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GEOSTAT 4:

A Business Case for Emergency Care Data

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Table of contents

1. Introduction	3
2. Medical Birth Register and Perinatal statistics	4
3. National emergency medical systems (EMS) database.....	5
4. Data collection.....	6
5. Data processing and analyzing	7
6. Data dissemination.....	8
7. References.....	9

1. Introduction

This business case for emergency care data focuses on out-of-hospital childbirths. The Finnish Institute for Health and Welfare (FHS) collects a Medical Birth Register (<https://thl.fi/en/web/thlfi-en/statistics/information-on-statistics/register-descriptions/newborns>) on the mother's current and previous pregnancies, delivery and of the infant. The Medical Birth Register has a very limited amount of data on unplanned out-of-hospital childbirths, only a checkbox on the place of birth (hospital with delivery unit, other hospital, planned home birth, unplanned birth outside hospital, transport birth, no information if the birth outside hospital was planned or unplanned, and unknown). There is no information on the distance between the residence and birth hospital. This business case explores a model to enrich the data on out-of-hospital childbirths by adding the Emergency Care System's location and health data to the Medical Birth Register's dataset. The aim is to be able to provide comparable statistics on out-of-hospital childbirths to give the possibility to evaluate the recent decisions on centralizing childbirths to a certain number of hospitals. The business case was also planned to apply some available tools on analyzing and combining geospatial data with other healthcare data, but this application was not explored due to challenges in data acquisition.

2. Medical Birth Register and Perinatal statistics

The Medical Birth Register was established in 1987 (FHS 2022a). The Register includes data on live births and on stillbirths of fetuses with a birth weight of at least 500 g or with a gestational age of at least 22 weeks, as well as data on the mothers.

The statistical reports covering basic information on parturients, deliveries and newborns are published twice a year: first preliminary statistics in June and final statistics in October-November (FHS 2021a). Basic tables are also provided as statistics in a database (FHS 2021b).

The statistics contain data on parturients, births and newborns. Key indicators include number of parturients, age, parity, BMI, mode of delivery, interventions during birth and newborn health status. The statistics also contain data on the most important delivery procedures as well as birth weight and perinatal mortality.

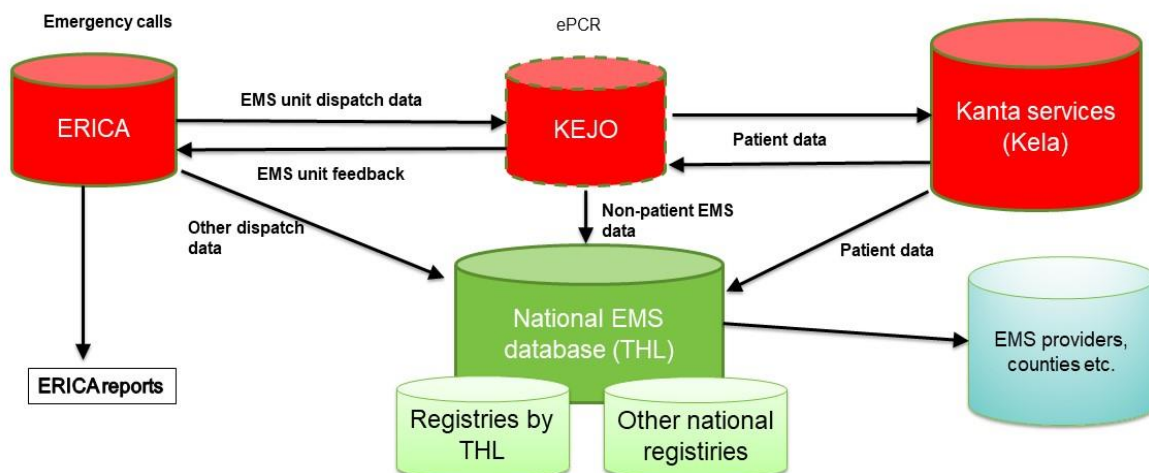
The quality description of the statistic can be found on the FHS website (FHS 2022b).

3. National emergency medical systems (EMS) database

The Finnish Emergency Medical System (EMS), meaning the prehospital assessment, care and conveyance of patients that are in need of urgent medical care, is moving towards national systems in data management. The data management structures relevant to this business case are 1) the National emergency response information system (ERICA) used in Finnish Emergency Response Centres (ERC) 2) EMS-specific electronic patient care record (ePCR-EMS) as part of a multi-authority command and control system (KEJO) and 3) a national database for collecting EMS data in the Finnish Institute for Health and Welfare (THL). The figure below also shows the Kanta services which consist of a national patient record archive to store the patient data gathered during an EMS mission.

Structure of data sources and information routes in planning national EMS database

(modified from the working paper of National EMS data repository and information management, Ilkka 2016)



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The national data management systems enable the secondary use of the ePCR-EMS and KEJO data. The KEJO data is non-patient data that consists for example the EMS mission's address and coordinates dispatched from the Emergency Response Centre through ERICA. In future versions it is also possible to store the exact coordinates during an EMS mission and the route taken. As shown in the figure, other registries are meant to be combined with the national EMS database/registry to provide more in-depth information from the Finnish social and health care functions. This business case highlights one example on how to combine data from different registries.

4. Data collection

Data is collected automatically by the KEJO system from the devices of the EMS unit (e.g. GPS system, monitor/defibrillator) or data input by the EMS practitioners (prehospital doctors and advanced and basic level paramedics). The patient data is stored to the Kanta services archive and the non-patient data to the national EMS database of THL. The legislation on the secondary use of social and health care data allows the THL to collect the data of EMS that is needed for its statutory tasks. The law on THL stipulates on the specifics of the data and what organizations are obliged to give the data to THL free of charge.

The EMS data is in the registry of the Finnish hospital districts that are the organizers of the EMS services within their area. They can produce the EMS services by themselves, in co-operation with a fire departments or by using private service providers. Regardless of the means of production the registry of the EMS data stays with the service organizer. THL can give an administrative decision about collecting the EMS data that creates a separate registry for THL from the data collected.

The technical specifics of the data collection are not valid nor public for this business case description.

The data itself was identified using test mission and patient data in XML format. A mission with a simulated out-of-hospital childbirth was carried out and the test data examined by the THL project group working with this business case. From the data and with knowledge of the future development work three data categories were identified:

- 1) Data that is accessible right now and is relevant to the business case
 - EMS dispatch code (791) to identify an out-of-hospital childbirth
 - street address of the EMS mission target location
 - coordinates of the EMS mission target location
 - patient id
 - child id
 - EMS unit's status timestamps for unit alerting, en route, patient encounter, arrival to target location and conveyance
 - information of an additional patient added during the EMS mission (childbirth)
 - street address of the hospital the patient/patients were conveyed to
- 2) Data that is of interest for the Medical Birth Register but not relevant to the business case
 - patient data (including symptoms, measurements, medicine received, etc.)
- 3) Data that will be useful for the business case in the future after it is made accessible
 - coordinates of the EMS unit during an EMS mission
 - route taken by the EMS unit

5. Data processing and analyzing

When both data sets (Medical Birth Register and KEJO) are available, the data can be linked and compared using the personal identity number of the mother. The personal identification system widely used in Finland enables high-quality register links.

With the help of the personal identity number, it is possible to evaluate the quality of the Medical Birth Register (e.g. how unplanned out-of-hospital births registered in KEJO are registered in the Medical Birth Register, do other available information correspond to each other in these two data sets) and analyze the more detailed characteristics of the unplanned out-of-hospital births. Of particular interest is the distance of unplanned out-of-hospital births from the nearest maternity hospital and their regional distribution. In the future, we aim to analyze the background factors of parturients in more detail with the help of additional register links (e.g. the Digital and Population Data Services Agency).

This information can be used to assess the centralization of maternity hospitals initiated through legislation in 2015. The analysis of the background factors of parturients that have encountered an unplanned out-of-hospital childbirth gives vital information for identifying factors that contribute to the risk of an unplanned out-of-hospital childbirth. These factors can be mitigated through the extensive child birth guidance center services offered in Finland during the pregnancy to reduce the number of unplanned out-of-hospital childbirth and risks for the child and mother.

6. Data dissemination

The quality measures of the Medical Birth Register will be described in the quality report of the statistical report.

The review of the data collected and analyzed will be carried out in co-operation with the developers of KEJO's data collection to ensure communication on all observations related to the data sets.

Depending on the final quality of the data and the results of the linkage, the aim is to publish a scientific article on the topic in the future. Separate scientific research permits will be applied for that in accordance with THL's policy.

In the future this data can be used to locate the exact location where the unplanned out-of-hospital childbirths are taking place. By combining this information to the THL's vast registry of other data on pregnancies and childbirths it is possible to calculate risk factors based on the mother's residency and distance from a maternity hospital. When the out-of-hospital childbirth risk is calculated based on actual unplanned out-of-hospital childbirths' locations, it is possible to add the necessary equipment and personnel training on child deliveries in the EMS units that are most probable to encounter such an event.

These calculations are, especially when combined with other social and health data in THL's registers, potentially forming a basis for scientific research on the risk factors and risk mitigation on unplanned out-of-hospital childbirths. A "unplanned out-of-hospital childbirth risk" score is possible to be calculated when enough data is gathered following a successful introduction of the Finnish EMS database and secondary use of EMS data.

7. References

FHS – Finnish Institute for Health and Welfare (2021a). The statistical reports (<https://thl.fi/en/web/thlfi-en/statistics-and-data/statistics-by-topic/sexual-and-reproductive-health/parturients-deliveries-and-births/perinatal-statistics-parturients-delivers-and-newborns>).

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