindividual differences in the caffeine alias CYP1A2 is determined by both genetic and environmental factors. *Pharmacogenetics*, 12(6), 473–478.
- Schousboe, K., Henriksen, J. E., Kyvik, K. O., Sørensen, T. I. A., & Petersen, P. H. (2002). Reproducibility of S-insulin and B-glucose responses in two identical oral glucose tolerance tests. *Scandinavian Journal of Clinical and Laboratory Investigation*, 62, 623–630.
- Skytthe, A., Kyvik, K. O., Holm, N. V., Vaupel, J., & Christensen, K. (2002). The Danish Twin Registry: 127 Birth Cohorts of Twins. *Twin Research*, 5(5), 352–357.
- Storgaard, L., Bonde, J. P., Ernst, E., Andersen, C. Y., Kyvik, K. O., & Olsen, J. (2002). Effect of prenatal exposure to oestrogen on quality of semen: Comparison of twins and singleton brothers. *British Medical Journal*, 325, 252–253.
- Svensen, A., Holm, N. V., Kyvik, K. O., Petersen, P. H., & Junker, P. (2002). Relative importance of genetic effects in rheumatoid arthritis: Historical cohort study of Danish nationwide twin population. *British Medical Journal*, 324, 264–267.
- Titlestad, I. L., Kyvik, K. O., Kristensen, T., & Lillevang, S. (2002). HLA Haplotypes in Dizygotic Twins More Similar Than Sibs? *Twin Research*, 5(4), 287–288.
- Tomassini, C., Rosina, A., Billari, F. C., Skytthe, A., & Christensen, K. (2002). The effect of losing the partner and losing the twin on mortality. *Twin Research*, 5(3), 210–217.
- Christensen, K. (2003). Tvillinger, genetic, miljø og aldring. *Gerontologi og samfund*, 19(3), 52–53.
- Christensen, K., Frederiksen, H., Vaupel, J. W., & McGue, M. (2003). Age trajectories of genetic variance in physical functioning: A longitudinal study of Danish twins aged 70 years and older. *Behavior Genetics*, 33(2), 125–135.
- Christensen, K., Kohler, H. P., Basso, O., Olsen, J., Vaupel, J. W., & Rodgers, J. L. (2003). The correlation of fecundability among twins: Evidence of a genetic effect on fertility? *Epidemiology*, 14(1), 60–64.
- Christensen, K., Tomassini, C., & Juel, K. (2003). Risk of suicide in twins: Author's reply. *British Medical Journal*, 327, 1169.
- Christiansen, L., Frederiksen, H., Schousboe, K., Skytthe A., Wormb-Schwark, N., Christensen, K., & Kyvik, K. O. (2003). Age- and sex-differences in the validity of questionnaire-based zygosity in twins. *Twin Research*, 6(4), 275–278.
- Evand, A., van Baal, G. C. M., McCarron, P., de Lange, M., Sørensen, T. I. A., de Geus, E. J. C. et al.(2003). The genetics of coronary heart disease: The contribution of twin studies. *Twin Research*, 6(5), 432–441.
- Frederiksen, H., & Christensen, K. (2003). The influence of genetic factors on physical functioning and exercise

- in second half of life. *Scandinavian Journal of Medicine and Science in Sports*, 13(1), 9–18.
- Frederiksen, H., Gaist, D., Bathum, L., Andersen, K., McGue, M., Vaupel, J. W., & Christensen, K. (2003). Angiotensin I — Converting Enzyme (ACE). Gene polymorphism in relation to physical performance, cognition and survival. A follow-up study of elderly Danish Twins. *Annals of Epidemiology*, 13(1), 57–65.
- Gaist, D., Pedersen, N. L., Koskenvuo, M., Bak, S., Giampaoli, S., Christensen, K., & Kaprio, J. (2003). Stroke Research in GenomEUtwin. *Twin Research*, 6(5), 442–447.
- Harris, J. R., Willemssen, G., Aitlahti, T., Petrini, C., Evans, A., Silander, K., Cirrincione, L., & Kyvik, K. O. (2003). Ethical issues and GenomEUtwin. *Twin Research*, 6(5), 455–463.
- Hartvigsen, J., Kyvik, K. O., Leboeuf-Yde, C., Lings, S., & Bakketeig, L. (2003). Ambiguous relation between physical workload and low back pain: A twin control study. *Occupational and Environmental Medicine*, 60, 109–114.
- Hestbaek, L., Leboeuf-Yde, C., Kyvik, K. O., & Manniche, C. (2003). Is low back pain in youth associated with weight at birth? A cohort study of 8000 Danish Adolescents. *Danish Medical Bulletin*, 50(2), 181–185.
- Hindsberger, C., & Bryld, L. E. (2003). Analysis of twin data ascertained through probands: The double-entry of approach. *Genetic Epidemiology*, 25, 225–235.
- Hougaard, J. L., Kessel, L., Sander, B., Kyvik, K. O., Sørensen, T. I. A., & Larsen, M. (2003). Evaluation of Heredity as a Determinant of Retinal Nerve Fiber Layer Thickness as Measured by Optical Coherence Tomography. *Investigative Ophthalmology & Visual Science*, 44(7), 3011–3016.
- Kessel, L., Hougaard, J. L., Kyvik, K. O., Sander, B., Sørensen, T. I. A., & Larsen, M. (2003). Corneal fluorescence in relation to genetic and environmental factors: a twin study. *Acta Ophthalmologica Scandinavica*, 81, 508–513.
- McGue, M., & Christensen, K. (2003). The heritability of depression symptoms in elderly Danish twins: Occasion-specific versus general effects. *Behavior Genetics*, 33(2), 83–93.
- Mulder, E. J., van Baal, C., Gaist, D., Kallela, M., Kaprio, J., Svensson, D. A., Nyholt, D. R., Martin, N. G., Macgregor, A. J., Cherkas, L. F., Boomsma, D. I., & Palotie, A. (2003). Genetic and environmental influences on migraine: A twin study across six countries. *Twin Research*, 6(5), 422–431.
- Posthuma, D., Beem, A. L., de Geus, E. J. C., van Baal, G. C. M., von Hjelmborg, J. B., Iachine, I., & Boomsma, D. I. (2003). Theory and practice in quantitative genetics. *Twin Research*, 6(5), 361–376.
- Schousboe, K., Visscher, P. M., Henriksen, J. E., Hopper, J. L., Sørensen, T. I. A., & Kyvik, K. O. (2003). Twin study of genetic and environmental influences on glucose tolerance and indices of insulin sensitivity and secretion. *Diabetologia*, 46, 1276–1283.
- Schousboe, K., Willemssen, G., Kyvik, K. O., Mortensen, J., Boomsma, D. I., Cornes, B. K., Davis, C. J., Fagnani, C., Hjelmborg, J., Kaprio, J., de Lange, M., Luciano, M., Martin, N. G., Pedersen, N., Pietiläinen, K. H., Rissanen, A., Saarni, S., Sørensen, T. I. A., van Baal, G. C. M., & Harris, J. R. (2003). Sex differences in heritability of BMI: A comparative study of results from twin studies in eight countries. *Twin Research*, 6(5), 409–421.
- Skytthe, A., Pedersen, N. L., Kaprio, J., Stazi, M. A., von Hjelmborg, J. B., Iachine, I., Vaupel, J. W., & Christensen, K. (2003). Longevity studies in GenomEUtwin. *Twin Research*, 6(5), 448–454.
- Wienke, A., Holm, N. V., Christensen, K., Skytthe, A., Juel, K., Vaupel, J. W., & Yashin, A. I. (2003). The heritability of cause-specific mortality: A correlated gamma-frailty model applied to mortality due to respiratory diseases in Danish twins born 1870–1930. *Statistics in Medicine*, 22, 3873–3887.
- Basso, O., Nøhr, E. A., Christensen, K., & Olsen, J. (2004). Risk of twinning as a function of maternal height and body mass index. *Journal of the American Medical Association*, 291, 1564–1566.
- Brix, T. H., Hansen, P. S., Kyvik, K. O., & Hegedüs, L. (2004). Aggregation of thyroid autoantibodies in first-degree relatives of patients with autoimmune thyroid disease is mainly due to genes: A twin study. *Clinical Endocrinology (Oxford)*, 60(3), 329–334.
- Christensen, K., Iachina, M., Rexbye, H., Tomassini, C., Frederiksen, H., McGue, M., Vaupel, J. W. (2004). Looking old for your age: Genetics and mortality [Letter to the editor]. *Epidemiology*, 15, 251–252.
- Hansen, P. S., Brix, T. H., Sørensen, T. I. A., Kyvik, K. O., & Hegedüs L. (2004). Major Genetic influence on the Regulation of the Pituitary-Thyroid Axis. A study of Healthy Danish Twins. *Journal of Clinical Endocrinology & Metabolism*, 89(3), 1181–1187.
- Hartvigsen, J., Christensen, K., Frederiksen, H., & Pedersen, H. C. (2004). Genetic and environmental contributions to back pain in old age. A study of 2108 Danish Twins aged 70 and older. *Spine*, 29(8), 897–902.
- Hestbaek, L., Iachine, I. A., Leboeuf-Yde, C., Kyvik, K. O., & Manniche C. (2004). Heredity of Low Back Pain in a Young Population: A Classical Twin Study. *Twin Research*, 7(1), 16–26.
- Kyvik, K. O., Nystrom, L., Gorus, F., Songini, M., Oestman, J., Castell, C., Green, A., Guyras, E., Ionescu-Tirgoviste, C., McKinney, P. A., Michalkova, D., Ostrauskas, R., & Raymond, N. T. (2004). The epidemiology of Type 1 diabetes mellitus is not the same in young adults as in children. *Diabetologia*, 47, 377–384.
- Laursen, M., Bille, C., Olesen, A. W., Hjelmborg, J., Skytthe, A., & Christensen, K. (2004). Genetic influence on prolonged gestation: A population-based

- Danish twin study. *American Journal of Obstetrics and Gynecology*, 190, 489–494.
- Lorenz, D., Frederiksen, H., Moises, H., Kopper, F., Deuschl, G., & Christensen, K. (2004). High concordance for essential tremor in monozygotic twins of old age. *Neurology*, 62(2), 208–211.
- Schousboe, K., Visscher, P. M., Erbas, B., Kyvik, K. O., Hopper, J. L., Henriksen, J. E., Heitmann, B. L., & Sorensen, T. I. A. (2004). Twin study of genetic and environmental influences on adult body size, shape, and composition. *International Journal of Obesity*, 28, 39–48.
-
- Ph.D. and Doctoral Theses**
- Juel-Nielsen, N. (1965). Individual and Environment. A Psychiatric-Psychological Investigation of Monozygotic Twins Reared Apart. Copenhagen: Munksgaard.
- Jensen, K. G. (1972). Peptic Ulcer. Genetic and Epidemiological Aspects Based on Twin studies. Munksgaard.
- Fischer, M. (1973). Genetic and Environmental Factors in Schizophrenia. A Study of Schizophrenic Twins and Their Families. Munksgaard.
- Schiøttz-Christensen, E. (1976). Feberkramper. Studier af Ætiologi og følgetilstande med udgangspunkt i tvillinge undersøgelser.
- Holm, N. V. (1983). Tvillingstudiers anvendelse til belysning af årsagsforholdene for sygdomme af kompleks ætiologi med cancer som eksempel. Odense University.
- Brandrup, F. (1985). Aetiological Studies of Psoriasis. A survey. Odense University.
- Schultz Larsen, F. (1985). Atopic dermatitis. Etiological studies based on a twin population. Lægeforeningens forlag.
- Christensen, K. (1994). Epidemiologi and etiology of cleft lip and/or palate. A genetic-epidemiological study based on 55 Danish birth cohorts with emphasis on selection bias and twin studies. Odense University.
- Kyvik, K. O. (1994). Etablering af en kohorte af tvillinger med henblik på belysning af ætiologiske forhold ved insulin-krævende diabetes mellitus (IDDM). Odense University.
- Hougaard, P. (1995). Frailty for survival data. Lægeforeningens forlag. Copenhagen University.
- Poulsen, P. (1995). Tvillingstudier af ætiologien til ikke-insulinkrævende diabetes mellitus (NIDDM). Arv versus præ-/postnatal miljø. Odense University.
- Herskind, A. M. (1996). Genetic influence on longevity in Danish twins: A path analysis including the covariates smoking and body mass index. Odense University.
- Klåning, U. (1996). Schizophrenia in twins. Incidence and risk factors. Aarhus University. Ph.d.-afhandling.
- Løgstrup, N. (1997). Øjets refraktion og biometri ved insulinkrævende diabetes mellitus — et tvillingestudie. Odense University.
- Steffensen, I. E. (1997). Kronisk obstruktiv lungelidelse - arv eller miljø? Bispebjerg Hospital.
- Svendson, A. (1997). The importance of environmental and genetic factors in rheumatoid arthritis. A nationwide Danish twin study. Odense University.
- Sørensen, R. G. (1998). Er oral antiception (OC) en ætiologisk betydende faktor for tvillingefødsler. Odense Universitet.
- Ulrich, V. (1998). The Inheritance of Migraine with Aura Investigated by Analysis of Twins. Copenhagen University.
- Bryld, L. E. (1999). A genetic-epidemiological study of hand eczema in young adult twins. Copenhagen University.
- Christensen, K. (1999). The 20th Century Danish Facial Cleft Population — Epidemiological and Genetic-Epidemiological Studies (Dr.Med.Sci.-thesis). University of Southern Denmark, Odense University.
- Kessel, L. (1999). Linseforandringer i relation til farvesyn, diabetes og fysiologisk aldring. KAS Herlev.
- Skadhauge, L. (1999). Genetic and environmental influence on asthma. Population based study of Danish twins. University of Southern Denmark, Odense University.
- Brix, T. H. (2001). Genetic and environmental factors in the etiology of autoimmune thyroid disease. A population-based twin study. University of Southern Denmark, Odense University.
- Gervil, M. (2001). A genetic-epidemiological investigation of migraine without aura. A population-based twin study. Copenhagen University.
- Hartvigsen, J. (2001). Occupational factors and low back pain. University of Southern Denmark, Odense University.
- Kortegaard, L. S. (2001). Arvelighed af spiseforstyrrelser — belyst ud fra en uselekteret tvillingepopulation. University of Southern Denmark, Odense University.
- Lyhne, N. (2001). Øjets refraktion og refraktive komponenter. En populationsbaseret tvillingundersøgelse blandt 20 til 45 årige. University of Southern Denmark, Odense University.
- Poulsen, P. (2001). Impact of the intrauterine environment in the etiology of Type 2 diabetes mellitus and associated defects of metabolism — evidence from twin studies. University of Southern Denmark.
- Skytthe, A. (2001). The Danish 1931–1952 Twin Cohorts. The Relative Importance of Genetic and Environmental Factors to Early Death in a Twin Population. University of Southern Denmark, Odense University.
- Bak, S. (2002). Environmental exposures and genetic factors in stroke. University of Southern Denmark.
- Frederiksen, H. (2002). Genes and Physical Functioning in Elderly. University of Southern Denmark.

- Hestbæk, L. (2003). The natural course of low back pain and early identification of high-risk populations.
- Kjeldsen, M. J. (2003). Epilepsi og feberkramper hosvillinger: Genetiske og miljømæssige ætiologiske faktorer.
- Schousboe, K. (2003). Body composition and glucose homeostasis: Genes and environment. University of Southern Denmark.
- Hougaard, J. L. (2004). Optical Coherence Tomography and the Human Retinal Nerve Fiber Layer. Aspects of methodology, heritability and glaucoma diagnostics.
- Kessel, L. (2004). Lens fluorescence as a marker of ageing in relation to heritability, diabetes mellitus, and ischemic heart disease.

Additional References

- Boje, P., & Jespersen, K. J. V. (1991). *Frugten vokser frem. Træk af Odense Universitets historie 1966–1991*. Odense: Odense Universitetsforlag.
- Busk, T., Clemmesen, J., & Nielsen, A. (1948). Twin studies and other genetical investigations in the Danish Cancer Registry. *British Journal of Cancer*, 156.
- Fremming, K. (1947). *Sygdomsrisikoen for sindslidelser og andre sjælelige abnormtilstande i den danske genemsnitsbefolkning*. København: Munksgaard.
- Kemp, T. (1951). *Arvehygiejne*. København: Københavns Universitets Festskrift.
- Mohr, J. (1954). *A Study of Linkage in Man*. Copenhagen: Munksgaard.
-