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# REGISTER-BASED VITAL STATISTICS ISSUES TO CONSIDER: SOME DANISH EXPERIENCES WITH

BY

ANITA LANGE, DENMARK STATISTICS*

* The views expressed in this paper are those of the author and do not necessarily reflect those of the United Nations.

* Issued without formal editing

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# Register-based vital statistics. Issues to consider Some Danish experiences

## 1. Introduction

The present paper gives a description of the register-based vital statistics, with Danish conditions as the basis. At the same time, it draws attention to matters that are important in compiling this type of statistics. The paper must be considered in connection with another paper "Danish experiences with Computerisation of Civil Registration", which provides a description of, e.g. the contents and updating method in the Danish Civil Registration System, which forms the basis of the population statistics.

## 2. Histoy of the vital registration in Denmark

Since 1924 every municipality in Denmark has kept a local population register, i.e. a file containing information about all persons living in the municipality. These registers contain identifying information such as name, occupation, date and place of birth, address, family circumstances and nationality. The municipalities are responsible for keeping the files continually updated, with information on births, deaths, etc., obtained from various public authorities. Individual citizens are obliged to report changes in address to the registration office.

Electronic data processing was introduced in 1968, and a Civil Registration System was established. A part of this new system included all the local population registers in one administrative system a Central Population Register (CPR). An essential part of the reform was the introduction of a permanent identification number for each individual person: the person number (PN). This number was considered a practical necessity for the operation of the Civil Registration System. The main purpose of the register was administrative, but statistical utilization was also an important element.

**Danmarks Statistik**

The responsibility for the general statistical utilization of the information in the Central Population Register rests with Danmarks Statistik. Danmarks Statistik is an independent institution under the supervision of a Board consisting of the National Statistician as chairman and six other members familiar with social and economic conditions.

During the 1970's the register-based cumputerized vital statistics were established and developed by Danmarks Statistik.

The basis of these statistics was information on individuals from the CPR, in some cases combined with information from other sources.

The way through the system from the event to the finished statistics and the issues to consider are treated below.

keep the quality of the status over the years by using this procedure. Small errors in the first status or in the change extract can over the time develop, in such a way, that after some years there are increasing differences between the calculated status and the real status. Therefore, processing the status extract regularly, e.g. once a year gives a better quality of data.

**Check for error**

Like all data used for statistics, the status extracts as well as change extracts have to be checked for errors. Checks of computer-based information is a comparatively quick process, which makes it possible to effect a more extensive checking than in the old-fashioned processes. There are mainly two different types of error-checks to consider, validity checks and combination checks or logical checks.

**Validity check**

A validity check ensures that for every single item only valid codes exist. For example, the item of sex will normally have only two acceptable codes, one for men and one for women, all other codes will be understood as errors.

**Logical check**

The logical checks are based on comparison between two or more pieces of information concerning the same person. If the event, e.g. is a birth, the mother's age is supposed to be in the interval 14-49 years. A marriage should be between a man and a woman, and there can be an age limit for marriages. In the Danish data extracts from the CPR today, less than 1 per cent of the items of information are defective. This can, of course, be attributed to a well-developed check for errors in the CPR.

The data extracts can, after check for errors and corrections, provide inputs to statistical registers. Statistical registers are usually organized after the type of statistics that is the final output. There is no one-to-one relationship between extracts from administrative registers and statistical registers. The data extracts from one administrative register often constitute the input to several statistical registers and one statistical register often receives inputs from more than one administrative register, and sometimes the input is a combination of administrative extracts and data collected in other ways.

**Extracts from CPR to Danmarks Statistik**

Once a year Danmarks Statistik receives *a status extract* from the CPR. This extract forms together with 40 day's change extracts the basis of the statistical register, which in turn constitutes the basis of the annual statistics of the population and its composition according to various criteria. The unit in this statistical register is naturally the person, who is unambiguously identified by his/her person number.

By way of illustration, the data contents in the status extract and change extract from the CPR are shown in appendix 2.

Every week Danmarks Statistik receives an *extract* from the CPR *of the changes* which are of interest. The information from the weekly change extracts is compiled, after error-checking, for statistical registers with quarterly information, which at a later stage is compiled for annual registers. Like the status register the unit is here the person. The statistical registers of changes are used as basis for the vital statistics.

### 3.3. Further processing of the statistical information on the registers.

The basis of the population statistics in Denmark is, as stated above, the statistical registers which are established on the basis of the extracts from the CPR - the status register and change register.

The information contained on the statistical register (see appendix 2) is subject to a further processing in order to provide the final information which is to be included in the statistics. For example, information is constructed on the basis of the person number concerning date of birth, age and the last digit of the number is converted into the person's sex. Information on address is converted by means of the ancillary registers for various administrative distributions such as parishes and counties.

**New units**

As already stated, the unit in the status register as well as the change register is the person, but information on the level of persons can bu used for constructing other units. This is done in two cases based on information from the status register.

The address, which is so exact that every apartment or dwelling has a unique address, is used for constructing households. All persons with the same address are referred to the same household.

The information on person number for mother, father and spouse is used together with the information on address for constructing families. Persons living at the same address and who have joint reference numbers are referred to the same family. This is a principal rule, which is subject to exceptions such as age of the child, etc. (they must be under the age of 18 years in order to be considered as children, and if they are married or if they have children of their own they constitute their own family).

**New data**

For each of the new units a number of new data can be constructed. For households, data concerning, e.g. size of household and number of children in the household can be constructed. For families, a family type can be indicated, e.g. whether the family consists of a single person, a single person with children or a married couple with or without children. The size of the family is another piece of information which can now be added to the information already recorded on the register.

For all units, a range of variables such as groupings of age, place of birth or citizenship can be constructed. It can be practical to have groupings of this type available as ready-made data.

The construction of new enumeration units on the basis of the existing material and the construction of new variables and variable groupings are processes which call for major screenings and comparisons of variable values for several individuals, tasks which, in practice, can only be solved if the data material is computer-based.

**Division of data**

In many cases, it it practical to divide the vast data material contained on the status register into several sub-registers.

It will be natural to divide the data in accordance with the unit to which the information relate, i.e. information which concerns families separately and data concerning households separately. Data for the same unit - such as data on individuals - can, of course, also be divided according to any criteria which are on the register.

**Data supplements from other sources**

In certain cases, the information extracted from administrative registers does not cover all the statistical fields for which information is required. In such cases, it is necessary to replenish with information from other sources. In Denmark this concerns particularly one area, i.e. medical information in connection with births and deaths. Demographic information from the CPR is here supplemented with the medical information from the birth and death certificates. The birth and death certificates are collected by Sundhedsstyrelsen (the National Board of Health), which is responsible for providing the information with code numbers, and thereafter submits the data to Danmarks Statistik. The certificates contain the person number and information from the certificates can, therefore, be linked to information from the CPR.

There are several reasons why the medical information is not recorded on the CPR. First, the CPR is, as already mentioned, an administrative register and medical information does not belong to an administrative register. Medical information is considered by many people to be highly confidential, and should therefore be recorded in as few places as possible, and only in places where there is a qualified need for the data. The medical data often require a more qualified evaluation during the coding process than the general demographic data, and this is one of the reasons why that treatment of the medical data is the responsibility of Sundhedsstyrelsen.

**Check of the register's degree of coverage**

By linking information from birth and death certificates with information from the CPR, it is possible to check the extent to which the registerbased information and information from the certificates correspond. Our esperience shows that in about 99 per cent of all cases, it is possible to link the person number by computer. The remaining part, which cannot be linked, is usually evenly distributed between errors on the register and missing or defective certificates.

### 3.4. The statistics in Denmark.

**Status statistics**

As already mentioned, once a year statistics of the population are compiled in Denmark as at 1 January. These status statistics contain information on the distribution of the population by sex, one-year-age groups, by marital status and by citizenship and country of origin. Furthermore, statistics of families by type and size and households by size are compiled.

**Geography**

All the statistics mentioned are compiled for all Denmark, but also for each municipality (Denmark is divided into 275 municipalities). Address information, which is available on the register, makes it possible to compile the same statistics for a range of other fields. However, as a standard only

summary statistics of the population in parishes are compiled (2 000 parishes).

**Delays**

The first final results from the annual status statistics, concerning the total population in all Denmark and in each municipality, are published in a news letter before the end of February. Simultaneously with the publication of the first available information, detailed information on the level of municipalities is made available for the users who subscribe to Danmarks Statistik's data banks. The data banks constitute a system of data bases to which the users can obtain on-line access. A fee is charged for access to the data banks.

The more detailed information is published, at a later stage, subject to the delays caused by the editing and technical production of major publications.

**Vital statistics**

As mentioned, the weekly change extracts are compiled for quarterly vital statistics. For each quarter the number of births and deaths (preliminary figures), number of external and internal migrations, marriages and divorces are published. The statistics are analysed by sex. Once a year, statistics of naturalizations and adoptions are compiled in addition to the statistics already mentioned.

**Geography**

The quarterly statistics are compiled for all Denmark and for each municipality.

**Delays**

The quarterly statistics, like the status statistics, are also published with a delay, i.e. within 2 months after the end of the quarter.

The final statistics of births and deaths, i.e. the information which is constructed by linking information from the CPR and information from the certificates, are only compiled annually. They are available with a delay of 6 to 9 months.

## 4. Vital statistics as part of a register system

The statistics described here constitute today part of a register-based statistical system in Denmark. Through the 1970's a range of administrative EDP registers were established, which by means of various keys can be linked in order to construct statistical information on persons, dwellings and business enterprises.

The information contained in the tax system concerning incomes and economic activity status can be linked to the demographic information in the CPR by means of the person number, which is the identification number in both systems. The registers in the tax system also contain for each person in employment an identification number for the employer. The employer's number is recorded as identification number in the register system for business statistics. This register system contains information on industry, size and ownership of the business enterprise.

The Central Register of Building and Dwellings, which contains a range data concerning quality and size for each dwelling, has the same exact address as identification as the one which is used in the CPR. Consequently, it is possible to link information on the dwelling to individual persons.

The register of educational attainment contains information on persons receiving education or persons who have completed an education. The identification is here the person number.

Linking information from all these administrative register systems made it possible for Denmark in 1981 to conduct a population and housing census based entirely on extracts from registers and without applying directly to the population.

## 5. Centralized versus decentralized data processing

The data input concerning the basic demographic information has been decentralized in Denmark, i.e. the local population register in each municipality is responsible for recording an event. However, the same event is also recorded on the Central Population Register. This combination consisting of decentralized and centralized registration yields a range of advantages. The local knowledge, which is a great strength of the decentralized data collection, is maintained, while at the same time the centralized registration ensures that, for example, duplicate registration is avoided.

The Danish system enhances the possibilities of a decentralized as well as a centralized production of population statistics. The information on the population stored by the municipalities is similar to the information stored by the central statistical authority Danmarks Statistik. The Danish production of official statistics is, however, greatly centralized. Danmarks Statistik is responsible for producing most of the statistics in the demographic, social and economic fields. Some of the reasons for a centralized production of the statistics appear from chapter 3.

The numerous processes, which are conducted before the final production of the statistics, can be difficult to handle and a homogeneous treatment of the data is very important for the final results.

The centralized statistical production ensures a high degree of consistency, e.g. the population figures for small areas add up to larger areas, which, in turn add up to figures for all Denmark. It is also possible to ensure consistency between the various statistical fields, e.g. by using the same definitions and classifications, when this is desirable. Furthermore, a centralized production also ensures certain advantages of a large-scale operation. This may involve that the data material from one field to another is re-used.

From a user's point of view, there are often advantages of a centralized production, which make it easier to get an overview of the statistics and to describe the relationship between the various statistics.

The decentralized production can, to a greater degree, be adapted to the local requirements as regards the time of compilations and the level of detail.

## 6. Data protection

In order to be able to produce and maintain a statistical system, which presupposes that the producer of statistics has access to identifiable information on persons, it is necessary to attach importance to a data policy which ensures the public against any abuse of the information on individuals.

In Denmark, like most other countries, legislation concerning registers has been laid down. The legislation provides general rules and regulations governing the establishing and operation of public authorities' registers which contain information on individuals. In some cases, the legislation provides special rules and regulations governing registers that are only used for the production of statistics. The ordinary citizen's right to obtain access to data registered on him/her does not apply to statistical registers. The reason why is that the statistics cannot threaten the privacy of a person, because information on the individual citizens cannot be identified in the tables, and because information on individuals stored on the statistical registers may not be used for administrative purposes. In this context, it must be noted that the legislation provides that *no data referable to an identifiable individual must be passed on from the statistical registers.*

The legislation generally benefits the producer of statistics. Exact rules and regulations have been laid down in respect of a range of issues, and it is an advantage that the producer of statistics is not the only one who guarantees that the information is not being abused.

## Appendix 2

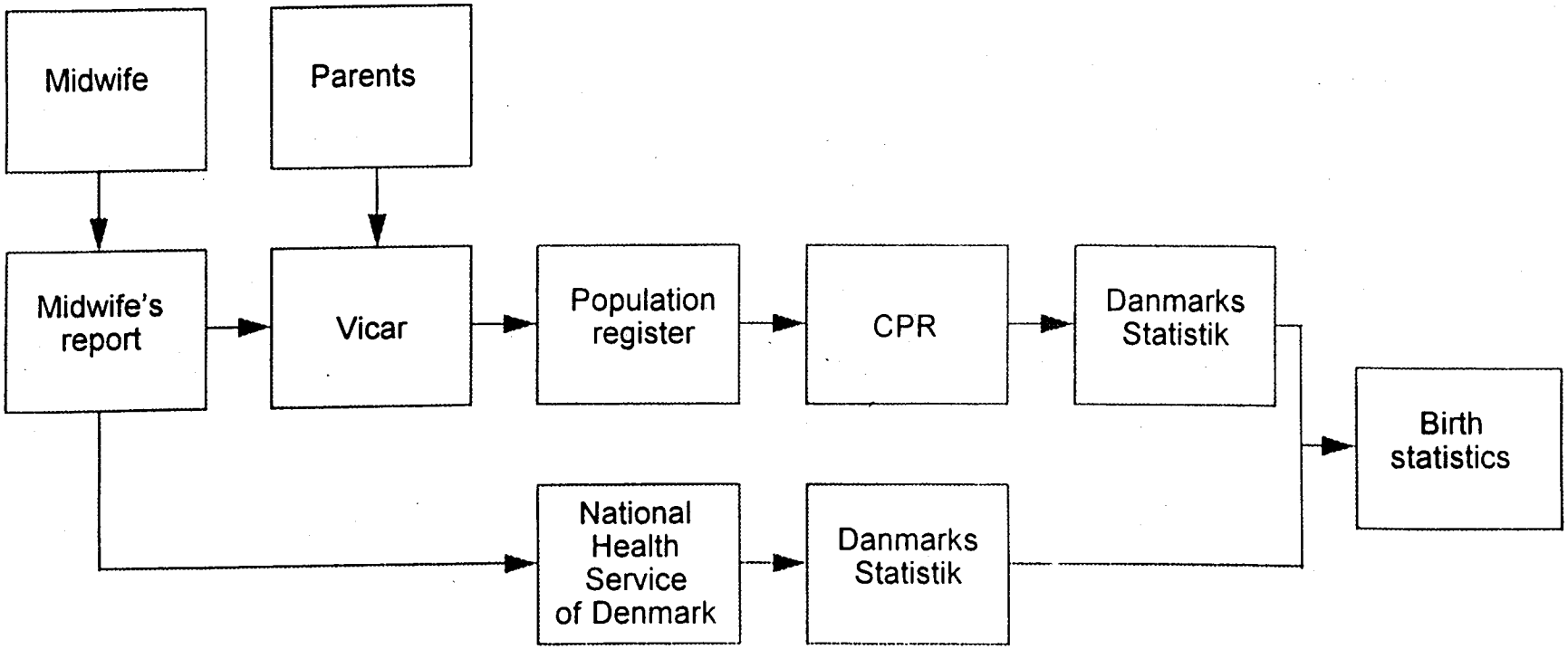
Status extract from CPR: (yearly)
Person number
Status (active or not)
Date for change of address (latest)
Code for address (municipality, street, streetnumber, floor, apartment)
Member of church
Marital status
Date for change in marital status
Place of birth
Name
Person number of spouce
Person number of mother
Person number of father
Date for immigration
Citizenship

Change extracts: weekly, accumulated to quarters and year

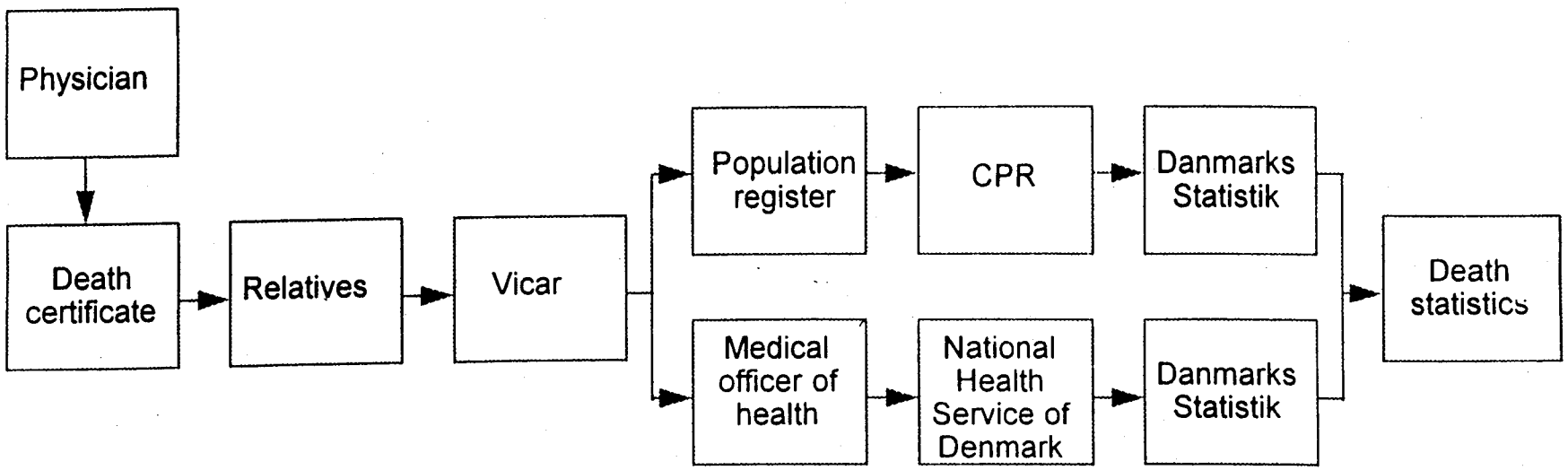
Person number
Type of change
Date of change
Status (active or not)
Date of registration (of change)
Date for change of address (latest)
Code for address
Date for change in marital status
Marital status
Person number of spouce
Person number of mother
Person number of father
Member of church
Place of birth
Date for immigration
Date for emigration
Citizenship
Country of immigration/emigration

Old status
Code for old address
Old marital status
Old date for change of marital status
Old person number of spouce
Old person number of mother
Old person number of father
Old place of birth
Old date of immigration
Old date of emigration
Old citizenship
Old country of immigration/emigration

# Birth statistics



# Death statistics



# Change of address