

Developing Data Product Maps for Total Data Quality Management: The Case of Georgia Vital Records

(Practice-Oriented Paper)

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Abstract: The experience of how GDPH develop information product maps for birth certificate and death certificate processes is presented. Significant information quality issues specific to vital records are also illustrated.

1. Introduction

Planning and implementing a program to efficiently achieve and maintain a state of high data quality for short-term results and long-term benefits is complex and not a trivial undertaking. Organizations from different industries and government agencies, with disparate business goals and operating environments, call for developing a data quality management program that fits their particular business goals. The experience of the Georgia Division of Public Health presents an example of how to develop information product maps to better understand how an information product is produced and data quality is monitored for the consumers of vital records data.

The business drivers for the data quality initiative at GDPH include:

GDPH needs to acquire more skilled data quality personnel, e.g., currently only two field coordinators are charged with training primary data providers and solving data quality problems across the entire state.

GDPH needs to establish some means of accountability for primary data collection agencies, which include over 100 mostly private birthing hospitals, hundredsof independent funeral directors and 159 county coroners and medical examiners, all who are outside the direct jurisdiction of the state registrar.

GDPH needs to meet state law and Department regulations regarding vital records registration and at the same time meet customer demands.

GDPH needs to map vital records data flow from point of collection to a final destination to initialize and sustain data warehouse use and management.

A key decision was made early on in the GDPH data warehouse project to ensure that the quality of data is high before they are loaded into the data warehouse. A primary target for this initiative is to develop, standardize and institutionalize data quality processes throughout GDPH to form the basis for continuous IQ improvement. Associated data quality objectives are:

to develop specific GDPH data quality measures; to construct functional and systematic data quality reporting competence; and to maintain continuous data quality improvement processes focused on primary data providers.

Data and information are often used synonymously in the literature. However, in practice, successful managers can intuitively distinguish useful information from data arrays, tending to describe information as data that have been "processed." Therefore, unless specified otherwise, this orientation will be presumed in this presentation.

2. Organizational Background

In most states, vital records datasets are composed of *vitalevent* information derived from the following information domains: births, deaths, fetal deaths, induced terminations of pregnancy (ITOPs or induced abortions), marriages, and divorces. Vitalevents are defined and registration processes managed by each state with guidance from the US Department of Health and Human Services (DHHS) through the Centers for Disease Control and Prevention (CDC). Specific vitalevent registration methods and detailed data management processes are recommended to the states and enforced through contract deliverables by the National Center for Health Statistics (NCHS).

Using the vitalevent data collected through the data contracts with each state, NCHS is responsible for maintaining a national vital statistics dataset. Also, in close collaboration with the states, NCHS periodically develops a model birth certificate, death certificate and fetal death report, minimum basic datasets, model vital statistics laws and regulations, and standard data processing rules. The model law and regulations include appropriate definitions of relevant terms and the data processing rules allow all states to virtually function in the same manner regarding each vitalevent and variable. Although each state is independently responsible for the collection of vitalevent data and may employ modified standard certificates and vital statistics laws and regulations, NCHS is the assigned federal agency for recommending standardized guidelines for the national vital statistics dataset. Specific sections of the model law read in part:

The (State Health Officer) shall appoint the State Registrar of Vital Statistics, hereinafter referred to as "State Registrar," in accordance with (applicable civil service laws and regulations).

(a) The State Registrar shall:

(1) Administer and enforce the provisions of this Act and the regulation issued hereunder, and issue instructions for the efficient administration of the system of vital statistics.

(2) Direct and supervise the system of vital statistics and the (Office of Vital Statistics) and be custodian of its records.

(3) Direct, supervise, and control the activities of all persons when they are engaged in activities pertaining to the operation of the system of vital statistics.

(4) Conduct training programs to promote uniformity of policy and procedures throughout the State in matters pertaining to the system of vital statistics.

(5) Prescribe, with the approval of the State Agency, furnish and distribute such forms as are required by this Act and the regulations issued hereunder, or prescribe such other means for transmission of data as will accomplish the purpose of complete and accurate reporting and registration.

(6) Prepare and publish reports of vital statistics of this State and such other reports as may be required by the State Agency.

(7) Provide to local health agencies copies of or data derived from certificates and reports required under this Act, as he or she shall determine are necessary for local health planning and program activities. The State Registrar shall establish a schedule with each local health agency for transmission of the copies or data. The copies or data shall remain the property of the (Office of Vital Statistics), and the uses which may be made of them shall be governed by the State Registrar.

(b) The State Registrar may establish or designate offices in the State as provided by regulation to aid in the efficient administration of the system of vital statistics.

(c) The State Registrar may delegate such functions and duties vested in him or her to employees of the (Office of Vital Statistics) and to employees of any office established or designated under (b). [1]

NOTE: The NCHS model vital statistics law and regulations is not an actual federal law and they are only used by each state as a guide to develop state laws and regulations. However, since most state laws closely follow the model, these sections displayed in this presentation are useful to define vital records registration activities and processes.

When the NCHS model and individual state vital records laws are examined, they mostly all show that a state vital records registrar has enormous responsibility to collect and sustain a comprehensive vital records system to systematically report vital event data. Unfortunately, this is usually accomplished with insufficient funding to adequately support these responsibilities. For example, a major issue that significantly affects the collection of vital event data, especially birth and fetal death, is these records are completed mainly by private hospital staff whose daily activities are not directly managed by the state registrar. In addition, hospitals are not reimbursed for the extensive work required to complete vital records. Mostly, only training opportunities and collection media (paper and electronic) are furnished to the hospital staff that collect, enter and verify the data. Lastly, in many states little systematic IQ "feedback" is furnished to hospital staff.

This disjunction between private industry and government agencies has produced some negative side effects. For example, hospital staff are instructed to abstract medical information directly from medical records, but in many cases the mother is asked to complete the entire birth

certificate. Moreover, the mother may also have hospital admission, delivery room, charges and possibly emergency room records and recorded, each of which may be entered into different data collection and billing systems within the same hospital. In addition, delivery room and admission data may be entered manually onto the birth certificate giving rise to the opportunity for transcription errors. Delays in manually accessing data from different parts of hospital also affect quality and timeliness even when electronic birth registration software is used. These and other factors critically influence the data entry, reliability and timeliness of vital records data processing that may result in inherent system data quality issues.

Vital record completion and registration issues have long been discussed in the literature with some interesting solutions. For example, Starr and Starr propose using personal digital assistants (PDAs) to collect vital event data at various areas of hospital service delivery and upload the collected data into a central repository. Their premise is that a central patient record could be utilized to document and track each service a person receives with each kind of data entered only once [3]. In addition, the Clinical Context Object Workgroup (CCOW) has created standards and specification for integrating many heterogeneous, medical software packages into single workstation view, which would improve vital event data timeliness, completeness and accuracy [4]. There is also discussion about utilizing health smart cards and computerized patient records to link and manage health information. Whereasthese ideas have merit, the information technologies for this type of endeavor are not now widely employed, nor cost effective for recording vital event data as hospitals usually bear the initial and sustaining costs for carrying out technological solutions.

Vital event data have many kinds of consumers who expect an acceptable level of accuracy and timeliness. NCHS for example, require the state to report vital event data within 90 days of collection (and this time limit will be decreased in the future). The Social Security Administration also has similar requirements for birth and death data. Furthermore in Georgia, many state agencies such as Child Support Enforcement and public health programs (immunization registries, newborn hearing screening, etc.) desire vital records data within several days of occurrence of the event. Unfortunately, real and perceived relatively long processing times and data quality issues have caused some of these agencies to directly contact hospitals to acquire similar data thereby placing an additional burden upon hospital staff. Moreover, increasing and varying administrative, statistical, and program use of vital event data, although an advantageous marketing factor for vital records, are based upon different real or perceived needs for timeliness. Along with demands for additional unfunded information or services, these variances cause conflict within long established state vital records registration systems.

2.2 Birth Certificate Data Product

Birth certificates account for most of the vital event data recorded in the states. In Georgia (a “medium” size state), over one hundred twenty five thousand births occur each year. The NCHS model law defines requirements for the birth registration process in its regulations:

- (a) A certificate of birth for each live birth which occurs in this State shall be filed with the (Office of Vital Statistics), or as otherwise directed by the State

Registrar, within 5 days after such birth and shall be registered if it has been completed and filed in accordance with this section.

(b) When a birth occurs in an institution or en route thereto, the person in charge of the institution or his or her authorized designee shall obtain the personal data, prepare the certificate, certify that the child was born alive at the place and time and on the date stated either by signature or by an approved electronic process, and file the certificate as directed in (a). The physician or other person in attendance shall provide the medical information required by the certificate within 72 hours after the birth.

(c) When a birth occurs outside an institution,

(1) The certificates shall be prepared and filed by one of the following in the indicated order of priority, in accordance with regulations promulgated by the State Agency:

(a) The physician in attendance or immediately after the birth, or in the absence of such a person;

(b) Any other person in attendance or immediately after the birth, or in the absence of such a person;

(c) The father, the mother, or, in the absence of the father and the inability of the mother, the person in charge of the premises where the birth occurred.

(2) The State Agency shall by regulation determine what evidence may be required to establish the facts of birth.

(d) When a birth occurs on a moving conveyance within the United States and the child is first removed from the conveyance in this State, the birth shall be registered in this State and the place where it is first removed shall be considered the place of birth. When a birth occurs on a moving conveyance while in international waters or airspace or in a foreign country or its airspace and the child is first removed from the conveyance in this State, the birth shall be registered in this State, but the certificate shall show the actual place of birth insofar as can be determined.

(e) For the purposes of birth registration, the mother is deemed to be the woman who gives birth to the child, unless otherwise provided by State law or determined by a court of competent jurisdiction prior to the filing of the birth certificate. The information about the fathers shall be entered as provided in Section 7(f).

(f)(1) If the mother was married at the time of either conception or birth, or between conception and birth, the name of the husband shall be entered on the certificate as the father of the child, unless:

(a) Paternity has been determined otherwise by (a court of competent jurisdiction), or

(b) The mother and the mother's husband execute joint or separate affidavits attesting that the husband is not the father of the child. Affidavits shall be notarized, and signatures of the mother and of the husband shall be individually notarized on any joint affidavit. In such event, information about the fathers shall be omitted from the certificate, or

(c) The mother executes an affidavit attesting that the husband is not the father and that the putative father is the father, and the putative father executes an affidavit attesting that he is the father, and the husband executes an affidavit attesting that he is not the father. Affidavits may be joint, individual, or a combination thereof, and each signature shall be individually notarized. In such event, the putative fathers shall be shown as the father on the certificate.

(2) If the mother was not married at the time of either conception or birth or between conception and birth, the name of the father shall not be entered on the certificate without an affidavit of paternity signed by the mother and the person to be named as the father.

(3) In any case in which paternity of a child is determined by (a court of competent jurisdiction), the name of the father and surname of the child shall be entered on the certificate of birth in accordance with the finding and order of the court.

(4) If the father is not named on the certificate of birth, no other information about the father shall be entered on the certificate.

(5) Affidavits referenced in this section shall be filed with the State Registrar.

(g) Either of the parents of the child, or other informant, shall verify the accuracy of the personal data to be entered on the certificate in time to permit the filing of the certificate within the 5 days prescribed in 7(a).

(h) Certificates of birth filed after 5 days, but within one year from the date of birth shall be registered on the standard form of live birth certificate in the manner prescribed above. Such certificates shall not be marked "Delayed." The State Registrar may require additional evidence in support of the facts of birth. [2]

Georgia and other states' vital records laws and regulations, which are similar to the federal recommendations shown above, are complex and place key system responsibility upon state registrars. When closely examined there are, however, only six major steps in the registration of a birth: data gathering, data entry, certification, registration, data processing and archiving. These steps can take place in three locations. Data gathering, data entry and certification usually occurs in a hospital shortly after the birth occurs. In most states, registration is done by a county or local vital records registrar (or in some cases by hospital staff). Data processing, which includes coding, editing and error correction plus archiving, happens at the state office of vital records.

A certifier, usually the medical records person who enters the data, only "certifies" that the birth occurred to an individual on the date at the place shown on the birth certificate. For example, the Georgia birth record certification statement reads: "I certify that the above named child was born alive at the place and on the date stated above." The other data entered and shown on the birth record is assumed to fall under the certification rubric, but this is not always the real case in practice. When the birth certificate is registered and an "official" state file number is assigned, it becomes the notice that, indeed, a person has been legally born.

NCHS, as illustrated by its data processing rules, provides a means for the quality control of vital event data in the states and for the distribution of those data at the national level. However, vital event data, especially birth events, are increasingly employed for the measure of women and infant population health; a fact that places an increasingly high premium on reliable birth certified data and greater than ever demand on state vital record systems. Most importantly, the expanded utility of vital event data for state, community and local population health analyses invokes stricter requirements to improve data quality and registration timeliness; beyond those mandated by the NCHS.

New uses of vital event data places new emphasis on these data as information products include: health policy modeling, resource allocation, and spatial and demographic determinants of health. Health policy is often dependent on the vital statistics information products, since these statistics contain the numbers of births and deaths with attributions of standard epidemiological references, such as place, time, race, age and sex. Deaths are additionally attributed by their causes. Resource allocations, for many state and federal agencies, also require vital statistics. For example, education departments need to know the birth rates in counties in order to prepare educational resources, when those children become ready for school. Health status is closely tied to physical and social environments. Moreover, social and physical environments are spatially correlated, so modeling spatial distributions of environments, and their respective vital statistics illustrate the influences of these environments on birth outcomes and causes of death.

2.2.1 Accuracy

The accuracy of the data shown on a birth record is indirect relationship to the amount of effort exercised by the person completing the birth certificate. For example, as noted previously, birth record clerks in hospitals are instructed to abstract medical information directly from the

mother's or newborn's medical chart. In practice, the mother may be asked to complete both the demographic and medical portions of the certificate. Although this may be the result of overworked hospital clerical staff, it may also be caused by other reasons. Unavailability of charts, incomplete medical records or, as has been noted in Georgia by some birth clerks, the mother of the newborn has better knowledge of her medical history and is, therefore, the best person to answer the questions on the birth record in a more reliable manner. These reasons clearly raise the issue of accuracy of the data recorded on the birth certificate, especially when it is compared to the recognized "gold standard" the mother's and newborn's medical records.

Electronic birth certificate (EBC) registration software significantly improved the completion of birth records in Georgia where by about 96% of all births are registered using this first generation software. The EBC provides an editing capability at the hospital but edits that are more stringent are applied at the state office of vital records. The edits mainly deal with date comparisons and variable range edits such as birth weight. However, hospital birth clerks have learned to manipulate the EBC where out of range entries can be "forced" into the record, whether they are accurate or not.

State vital records office staff visually scan the paper and electronic birth records to ensure the all entries match and have not been changed. Birth information is also edited through local area network and main frame programs based upon NCHS edit rules, however, due to the shortage of staff, no systematic quality control reviews are conducted with hospital records.

Lastly, NCHS gained its birth records and supplies edit reports to state office staff review and correct.

2.2.2 Timeliness

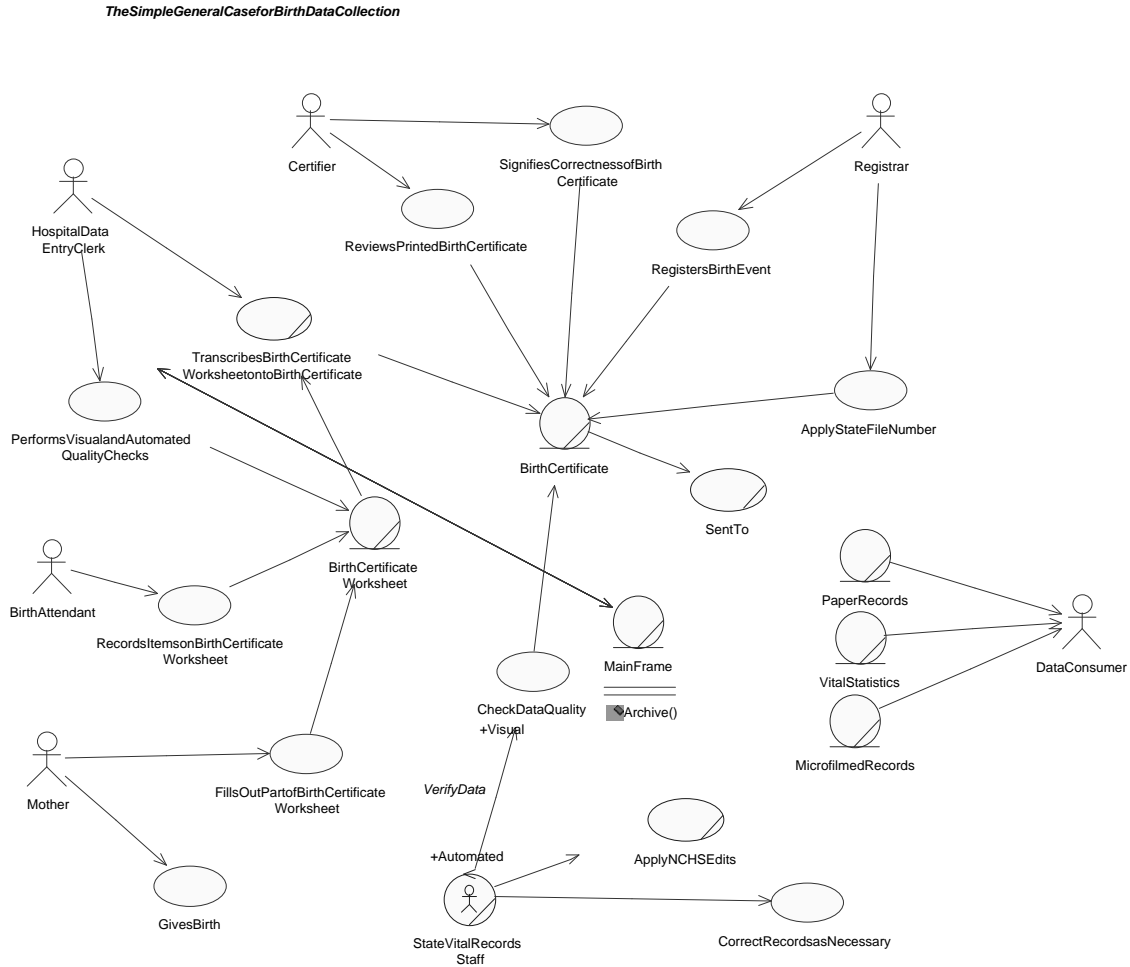
The registration of birth records in a timely manner is dependent upon hospital staff completing and sending the records to the state office or county office of vital records, depending upon the registration system used in a county. In Georgia approximately, fifty percent are received in the state office within ten days of the birth (Georgia Code 31-10-9). The rest arrive at the state office within twenty days after the birth occurred with a few received after this time. Hospital staff indicate that the collection of all of the data required on the birth certificate is time consuming, especially if abstracting from medical records or gathering information from different parts of the facility.

2.2.3 Completeness

Birth certificates have minimal completeness requirements. For certification that a birth occurred, the following minimum data are required: complete name of child; mother's complete legal and maiden last name; father's complete name (if there is one); date of child's birth; sex; place of child's birth (city, county, state); mother's resident address, state file number, date birth certificate was registered/filed, name or certifier at birth or their signature. Technically all of the items asked on the birth certificate need to be completed to be registered, however, for legal purposes, if all of the above items are complete, and all others are unknown, the certificate would still be filed, e.g., a foundling with no information is filed as a "foundling" child's name and most other information is unknown or blank.

2.3. Birth Certificate Data Product Map

Figure 1 represents the simplest overview of the birth data collection process. As a use case diagram, Figure 1 does not explicitly illustrate sequence, but the authors have attempted to include this. As a data product map, Figure 1 may be too simplistic, but it represents a first attempt, at the very least, to formally outline the process of birth data production in Georgia. The



actors in Figure 1 have been described in detail in the preceding text.

Figure 1 – Simple Use Case Model of Vital Records Flow in Georgia

flow. Like Figure 1, Figure 2 is simplistic, but it does show the essential process states and the required transitions. The authors are working on a more detailed state model for the entire vital records process in Georgia.

Simple Descriptive View of Vital Event Processing

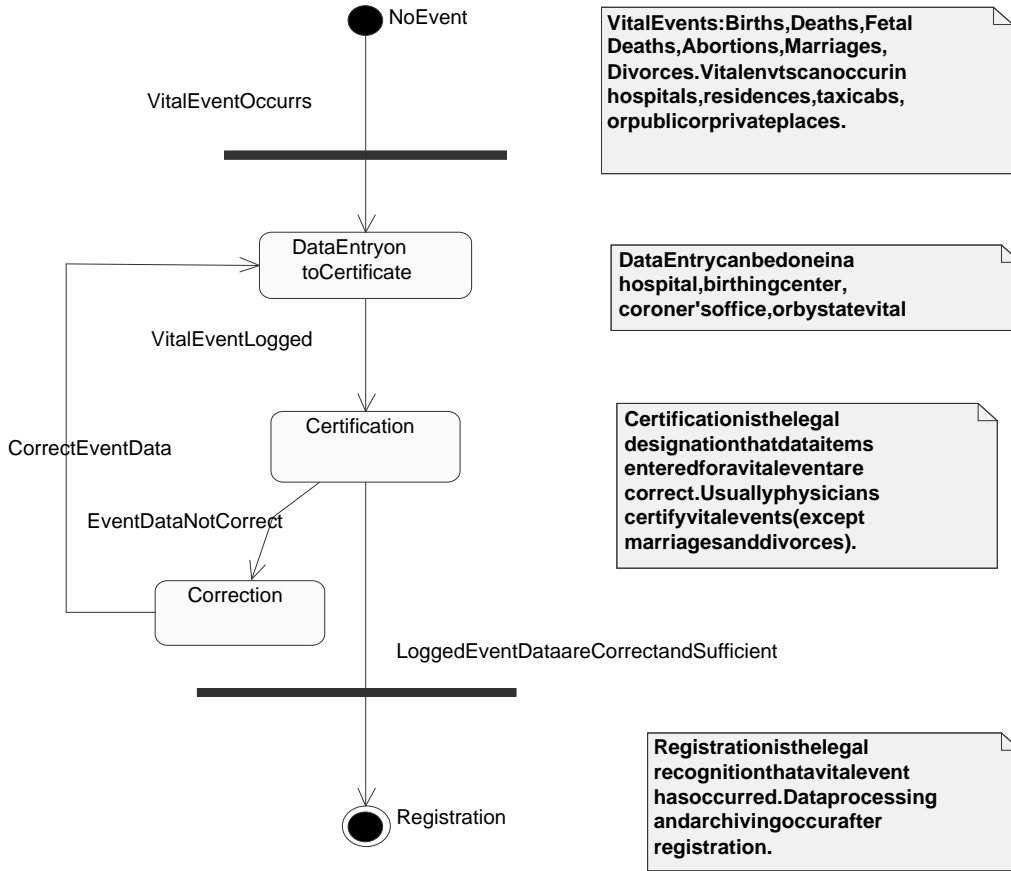


Figure 2 –Simple State Diagram of the Vital Records Process in Georgia.

3. Research Design

Figures 1 and 2 are incomplete. Our goal is to create an accurate and comprehensive view of the actors, processes, states, and state transitions for the production not only for birth data, but also for all vital events. We have explored the possibility of submitting “blind” certificates through the system, starting at the hospital data entry, to monitor timeliness a

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completeness. However, this is not feasible, since the imitation of the birth process, the act of giving birth, is not a state regulated function, and hospital administrators would incur the burden of managing the process (the reader is reminded that the state has no authority, in Georgia, to force hospitals to perform this kind of information quality assurance.)¹ Moreover, vital event certificates are legal documents, and would require the state registrar to reserve certificates for this kind of data quality control process.

4. Conclusion

Data quality is fundamental to the production of vital event data products. The state and federal agencies that collect and regulate vital event data have established sufficient guidelines, responsibilities, and roles for each actor engaged in the vital record system. What is not clear and often undetermined or not well known are the technical details of vital records processing. This fact is particularly true for consumers of vital statistics, who believe that only the latest vital statistics are relevant, and that the state's calculated vital statistics must match those calculated by local agencies must exactly match. In the case of the latest available vital statistics, information consumers may not be aware that the statistics relevant to health decisions do not change significantly from year to year. For issues of statistical accuracy, in terms of exactly matching local statistics, information consumers usually do not understand that vital record statistics have a closing period that may not include all vital events recorded in local areas. This fact alone is the primary concern of vital statistics accuracy, but the differences are not significant. Consumers of vital statistics information need to become trained in the uses and limitation of those data. For example, some consumers incorrectly use vital statistics for case control studies of health outcomes. Vital statistics is inappropriate for case control studies, but is invaluable for population based health assessments.

In our attempt here to illustrate the complexities of the vital records process in the US and Georgia, we realize the necessity for a substantial description of the current vital records process in Georgia. This treatise is, at best, a simple introduction that has shown the author's own need to explicitly define the details of the vital records process in Georgia.

5. References

- [1] DHHSPublication No. (PHS)94-1115, Hyattsville, Maryland February 1994, pp.3.
- [2] DHHSPublication No. (PHS)94-1115, Hyattsville, Maryland February 1994, pp.3-4.
- [3] Paul Starr and Sandra Starr, "Reinventing Vital Statistics: The Impact of Changes in Information Technology, Welfare Policy, and Health Care," *Public Health Reports* **110** (September/October 1995):534-544.
- [4] The Clinical Context Object Workgroup: Its Standard and Methods, CCOW98-02-16, 1998.

¹Opportunities may exist to create incentives for hospitals by giving them "credit" for participating in best practices for the production of vital records data.

