PRDH and IMPQ 1800–1849 Quebec Historical Family Reconstitution. Content, Design and Biographical Completeness

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PRDH and IMPQ 1800–1849 Quebec Historical Family Reconstitution

Content, Design and Biographical Completeness

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ABSTRACT

Since 1966, the Programme de recherche en démographie historique (PRDH) has worked to create comprehensive genealogical data of the Quebec population. The PRDH longitudinal database, the Registre de la population du Québec ancien (RPQA), draws upon the French Catholic parish registers of the St. Lawrence Valley as its main source material. This family reconstitution covers the French Catholic population of Quebec up to 1799, along with deaths after 1800 of persons born before 1750. Subsequent partnerships with l'Institut Généalogique Drouin, FamilySearch and Ancestry as well as collaboration on the 2011–2017 *Infrastructure intégrée des Microdonnées historiques de la Population du Québec (1621–1965)* (IMPQ) project enabled the PRDH to continue efforts to reconstitute the French Catholic population up to 1849. Despite these advances, pushing family reconstitution forward to the mid-19 century has forced the PRDH team to reckon with the increasingly mixed and geographically mobile Quebec population of the 19th and early 20th centuries. This article describes the content and design of the RPQA database, detailing the structure of the RPQA relational database and the breadth of variables available for data management and analysis. It then describes features of the IMPQ extension of family reconstitution from 1800 to 1849, including observational protocols necessary to use these data and consideration of data completeness after 1800. At the same time, the article addresses the fundamental question, "What is my population?" as part of a broader reflection upon the target population encompassed by these data.

Keywords: Registre de la population du Québec ancien (RPQA), Programme de recherche en démographie historique (PRDH), Infrastructure intégrée des microdonnées historiques de la population du Québec (IMPQ), Institut généalogique Drouin (IGD), BALSAC, Family reconstitution, Record linkage, Historical population data, Genealogical data, Parish registers, Censuses

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1 INTRODUCTION

Since 1966, the Programme de Recherche en Démographie Historique (PRDH) has worked to create comprehensive genealogical data of the Quebec population. The PRDH longitudinal database, the Registre de la Population du Québec Ancien (RPQA), draws upon the French Catholic parish registers of the St. Lawrence Valley as its main source material. The PRDH has also incorporated into the RPQA complete-count 17th- and 18th-century census microdata as well as supplementary information drawn from notarial and other records (Dillon et al., 2018). By the early 2000s, the PRDH had succeeded in reconstituting the French Catholic population of Quebec up to 1799, along with deaths after 1800 of persons born before 1750 (Dillon et al., 2018). Subsequent partnerships with l'Institut Généalogique Drouin (IGD), BALSAC and the Centre Interuniversitaire d'Études Québécoises (CIEQ) on the 2013–2017 *Integrated infrastructure of the historical microdata of the Quebec population (1621–1965)* (IMPQ) project enabled the PRDH to continue efforts to reconstitute the French Catholic population. The PRDH and BALSAC collaborated to combine Quebec parish register data across four centuries in the new infrastructure, the IMPQ database. This collaboration drew upon the 17th-, 18th- and 19th-century RPQA longitudinal data, the 19th- and 20th-century BALSAC marriage data, and Catholic births and deaths provided by IGD. Subsequently the PRDH and IGD supplemented the IMPQ data with non-Catholic marriage acts.

This article describes the content and design of the RPQA database, detailing the structure of this relational database and the breadth of variables available for data management and analysis. It then describes features of the IMPQ infrastructure, focusing on the extension of family reconstitution from 1800 to 1849, describing observational protocols necessary to use these data and investigating data completeness after 1800. This article should be read in conjunction with our 2018 *History of the Family* publication which provides further information on the origins of the PRDH, issues posed by migration, missing data, record linkage procedures and research possibilities (Dillon et al., 2018). Finally, we address a fundamental question, "What is my population?" as part of a broader reflection upon the target population encompassed by these data. Pushing family reconstitution forward to the mid-19th century and working with complete-count census data has forced the PRDH team to reckon with an increasingly mixed and geographically mobile Quebec population which included both Catholics and non-Catholics. Fortunately, collaboration with genealogical partners have enhanced our purchase on the diverse ethnic groups and enabled us to broaden our mandate beyond the settled French-Catholic population.

2 BACKGROUND AND SCOPE OF THE RPQA DATABASE

The PRDH was launched by Hubert Charbonneau and Jacques Légaré in 1966. At the time it was one of a handful of university-based programmes to computerize historical population data (Charbonneau et al., 1967). The PRDH family reconstitution efforts were facilitated by the exceptional circumstances of historical parish register preservation in Quebec: Catholic parish registers were maintained from the beginning of the colony and annual copies of each parish register were duplicated for civil authorities, ensuring that a comprehensive set of parish records were preserved for posterity (Bouchard & LaRose, 1976; Desjardins, 1998). The PRDH created its own microfilm images of Quebec's parish registers prior to 1700, and then turned to microfilmed images created by the Genealogical Society of Utah (Desjardins, 1998, p. 216; LaRose, 2015, p. 172) as well as a different set of microfilm images created by IGD (LaRose, 2015, p. 171). The PRDH conducted all transcription of the 17th- and 18th-century parish acts, as well as death acts after 1800 of persons born before 1750 (for an example of these sources, see Figure 1).

An article published at the very beginning of the project conveys an ambitious and comprehensive objective, stating that

> […] we attempt to establish the most complete file possible of all individuals who migrated to or were born in the specified territory (Quebec, where one finds a relatively complete series of parish registers) in the course of a particular period. The selection will extend from 1608 to 1850 […] (Charbonneau, Légaré, Durocher, Paquet, & Wallot, 1967, pp. 216–217, translation).[1]

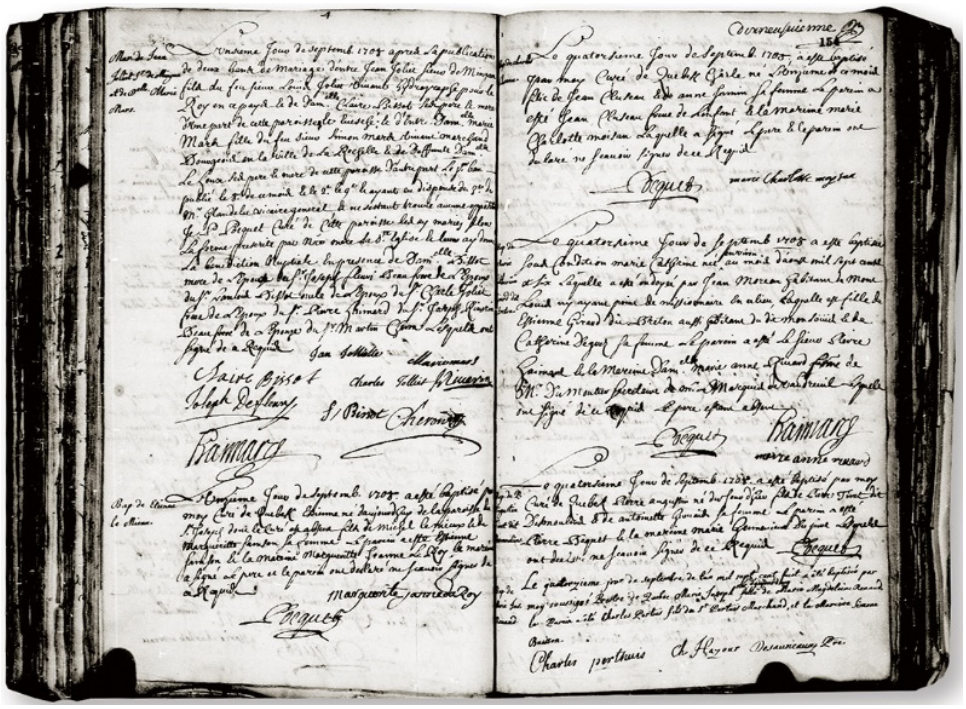
1 «Pour ce faire, nous tenterons d'établir un fichier aussi complet que possible de tous les individus venus ou nés dans un territoire défini (le Québec, où se trouve une série relativement complète des registres paroissiaux) au cours d'une certaine période. La cueillette s'étendra de 1608 à 1850 […]»

For the past 50 years, the PRDH maintained a 100% record linkage philosophy which aimed to reconstruct, as exhaustively as possible, all demographic events for a complete population. As explained at length in our 2018 article:

> When an act is missing, we not only glean information from other acts in order to infer events and dates, but, more importantly, we construct identities for persons who would otherwise remain ghosts in the documentary corpus […] The pursuit of fragmentary lives and the completion of individual and family biographies is an important part of producing as complete a file as possible. (Dillon et al., 2018, p. 12).

Accordingly, the project incorporated into the database all of the Catholic parishes which lined both sides of the St. Lawrence River and which comprise the Quebec colony then known as "Le Canada". The PRDH devoted extra attention to missing events and dates in the 17th and 18th-century, filling in gaps by consulting complementary sources such as censuses and notarial acts (Desjardins, 1993). It exerted efforts to identify the founders, or heads of ascending genealogical lines, who first immigrated into Quebec, as well as, in some cases, the French parents of these founders who never set foot in Quebec (persons identified as "Hors Population"). It also traced persons who left the St. Lawrence Valley to conduct mission work or pursue the fur trade in places such as Détroit and Michilimackinac, insofar as Catholic parish registers are available for those locations. The PRDH drew the line, however, at persons who did not appear in the Catholic parish register collection, in other words, who did not integrate into the French Catholic population, notably non-Catholic indigenous persons and Protestants. The Quebec colony is often characterized as a "semi-closed population", with limited in- and out-migration after the initial period of settlement up to 1700, although some outmigration from the colony did occur at certain times (see Dillon et al. (2018) for an extended discussion of migration issues concerning the RPQA). Over time, the PRDH integrated into the database references from the *Mémoires de la Société généalogique canadienne-française*, the publication *l'Ancêtre*, notarial acts, the *Dictionary of Canadian Biography* and religious community archives in order to identify 1,074 persons who left the colony and approximate their date of departure. Emigrants are identified in the database by the Emigrant variable, while particular records pertaining to outmigration are identified by the Type_Acte variable. While a third of these departures occurred before 1700, about 10% occurred during the 1750s and a quarter during the 1760s. Researchers using the RPQA benefit from these efforts by the PRDH to identify outmigrants combined with consistent observation of inter-parish migrants, and are thus better equipped to control for migration selection bias.

Figure 1 *Registre de Notre-Dame-de-Quebec, including one marriage act and four baptismal acts, September 3 and 4, 1708*



Source: Image provided with permission by ©2016 Institut généalogique Drouin.

3 THE RPQA DATABASE

3.1 STRUCTURE AND VARIABLES AVAILABLE FOR ANALYSIS

The RPQA is stored in a 24-table Microsoft SQL relational database held on a dedicated server hosted by the Université de Montréal. The principal variables in this database are described in Appendix 1. The transcription of each individual act is recorded in the ACTE and MENTION tables. Transcribed acts are mainly baptismal, marriage and burial acts, but other kinds of acts are also present in the RPQA. Over 60,000 complementary historical sources have also been integrated into the RPQA database, namely the 1666, 1667 and 1681 censuses of the colony, the 1716 and 1744 censuses of Quebec City, marriage contracts, hospital sick lists, and lists of migrants. Other types of acts which have been added to the RPQA include naturalizations, testimonies of freedom to marry, recantations, confirmations, marriage rehabilitations (post-hoc legitimizations of unions contracted by related persons or conducted by a civil authority), and marriage annulments.

The ACTE table contains one line for each act which denotes basic information pertaining to the act (see Appendix 1). The variable "idActe" is a unique number assigned to each act, and once assigned, this number is never overwritten or re-used. The variable "Type" describes 20 different act types, from baptisms, marriages and burials to censuses, fur trade contracts, researcher-contributed information, marriage contracts and several other types. The date of event variable ("DateEvenement") describes the date of the demographic event (such as a birth) while the date of registration variable ("Date") describes the date of registration of the demographic event (such as a baptism). A date of registration is always available but for 20% of acts between 1621 and 1849 the date of the demographic event is missing; in these cases, the researcher must rely upon the date of registration of the event. When the date of the demographic event is known, over 90% of event registrations occurred within three days of the event itself, with a quarter occurring on the same day. The gap between dates of birth and dates of baptism fluctuated on the basis of the dispersion of the population, the number of priests, the relative influence of priests within their community, the climate, the day of birth, and urban-rural status, with greater delays apparent among rural and winter births (Amorevieta-Gentil, 2010, p. 110). On the other hand, an unknown event date may signal a sizable time delay between the event and the registration of that event.[2] A code for the parish of registration is also recorded in the ACTE table. For parish acts dated from 1621 to 1849 and currently included in the RPQA database, the parish code specifies 331 different parishes, most of them located within the St. Lawrence Valley.[3] Some parish codes actually denote hospitals (e.g. Hôpital general de Montréal) or early missions.

About 9,634 acts registered in France from 1621 to 1849 as well as 458 acts registered in other parts of Europe (notably Ireland, Germany and England) or "At sea" have been added to this corpus, mainly to identify the origins of immigrants or parents of subjects residing in Quebec. Another 59,731 acts are registered in 77 different parishes, states or localities located outside the St. Lawrence valley but within the Americas, notably from Catholic parishes in present-day Ontario and Acadie, and ranging from Port-Royal to New Orleans. Finally, as of 2022, 45,100 parish acts from 181 Anglican, Congregational, Presbyterian and Methodist churches have been added to the RPQA. These acts are mainly Protestant marriage acts contributed by IGD to help identify mixed Catholic-Protestant couples who subsequently baptized or buried their child in the Catholic church; we also observe 80 Jewish marriage acts from Montréal's Shearith Israel Congregation. In just 1% of cases the parish is unspecified. A "Provenance" variable is included in table ACTE to describe the source of the act, while a "ObiitOndoiement" variable indicates if an emergency baptism has been performed or if a birth act includes a marginal notation indicating that a death occurred (such as in the case of stillbirths). A "Consanguinite" variable identifies consanguineous marriages explicitly denoted as such by the priest. However, not all consanguineous marriages are identified in this way and researchers interested in these marriages should apply programs designed to identify various degrees of consanguinity to capture all such cases.

Each individual person named in the act is considered a "mention" and their information is recorded in separate successive lines in the MENTION table (See Appendix 1). On average, there are five mentions per act; the number of mentions per act varies based on the type of act and the number of

2 For an extended discussion of missing data, events which were not recorded at all, see Dillon et al. (2018), pp. 8–10.

3 In this paragraph and the next paragraph, the counts of 1621–1849 parish acts across different regions are drawn from the most recent version of the RPQA dated December 2021.

witnesses present at the event. Since there are an average of 4–5 mentions per act, the MENTION table is quite large: the 2,235,082 acts from 1621 to 1849 include a total 8,987,409 mentions. Each named individual is identified via a unique identification number for their specific mention (idMention), as well as a unique identification number for the whole database (idIndividu). Once attributed, the idMention number stays the same and is never re-used. The idIndividu number is also never re-used. If the identities of two individuals bearing two different idIndividu numbers are subsequently merged, the idIndividu associated with the greatest number of mentions is kept and the second idIndividu number is archived, never to be re-used. For all mentions drawn from acts from 1621 to 1849, 80% are identified with a specific idIndividu, while 20% have a value of –1 in the idIndividu variable. The –1 value indicates that our record linkage program was unable to identify this person within the family reconstitution. Such individuals include persons who spent only a limited time in the colony and seemingly never joined in a family life in Quebec; it also includes witnesses whom we were unable to identify. On the other hand, over 90% of subjects, parents of subjects and children of subjects mentioned in an act have been successfully identified and connected into the family reconstitution.

Mentions are also identified in terms of their role as subject, spouse, father, mother, son or daughter ("Role") and their status as present at the event, absent, living, deceased or unknown ("Presence"). Often absent or deceased family members, notably parents and spouses from previous marriages, are mentioned in baptismal, marriage or burial acts. As a result, the "Presence" variable can optionally be used to identify that last recorded observation of an individual in the database when their death act is absent or can be used in conjunction with a preceding act to interpolate a date of last observation. The age and marital status of each mentioned individual, if given in the act, are also recorded here, along with the first and last name as recorded in the act as well as standardized versions of each derived from the name dictionaries. Finally, about 14% of mentions state the occupation of the subject (usually male) or his or her father. Most "habitants" or farmers do not have an occupation specified; on the other hand, nobles, seigneurs and other elites are usually identified via their occupation or an honorific title, allowing researchers to distinguish elite and non-elite men. All occupations have been coded with OCCHISCO, a North Atlantic Population Project code which is an adaptation of the original HISCO coding scheme (Roberts, Woollard, Dillon, Ronnander, & Thorvaldsen, 2003). The OCCHISCO coding scheme proved adaptable to the French- and English-regime parish register data, with the creation of additional codes to represent habitants (61119) and seigneurs (20500). Slaves were coded as 99150 (Worker not further specified) as their specific tasks were usually unspecified. The PRDH create two new OCSTATUS codes to represent the statuses slave (14) and bourgeois (53).

The ACTE and MENTION tables are linked to each other via the "idActe" variable. Adding the "Date" variable from the ACTE table to the MENTION table has the advantage of transforming the MENTION table into an event file. By sorting the MENTION table on idIndividu and then Date, researchers can assemble all mentions pertaining to each individual in chronological order. There are an average of 15 dated mentions per individual with a valid "idIndividu" in the MENTION table (1621–1849), with a third of individuals having 20 or more dated mentions. These mentions will usually begin with that person's first observation in a baptism and may end hastily with their death as an infant (in such cases, the birth and the death are declared in the same act; 11% of all identified persons from 1621 to 1849 have only one mention in the MENTION table). On the other hand, the series of mentions for a particular individual may continue for several decades through marriages and remarriages, the baptisms, marriages and early deaths of their children and ending (optimally) with their death. Researchers should keep in mind that the death mention for a given individual may not be their last dated observation, as parents and spouses can be mentioned in acts pertaining to their children or widowed spouses after death. Examining the MENTION file in this way will also reveal persons for whom no clear beginning or ending observation is readily apparent.

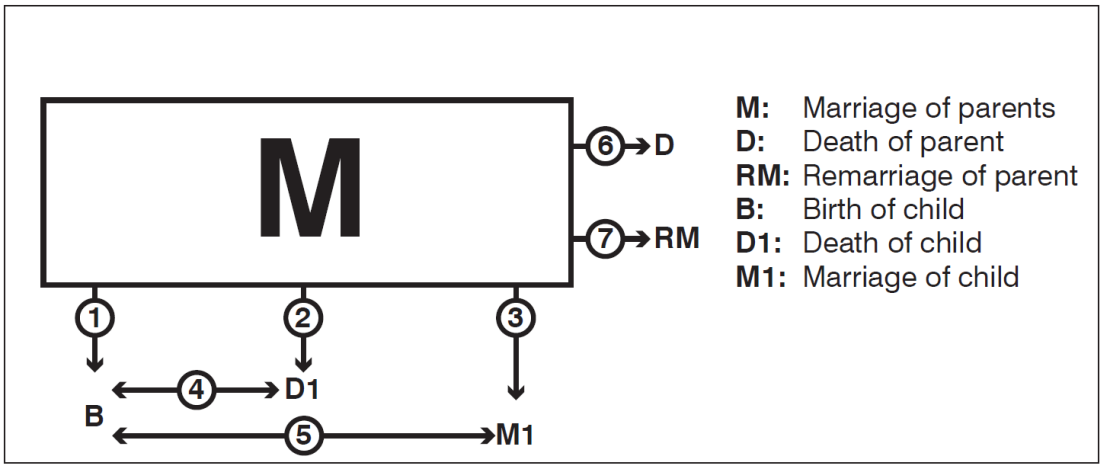
A further table named ACTE_COMMENTAIRE features a listing of over 280,000 comments either transcribed directly from the act or annotations added by a researcher or record linker. Many of these comments, notably indications that a child was baptized in emergency or that a child was born out of wedlock, or else dispensations accorded in the case of consanguineous marriages, were used to create variables in the ACTE table during manual record linkage. Other comments, read together, constitute a veritable social history of Quebec: indications of twin births, adultery ("commerce illicite"), wetnursing ("en nourrice"), abandoned or fatherless infants ("enfant anonyme"), slaves and slave owners ("panis ou panisse appartenant à …"). The comments also feature causes of death, although only 5% of death acts cited a cause of death, usually in circumstances such as drowning, sudden death, epidemics, sickness, accidents or war.

3.2 FAMILY RECONSTITUTION

The ACTE and MENTION tables contain the core information transcribed from historic parish registers. Two other tables, INDIVIDU and UNION, are created as a result of the family reconstitution process, and are used to build our research files. Since the reproductive period for historic Quebec families is quite long, the PRDH assembles transcriptions of parish register acts spanning a period of 25 years before initiating the family reconstitution process for that block of time. Figure 2 presents the different steps taken in the PRDH Family Reconstitution Process. This process starts by opening a family file for each couple based on the marriage acts. The record linkage programme then examines systematically and in chronological order all acts which name the same couple, from the birth of their first child (item 1 in Figure 2) to the marriage or death of their last child (item 2 and 3). The quality of the Quebec Catholic parish registers, which usually included parents' names on acts pertaining to children, facilitates this family reconstitution process. The deaths referred to in item 2 concern in particular the deaths of children before marriage; in these cases, their parents are mentioned on the death act. At the same time, two further types of acts which mention parents as "subject-spouse" are also linked to the family file. These remaining acts concern the death act for each spouse (item 6, a death occurring in adulthood) and, if available, a remarriage act for the remaining spouse (item 7). "Conducting record linkage in chronological order optimizes the process: as information is chronologically cumulated, the confirmation of links becomes easier." (Dillon et al., 2018).[4]

Once all acts pertaining to children are linked to their parents' family file, a second phase of linkage creates individual biographies by linking each child's birth, marriage and death record (see record linkage items 4 and 5, Figure 2). "This second stage is aided by the fact that the pool of acts is now constrained to those previously united for the family of origin." (Dillon et al., 2018). About three-quarters of the PRDH family reconstitution is effected via automatic record linkage, using an extensive first- and last-name dictionary. The PRDH has also employed extensive manual record linkage to resolve remaining cases. Most cases linked manually are resolved easily, distinguishing between two candidates or confirming a one-to-one link by identifying an error in name or date transcription or by detecting an error in a previous linkage. The most difficult cases, such as missing marriages, Protestant marriages or marriages which are incomplete in terms of the identification of parents or previous spouses, are resolved thanks to complementary information, such as the names of witnesses or godparents or through the use of notarial acts. There are no formalized rules used by the PRDH in manual record linkage; instead, the PRDH relies on the expertise of three record linkers with extensive experience in genealogy and who have worked with parish registers for several decades.

Figure 2 *PRDH Family Reconstitution Process*



4 Further information on the record linkage process, including the treatment of remarriages, the automatic linkage programme, blocking, the use of a name dictionary and the creation of individual biographies via horizontal linkage, is available in Dillon et al. (2018).

Most persons listed in the baptismal, marriage and burial acts are ultimately linked into the family reconstitution. Once connected to their parents' family file, subjects are then attributed an individual identity via the assignment of an individual identification number (ID_Individu) and are listed in the INDIVIDU table. As stated earlier, mentions of individuals who are not successfully linked into the family reconstitution remain in the MENTION table with the value –1 for their ID_Individu. The INDIVIDU table features one line per identified subject and summarizes their biographical and personal information, providing the date and place of birth and death ("DateNaissance", "CodeLieuNaissance", "DateDeces", "CodeLieuDeces") and the identification numbers for each person's mother and father ("idMere" and "idPere"). The identification numbers idMere and idPere can change if a link is subsequently modified in the course of updating the longitudinal file. Data quality codes for the date of birth, "QualiteDateNaissance", and date of death, "QualiteDateDeces" indicate if the date represents the date of demographic event, the date of registration, a date from an emergency baptism, a date deriving from information from a researcher, an inferred date or missing. The INDIVIDU file also includes complementary information on immigrant and emigrant status derived from parish acts or inferred based on an assessment of the known facts about the individual ("Immigrant", "Emigrant"). The variable "Illegitime" indicates if the individual was born out of wedlock; this status is often repeated at marriage, although some illegitimate children were subsequently legitimized via the post-birth marriage of their parents. The "Amerindien" variable indicates if the individual was an indigenous person. Some persons identified in our family reconstitution never set foot in Quebec but are nevertheless mentioned as parents on marriage or burial acts. The variable "HorsPopulation" identifies these persons, enabling researchers to set them aside from analysis. The presence of the pointer variables "idMere" and "idPere" allow researchers to attach characteristics of parents to their family members, as well as establish inter- and intra-generational links.[5]

A quarter of identified men and 16% of identified women born between 1621 and 1765 contracted two or more marriages. The percentage of women and men who remarried was higher during the 17th century, particularly in the case of women on account of the unequal sex ratio and smaller number of women on the marriage market (see Charbonneau, Desjardins, Légaré, & Denis, 2000, p. 116). To accommodate multiple marriages, marriage information is stored separately in the UNION table and linked to the INDIVIDU table via the "idIndividu" variables. The UNION table contains one line per marriage act, and indicates the unique number of the union ("idUnion"), the individual identification numbers (idIndividu) of the bride and groom ("idHomme" and "idFemme"), the date and place of the marriage ("Date" and "CodeLieu"), and the data quality of the date of marriage ("QualiteDate"). The identification number idUNION is never overwritten or re-used. Since the numbers idHomme and idFemme point to the idIndividu of the spouse, they can change if a link is subsequently modified. Importantly, this file is named the UNION file because some marital unions have been inferred indirectly via information from other acts (notably children's baptisms) rather than directly via an act of marriage. This inferential process resembles our process for creating identities for persons who were never physically present in the colony but were nevertheless mentioned in acts as absent parents. As explained in our 2018 article, "The pursuit of fragmentary lives and the completion of individual and family biographies is an important part of producing as complete a file as possible" (Dillon et al., 2018, p. 12).

4 RPQA RESEARCH FILE, DISSEMINATION PROCEDURES AND NEW DEVELOPMENTS

Today, the RPQA ACTE file includes almost 640,000 original baptismal, marriage and burial acts from 1621 to 1799 (Table 1, see section 5.1). This count of baptisms, marriages and burials is somewhat less than the "true" count of births, unions and deaths which actually took place and which are recorded as events in our INDIVIDU file. By augmenting our data with complementary information such as marriage contracts, inferring missing unions from baptisms, and inferring missing deaths from remarriages, almost 750,000 births, marriages and deaths from 1621 to 1799 are available in the

5 The idMere and idPere variables are analogous in function to the momloc and poploc variables in the IPUMS, NAPP and PRDH historical census microdata. See IPUMS "Family Interrelationships" (https://usa.ipums.org/usa/chapter5/chapter5.shtml) and IPUMS-NAPP "Constructed Family Interrelationship Variables" (https://www.nappdata.org/napp/family_interrelationships.shtml), accessed January 18, 2021; Dillon, 2000.

INDIVIDU and UNION files for analysis (statistics not shown). The burial acts of 40,879 individuals born before 1750 and who died after 1800 have also been added to the RPQA, ensuring complete observation and permitting a broader demographic study of this population (Desjardins & Dillon, 2008). Contributions by researchers and genealogists have also helped the PRDH augment the family reconstitution and add variables to the database; examples include Protestant-Catholic marriages prior to 1800, listings of French soldiers from the Seven Years War 1755–1760 and African-origin and indigenous slaves. The RPQA family reconstitution features 474,000 individual biographies and 74,000 family files encompassing four or five generations and up to nine generations in certain cases. Upon request from researchers, the PRDH distributes a research file of the RPQA. The most recent version of this file is dated December 2021 and includes many corrections to pre-1800 observations made in the course of recent infrastructure projects. The research file is based on the INDIVIDU file, but also includes information from the UNION file for ease of research. Usually, the PRDH distributes the entire research file to researchers, but occasionally the PRDH prepares a particular extract of the file for those working on specific years, places or population sub-groups. For researchers who plan to conduct event-history analysis, the PRDH will also provide the MENTION and ACTE files. The PRDH has created two date variables to indicate or estimate the first and last observation of each individual. The dates of first and last observation are ideally defined via the dates of birth and death, with post-death events excluded, but for a minority will concern other events. In the case of this minority, if the last dated mention of an individual is from an act in which their presence (and vital status) is not indicated, we interpolate a date of last observation between the date of this act and a preceding act in which the individual's presence is clear.

The creation of historical census data and the integration of census and parish register data is another important part of the PRDH mandate. The PRDH created a complete-count database of the household-level 1831 Census of Quebec (78,049 household heads) and linked half of these household heads to the family reconstitution data (Cherkesly, Dillon, & Gagnon, 2019). For the same project, the PRDH transcribed over 450,000 occupations from the 1800–1824 birth and death acts as well as 46,000 occupations from the birth and death acts of the 1825–1849 parishes of Montreal, Quebec City, Trois-Rivières, Gaspésie and Saguenay/Charlevoix, ensuring researchers using Quebec family reconstitution data can integrate socio-economic status into their analyses. These occupations have been coded with OCCHISCO. Most recently, the PRDH is working with *The Canadian Peoples/Les populations canadiennes* project to code and prepare complete-count datasets of the 1851 to 1921 Canadian census microdata. The resulting infrastructure, including the PRDH's data file of the 1881 Canadian census, created in collaboration with FamilySearch, will include 40 million observations (Baskerville & Inwood, 2020, p. 598).

In December 2020, the PRDH obtained new funding for the project T*ranscending borders: A historical demographic infrastructure for the study of French-Canadian families in motion*. This project will pursue Quebec family reconstitution up to 1861, incorporating Protestant acts within Quebec and Catholic acts in cross-border Ontario parishes. The Institut Généalogique Drouin has contributed to the project over 350,000 marriage acts from 1800 to 1861, drawn from its Connolly collection, as well as over 880,000 baptismal and burial acts from 1850 to 1861. Access to the IGD Connolly marriage acts, which carry no data usage restrictions, will facilitate data management as well as data legacy protection at the PRDH. The IGD is also contributing to the project Catholic birth, marriage and burial acts from bordering communities in Ontario, namely the counties of Glengarry, Stormont, Prescott and Carleton (Ottawa). Linking Ontario Catholic records into the database will enable researchers to explore the lives of francophones who moved back and forth across the Quebec-Ontario border. A renewed collaboration with FamilySearch as well as with Ancestry will enable the PRDH to integrate complete-count census observations into the longitudinal data, beginning with the 1831 and 1852 censuses and eventually incorporating the 1825, 1844 and 1861 censuses. The PRDH will then close the family reconstitution file with linkage to 19th-century nominal Canadian censuses. Integrating census observations into longitudinal data offers an unbiased way to establish which individuals were still present in the population as of the date of the enumeration and thereby maximize usage of the data (Gutmann & Alter, 1993). The PRDH offers historical data files and access to the RPQA online repertoire free of charge to researchers and students; since 2015, the PRDH has responded to 70 requests from graduate students and Canadian and international researchers interested to use the PRDH data.

5 PUSHING FAMILY RECONSTITUTION FORWARD: ANALYSIS OF THE IMPQ FAMILY RECONSTITUTION, 1800–1849

5.1 THE IMPQ DATABASE

The recent extension of Quebec family reconstitution forward to 1849 was accomplished via an inter-university and inter-sectoral collaboration. In 2006, the PRDH first entered talks with IGD to plan the transcription of baptismal and burial acts from 1800 to 1849; the IGD conducted this work from 2009 to 2011, and provided copies of these acts to the PRDH in exchange for links between the acts. The contribution of these transcribed acts from the IGD became part of the inter-institutional and inter-sectoral collaboration *Infrastructure intégrée des microdonnées historiques de la population du Québec (1621–1965)* (IMPQ) project (2013–2017), funded by the Canadian Foundation for Innovation (CFI) (Vézina & Bournival, 2020; Vézina, St.-Hilaire, Bournival, & Bellavance, 2018). One goal of this project was to extend family reconstitution to 1849, using 167,868 BALSAC 1800–1849 marriage acts (linked intergenerationally) and 1,357,899 IGD 1800–1849 baptismal and burial acts. The IMPQ project in turn drew upon an earlier PRDH-BALSAC collaboration in which Registre de la Population du Québec Ancien (RPQA) marriages from 1621 to 1799 were linked to the BALSAC 19th- and 20th-century marriage database to create a research file of intergenerationally-linked marriages from 1621 to 1965. Family reconstitution from 1800 to 1849 for the IMPQ project was conducted by the PRDH at the Université de Montréal, using the previously-linked BALSAC marriage records as a core set of family files into which the PRDH integrated birth and death records, adjusting marriage links and adding new unions as required. Fortunately, the PRDH was able to start the project with several tools already in place: a 24-table relational database structure, extensive first- and last-name dictionaries to facilitate name comparisons, family reconstitution protocols, an automatic record linkage program developed and refined over the course of several decades, links to over 40,000 deaths after 1800 of persons born prior to 1750 and access to Quebec Protestant marriage records from IGD.

The 1800–1849 family reconstitution conducted as part of the IMPQ project was closed in November 2018, when a copy of the INDIVIDU, UNION, ACTE and MENTION tables containing longitudinal data from 1621 to 1849 were delivered to the BALSAC office at the Université du Québec à Chicoutimi, whose server is used to house the IMPQ files. All 17th- and 18th-century data included in the IMPQ file was derived from the RPQA. The 1621–1799 family reconstitution data as well as the 1800–1849 extension were contributed with the agreement that the inter-institutional title *IMPQ* would be used rather than a single-institution brand. As a result, the title and citation to be used by researchers is: "*Integrated Infrastructure of the Quebec Population Historical Microdata (1621–1965)* (IMPQ) [Database]. Université du Québec à Chicoutimi/Université du Québec à Trois-Rivières/Université de Montréal/Université Laval." The tables were transferred with PRDH identification numbers (idIndividu, idUnion and idActe) permitting researchers to establish a correspondence between the research file disseminated by the IMPQ project and the RPQA infrastructure resident in Montreal. Researchers can request access to the IMPQ database via the IMPQ website, https://impq.cieq.ca, or by sending a message directly to impq@uqtr.ca.

The new family reconstitution data from 1800 to 1849 includes 1,596,526 original baptismal, marriage and burial acts (Table 1). The PRDH linked these data to preceding RPQA acts, and the resulting 1621 to 1849 file includes 2,235,082 acts.

Table 1 *Distribution of baptism, marriage and burial acts, by period, Quebec 1621–1849*

Period	Baptisms	Marriages	Burials	Total
1621–1699	21,307	3,857	6,166	31,330
1700–1759	116,125	20,402	65,274	201,801
1760–1799	239,821	39,377	126,227	405,425
1800–1824	316,087	104,943	158,291	579,321
1825–1849	616,128	103,614	297,463	1,017,205
1621–1849	1,309,468	272,193	653,421	2,235,082

Source: RPQA & IMPQ. File data_ACTE.2019-01-09.sav.

Explanation: No selections applied.

5.2 ASSESSMENT OF THE 1800–1849 IMPQ DATA COMPLETENESS

To facilitate research using the 1800–1849 family reconstitutions in the IMPQ database, we present a brief assessment of data completeness.[6] Since family reconstitution is a long-term process, requiring a period of at least 75 years to complete the observation of most persons, and since our family reconstitution is not yet closed with a nominal census, it is important to understand the extent of data completeness in the last decades of the study period. Tables 2 and 3 show the completeness of this family reconstitution, indicating the percent of individuals with linked births, unions and deaths. Table 2 focuses on the period 1621 to 1824, selecting persons who were born or married or died before 1825. By selecting persons with a birth and/or a marriage and/or a death before 1825, Table 2 identifies persons who were included in our family reconstitution well in advance of the end of our study period in 1849. In Table 2, the number of individual biographies which include a birth linked forward to one or more marriages and then to a death (the optimal scenario for the study of fertility) is 157,307, or 19% of the file from 1621 to 1824. Another 274,246 individuals have a known date of birth linked to a date of death but no known marriage; such persons are 34% of the whole file, many of whom would be children who died in infancy. Finally, 24% of individual biographies feature a date of birth linked to one or more marriages, but not to a corresponding date of death; these would be individuals born in the early 19th century who died after the end of our family reconstitution (197,600 persons). Another 16% of individuals are in a similar situation, born during the 19th century but have not yet either married or died before the end of the observation period (130,898 individuals). From these case counts, we see that there are 629,153 individuals with a beginning observation (birth date between 1621 and 1824) and with either a marriage and/or a death to close observation. These cases represent 77% of all biographies.

The rules of historical demography discourage the use of marriages to close observation, but since the Quebec population exhibited high marriage intensity, marriages can optionally close observation for certain research topics such as infant mortality, especially if the observation period is delineated in such a way that record linkage coverage reaches high levels. Researchers desiring to study a population bounded by clear birth and death dates will have access to 431,553 cases from 1621 to 1824, 53% of the biographies (see percentages Table 2A). Researchers who wish complete birth-to-death biographies which represent the majority of the population can opt for a shorter observation period based on individuals born from 1621 to 1760. In this case, the researcher will have access to 139,116 cases with birth and death dates out of 164,696 biographies, or 84 % (see Table 3).

Table 2 *Completeness of individual biographies, RPQA & IMPQ microdata, 1621–1824*

Frequency Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	11	10,871	46,300	951	58,133
Date of Birth	130,898	274,246	197,600	157,307	760,051
TOTAL	130,909	285,117	243,900	158,258	**818,184**
Percentage Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	0.00	1.33	5.66	0.12	58,133
Date of birth	16.00	33.52	24.15	19.23	760,051
TOTAL	130,909	285,117	243,900	158,258	**818,184**

Source: RPQA & IMPQ. File data_INDIVIDU.2019-01-09.sav.

Explanation: The table includes all persons born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

6 This assessment addresses the family reconstitution based on births, marriages and deaths from 1800 to 1849. The full IMPQ database also contains linked BALSAC marriages up to the 1920s (since one year of marriages is added each year, the end date of available marriages = current year - 100).

Table 3 *Completeness of individual biographies, RPQA & IMPQ microdata, 1621–1760*

Frequency Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	132	668	19	169	988
Date of Birth	14,896	60,372	9,696	78,744	163,708
TOTAL	15,028	61,040	9,715	78,913	**164,696**
Percentage Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	0.08	0.41	0.01	0.10	988
Date of Birth	9.04	36.66	5.89	47.81	163,708
TOTAL	15,028	61,040	9,715	78,913	**164,696**

Source: RPQA & IMPQ. File data_INDIVIDU.2019-01-09.sav.

Explanation: The table includes all persons born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

Table 4 encompasses the period 1825 to 1849 and includes persons who were born, married or died from 1825 to 1849. This selection allows us to focus on the completeness of biographies toward the end of our study period. In this case, only 7% of biographies feature a birth linked to both a marriage and a death (70,869 cases), and 20% of biographies represent births linked directly to a death without a marriage (187,858 cases). Another 15% of biographies represent births linked to a marriage before 1850 but not yet linked to a death (144,558 cases). Less than half of the biographies toward the end of our study period include a birth linked to either a marriage or death (and just over a quarter are bounded with certainty by a birth and death.

Table 4 *Completeness of individual biographies, RPQA & IMPQ microdata, 1825–1849*

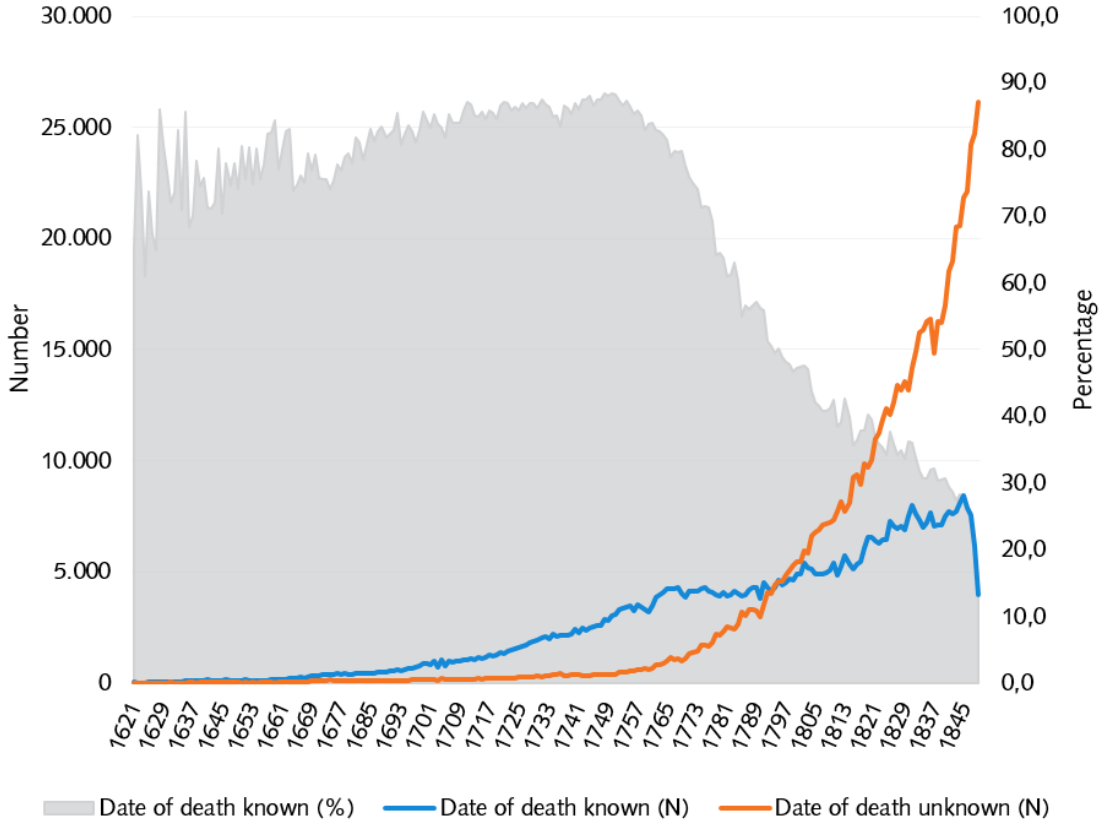
Frequency Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	1	20,495	119,248	397	140,141
Date of Birth	411,151	187,858	144,558	70,869	814,436
TOTAL	411,152	208,353	263,806	71,266	**954,577**
Percentage Distribution					
	No Date of Union		Date of Union		
	No date of death	Date of death	No date of death	Date of death	TOTAL
No date of birth	0.00	2.15	12.49	0.04	140,141
Date of birth	43.07	19.68	15.14	7.42	814,436
TOTAL	411,152	208,353	263,806	71,266	**954,577**

Source: RPQA & IMPQ. File data_INDIVIDU.2019-01-09.sav.

Explanation: The table includes all persons born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

Figure 3 addresses the completeness of individual biographies in the Quebec family reconstitution over time, showing the proportion of births linked to a known death, by year of birth, from 1621 to 1849. Obviously, the proportion of births not yet linked to a known death rises sharply toward the end of our study period as the closing of the biographies is constrained to younger and younger ages at death; 50% or more of persons born after 1794 are not linked to a known date of death (see the grey area in the graph).

Figure 3 *Number and percentage of births with known date of death by year of birth, Quebec 1621–1849*



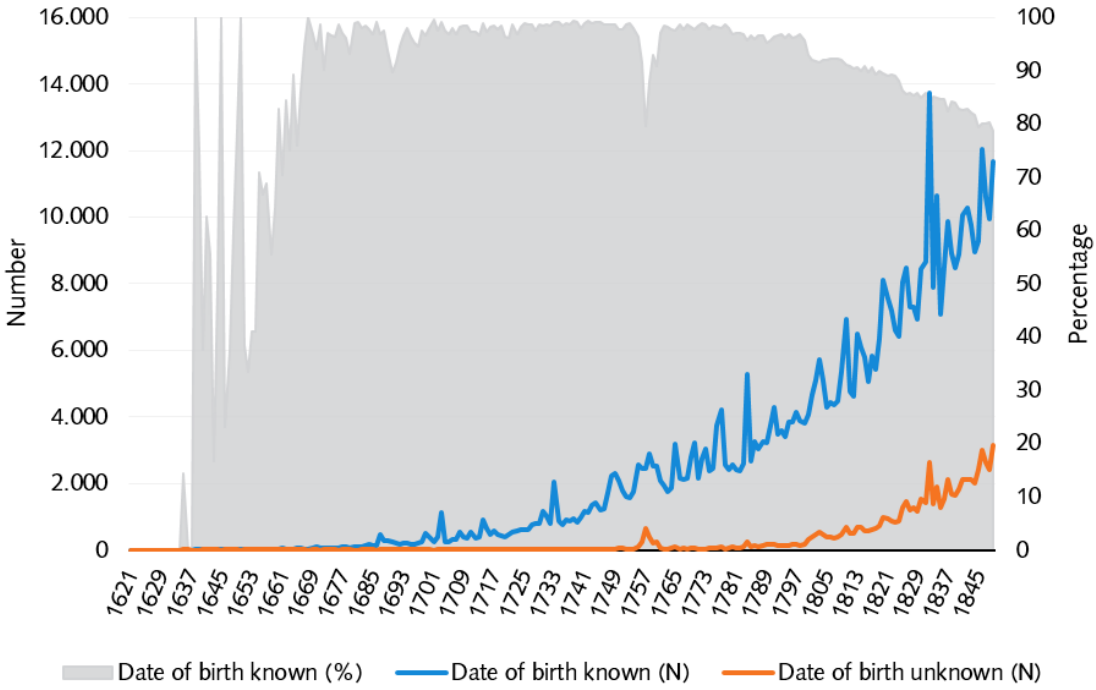
Source: File data_INDIVIDU_2019.01.09.sav.

Figure 4 presents the opposite view, the proportion of deaths in the database linked backward to a known date of birth from 1621 to 1849. This graph shows that more than 80% of individuals with a known death before 1849 and more than 90% of individuals with a known death prior to 1820 are also associated with a known birth. The proportion of deaths between 1820 and 1849 which are not yet linked to a known birth is in part due to incomplete horizontal or biographical linkage of acts from 1825–1849. Horizontal linkage of individual biographies from birth to marriage to death is always a final step after successive stages of vertical linkage (linking children's acts to the parental union), to avoid linking the wrong child baptism to the wrong child death or child marriage within sets of siblings. This hazard exists because the stock of first names among French Catholics in Quebec is relatively homogenous, and parents often re-used the same first name on a succeeding child if a prior child died in infancy. By the completion of the IMPQ project in November 2018, death and birth acts of children from 1825–1849 had been vertically linked to the parental union but many had not yet been "fused" or horizontally linked to form an individual biography.[7] The process of vertically linking child deaths to the parental record automatically generates an inferred birth year act, and the horizontal linkage phase reconciles (or "fuses") that inferred birth year act with a genuine birth act. As a result, the RPQA/IMPQ family reconstitution file includes, in some cases, a surplus of births associated with each parental file for the 1830s and 1840s. Researchers are therefore cautioned to limit for the moment fertility and mortality analyses to births and deaths occurring before 1825.

Record linkage from 1825–1849 in the 2018 Quebec family reconstitution is also incomplete because the PRDH encountered greater linkage difficulties after 1824. These difficulties required an increasing proportion of costly manual interventions to confirm birth and death links. The PRDH also needed to consult Protestant records to identify parents and determine a marriage place and date. We present here an investigation into the proportion and type of cases which required a manual record linkage intervention, to understand the scale of this dilemma and potential bias presented by using the IMPQ family reconstitution data after 1825.

7 For further detail on the PRDH record linkage process, including vertical and horizontal linkage phases, see Dillon et al. (2018, pp. 10–12).

Figure 4 *Number and percentage of deaths with known date of birth by year of death, Quebec 1621–1849*



Source: File data_INDIVIDU_2019.01.09.sav.

5.3 MANUAL RECORD LINKAGE OF BIRTHS AND DEATHS

The PRDH approach to family reconstitution has always been based on a combination of manual and automatic record linkage. For the 1800–1849 record linkage initiative, the PRDH deployed manual record linkage tasks to employees and volunteers using a series of Excel spreadsheets, most of which have been preserved. As a result, the authors have been able to create a variable indicating if the birth or death of an individual was linked vertically to the parental union via automatic or manual record linkage. In the context of the French Catholic population of Quebec the majority of births and deaths can be linked vertically to the parental file via automatic record linkage. Table 5 shows that overall, only 13% of births and 17% of deaths required individual attention to complete the vertical link. Over time, the proportion of births linked manually increased slightly, to reach 15% for the decade 1840–1849. The proportion of deaths which required a manual intervention to complete the vertical linkage increased notably, from 14% during the first two decades of the 19th century to 19–20% by the 1830s and 1840s.

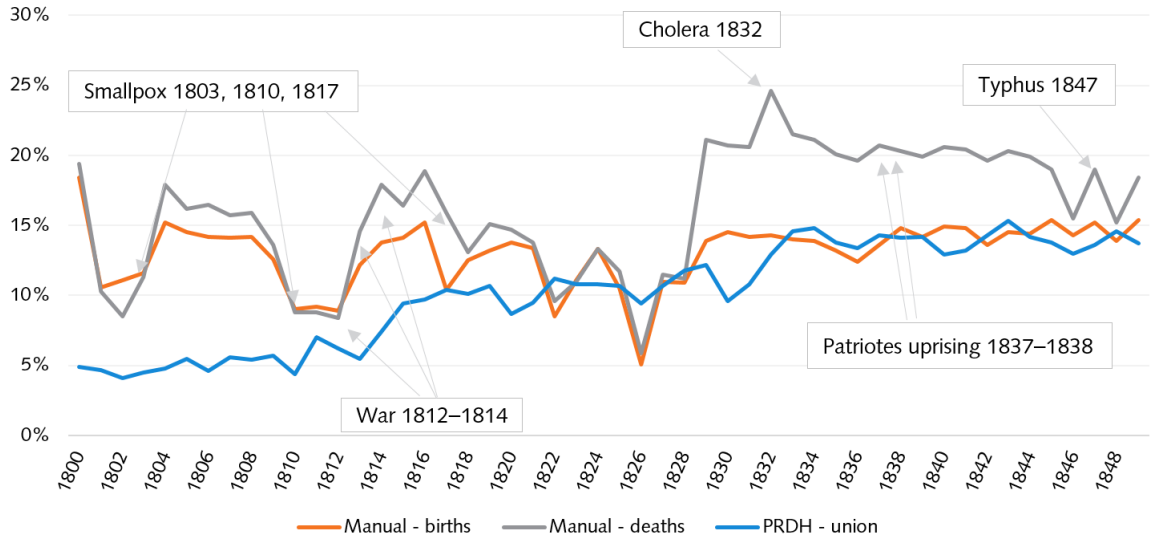
Table 5 *Percentage of births and deaths linked manually or inferred, and percentage of unions which are PRDH-inferred or Protestant unions, IMPQ microdata, 1800–1849*

	Births*	Deaths*	Unions**
%	13.3	16.8	11.4
% by decade			
1800–1809	13.7	14.5	5
1810–1819	11.9	13.8	8.1
1820–1829	11.2	12.4	10.6
1830–1839	13.9	20.9	13.3
1840–1849	14.6	18.8	13.9
N	914,428	434,371	224,297

*Source: *File data_INDIVIDU_2019.01.09.sav and **UNION_2018-11-02.*

Explanation: The table includes all persons born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

Figure 5 *Percent distribution of births & deaths* linked manually or inferred, and percent of unions** which are PRDH-inferred or Protestant, IMPQ microdata 1800–1849*



*Source: *From File data_INDIVIDU_2019.01.09.sav; **From UNION_2018-11-02 (PRDH-inferred & Protestant unions).*

Explanation: The table includes all persons born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

Figure 5 shows annual proportions of manually-linked deaths and births from 1800 to 1849, which can be divided into two periods. Before 1827, there are marked fluctuations in the proportions of manual links for both deaths and births, which rise and fall together. The proportions of deaths and births manually linked fell to their lowest levels, about 5%, in 1826. This pattern may indicate that some of the Excel work files used for manual linkage have not been preserved. Proportions of manual links for both deaths and births level off after 1827 with consistently higher interventions to link deaths than births. In this period, the proportion of deaths manually linked responds distinctly to epidemics of cholera in 1832 and typhus in 1847, but these events are not reflected in the series for births. In contrast, smallpox epidemics and war between 1800 and 1825 do not produce different responses in manual linkage for deaths and births.

Although fluctuations in manual linkages before 1827 may be due to missing work sheets, it is likely that automated linkage of deaths was less effective after 1827. Proportions of manually linked births after 1827 are roughly the same as peak years before 1827, but manually linked deaths are much more common after 1827. Our record linkers report that the quality and coherence of first name registration degraded significantly over the course of this period; Catholic priests would baptize a child with one first name and use a completely different first name on a burial act just days, weeks or months later. Any degradation in first name quality impedes automatic record linkage and increases the amount of time needed for manual record linkage. Poorer name quality should have a greater impact on linking parents' unions to child deaths than to child births, because parents' names routinely appeared in baptism records but did not appear consistently in burial records of married adults.

The diminished quality of Catholic birth and death registration after 1830 noticed by the manual linkers may be related to the increased number of parishioners per priest during this period. As the French-Canadian Catholic population kept growing rapidly in the course of the 19th century, the supply of priests probably did not at first keep pace. From 1810 to 1830, the average number of parishioners per priest rose from 1,375 to a peak of 1,834 (Hamelin, 1961, as quoted in Roy, 2001, p. 42), diminishing thereafter as the Catholic church began to open new parishes and recruit new priests.

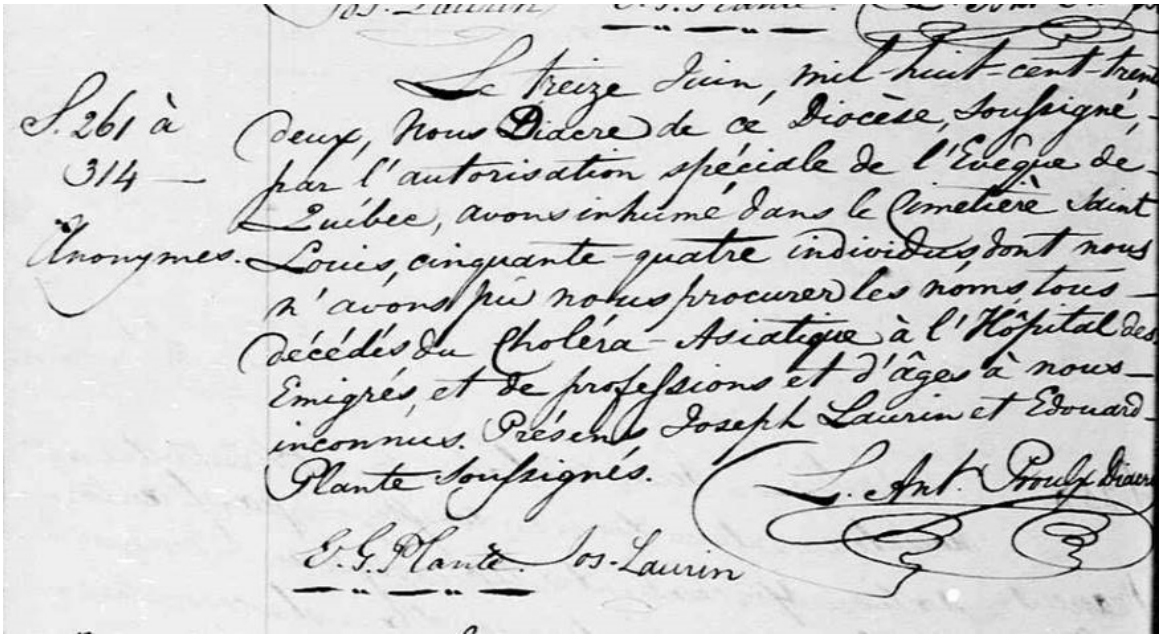
Greater record linkage difficulties might also have been occasioned by rapid social change and times of crisis. An earlier investigation of infant and juvenile mortality registration during the 17th and 18th century by Gagnon and Mazan concluded that epidemic outbreaks of diseases such as smallpox did not lead to under-registration of deaths (Gagnon & Mazan, 2009, p. 1611). However, by the 19th century, priests were handling an increasing number of new immigrants as well as rural-to-urban

migrants; the problem was not so much one of under-registration as quality of recorded information. For example, manual linkage interventions became increasingly necessary to link the births and deaths of children with 1 or 2 Protestant parents, although such cases represented only 2% of all manually-linked births and all deaths from 1800 to 1849.

Challenges encountered when manually linking records between 1800 and 1849 also suggest that when epidemics or wars occurred, the sudden rise in deaths was accompanied by a deterioration in the quality of record-keeping, including attentiveness to record both father and mother's first and last names and place of residence or place of birth. This hypothesis warrants a more focused follow-up study, beyond the scope of this paper. However, we observe that manual linkage interventions rose in the 1–3 years following the smallpox epidemics of 1803 and 1810 (but not 1817); manual linkage interventions also rose during the years of the War of 1812–1814 (Figure 5). Very telling is the way manual record linkage of deaths peaked at 25% in 1832, the year of a cholera epidemic. PRDH record linkers encountered at least 400 death acts for mass burials in Québec City during that year.

The majority of mass burials were registered in the Notre-Dame parish of Québec City from June 13 to July 1, 1832, upon the arrival of immigrant boats. Figure 6 provides an example of one such act which recorded the deaths of 54 individuals, "for whom we were not able to procure names, all having died of Asiatic-Cholera at the Emigrant Hospital, and professions and ages unknown to us." (translation by author).[8] The sudden increase in burials may have created an administrative burden for the church; in the act shown in Figure 6, it was not a priest who wrote the act and conducted the inhumation, but rather the deacon Louis-Antoine Proulx, acting by "special authorization". The PRDH created a death act in the ACTE file for each recorded death (see Figure 7), but the lack of name and age information prevents integration of each such death into the family reconstitution. While these acts are listed in the ACTE table, no corresponding individual identity has been assigned and the death is thus absent from the INDIVIDU table. In Figure 5, we also view an uptick in manual linkage of deaths during the year of a typhus epidemic in 1847, though no appreciable increase in manual linkage during the uprising of the Patriots in 1837.

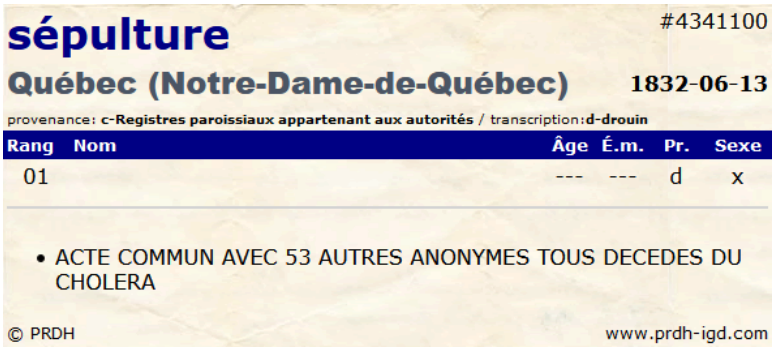
Figure 6 *Example of a mass burial, Notre-Dame Parish, Québec City, June 13, 1832*



Source: Image d1p_16170767.jpg provided with permission by ©2016 Fonds Drouin. http://www.prdh.umontreal.ca/RPQA/img/acte/4341131. Accessed January 8, 2021.

8 « […] cinquante-quatre individus, dont nous n'avons pu nous procurer les noms, tous décédés du Choléra-Asiatique à l'Hôpital des Émigrés, et de professions et d'âges à nous inconnus.» Signed by «Diacre de ce Diocèse» Louis-Antoine Proulx.

Figure 7 *Transcription of the first mention in the mass burial, Notre-Dame parish, Québec City, June 13, 1832*


sépulture #4341100

Québec (Notre-Dame-de-Québec) 1832-06-13

provenance: c-Registres paroissiaux appartenant aux autorités / transcription:d-drouin

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Source: http://www.prdh.umontreal.ca/RPQA/acte/4341100/. Accessed January 8, 2021.

5.4 IMPACT ON POPULATION PROFILE OF MANUAL RECORD LINKAGE OF PROTESTANT MARRIAGES

For the 1800–1849 marriages received from BALSAC, we do not know which unions were linked automatically or manually. However, for the purpose of this analysis, the authors have identified over 25,000 marriages which the PRDH manually integrated into the family reconstitution in one of two ways. The first case concerns baptisms or burials of children who could not be linked to a Catholic parental marriage record, but for whom one of the parents appeared to be English, Irish, Scottish, German or of another ethnicity based on last name and/or a place of origin reference within the act. In these instances, the PRDH turned to a collection of Quebec-based Protestant marriages made available to the PRDH by the IGD. The PRDH used these Protestant records to identify a date and place of the original parental union, in order to establish the family and to better specify the mother and father. In other instances of apparent Protestant-Catholic families, the PRDH could not find a corresponding Protestant marriage. Finally, the PRDH also identified child baptisms and burials for which the parents were apparently both French Catholic, but no marriage could be found. In such cases, the French Catholic parents may have married in another province, perhaps in neighbouring Ontario or New Brunswick or in an adjacent U.S. state. For these remaining acts, the PRDH used information on the children's baptismal and burial acts to "create" the parental union. On the basis of the date of birth of the first-known child, the PRDH inferred a year of marriage for the couple. All of this work required a manual linkage intervention.

Table 5 indicates that the proportion of all unions in the file which derive from the Protestant records or which have been inferred by the PRDH is 11%. This proportion represents a minimal estimate of manually-linked marriage acts, and is an indication of the proportion of unions which would be missing if researchers rely on French Catholic marriage acts in Quebec records alone. The proportion of all unions which the PRDH needed to research in the Protestant records or which the PRDH needed to infer on the basis of information on the children's record increased significantly, almost tripling from 5% in 1800–1809 to 14% of all unions in the 1840–1849 decade. According to Figure 5, which depicts the proportion of unions integrated into the file by the PRDH as a result of inferences based on other acts or via links to Protestant records, such links consistently rise, tracking the integration into the Quebec population of immigrants from England, Ireland and the United States. The gradual integration of British, Irish and American Loyalist immigrants into the population via inter-marriage with native-born Catholics slowed down the automatic record linkage process, requiring, over time, more and more consultation of Protestant records to link children's acts to unions.

Family reconstitution projects such as the PRDH combine automatic and manual record linkage to improve the representativity of the population under study by maximizing links across individual biographies and between generations. With our linkage status variable, we are able to compare the population profile of persons whose births or deaths were linked manually or automatically, as well as persons whose marriage link was inferred or drawn from Protestant records (Appendix 2). The most pertinent results concern the linkage of persons who married. Table 6 (drawn from Appendix 2) shows the percent distribution of characteristics of persons included in the Quebec family reconstitution file from 1800–1849 and who contracted a first union, controlling for the linkage status (PRDH-inferred or Protestant union, BALSAC Catholic marriage act, and all persons with a first union). It is supposed that the percentages in the final column represent as closely as possible the "true" distribution of characteristics in our targeted study population.

Table 6 *Percent distribution of characteristics by union status all persons with a first union, IMPQ microdata 1800–1849*

% Urban at first union	PRDH-inferred or Protestant	Balsac Catholic marriage acts	All unions
% First union in Montreal, Quebec City or Trois-Rivières	53	11	16
% Other parishes	44	73	70
% Unknown	3	16	14
% Married in Catholic or Protestant parish			
Married in Quebec, Catholic parish	0	84	74
Married in Quebec, Protestant parish	97	0	12
Unknown	3	16	14
% Ethno-Religious Status at first union			
French Catholic & other Catholic	0	84	73
English-Anglican	45	0	6
Scottish-Presbyterian	17	0	2
Other Protestant	34	0	4
Unknown	4	16	15
N	50,410	356,568	406,978

Source: File data_INDIVIDU_2019.01.09.sav

Explanation: The table includes all persons with a first marriage from 1800–1849, born in or who immigrated into Quebec including persons who emigrated from Québec, and excludes persons who never resided in Quebec ("Hors Population" status).

The integration of PRDH-inferred or Protestant cases alters the distribution of characteristics of persons with a first union. The proportion of individuals with a BALSAC-linked first marriage who married in an urban place (Montreal, Quebec City or Trois-Rivières) was 11%, whereas this proportion for all persons was higher, 16%. This increase in the percentage of individuals married in an urban place is due to the integration of PRDH-inferred and Protestant unions: 53% of these additional unions took place in Montréal, Québec City or Trois-Rivières. This same result is echoed in the distribution of marriage regions. While 84% of the BALSAC-linked first unions were contracted in a Catholic Quebec parish, this proportion falls to 74% in the total population of persons with a first union, due to the integration of PRDH-inferred and Protestant marriages. The ethno-religious status of persons declaring a first union provides additional detail: we see here that 45% of persons with a PRDH-inferred or Protestant first union were married in English or Anglican churches, 17% of these unions were contracted at Scottish or Presbyterian churches and another 34% were made in other Protestant churches (mostly Methodist, Baptist or Congregationalist).

Since the integration of mixed Protestant-Catholic marriages into the family reconstitution increased the overall percentage of Protestant unions in the study population and increased the percentage of urban first unions, it is possible that the geographic characteristics of births and deaths might have been similarly affected. However, the percentage of persons who were born or died in Montreal, Quebec City or Trois-Rivières was not increased by the identification and incorporation into the file of Protestant unions (Appendix 2). In this high-fertility society, the denominators for the "Births" and "Deaths" results are overwhelmingly dominated by children born to French Catholic families. Even when we isolate births and deaths from 1840–1849, the profile of automatically-linked cases is very similar to that of the whole population (results not shown). However, the "domino" effect of incorporating Protestant unions into the database will likely be manifested to a greater extent in subsequent years, as immigration increases.

7 CONCLUSIONS AND MOVING FORWARD

Participating in the IMPQ project and pushing family reconstitution forward to the mid-19th century has motivated PRDH record-linkers to confront the increasingly mixed and geographically mobile Quebec population of the 19th century. Marital exogamy, observed in the years following the British Conquest (Angers, 2021, p. 34; Pépin, 2021, p. 35), continued during the 19th century, as a minority of French Catholic women and men partnered with Irish, Scottish and English Catholics and Protestants who migrated to Quebec. The opportunity to form mixed ethno-religious marriages varied by region across Quebec, with the greatest potential to do so in Montreal and along the borders with Ontario, New England and New Brunswick (Gauvreau & Thornton, 2015, pp. 116–117). By 1881, the proportion of mixed marriages across the province was 4.85% (Gauvreau & Thornton, 2015, p. 123); this proportion varied from 4 to 8% in Quebec City from 1852 to 1911 (Beauregard-Gosselin, 2016, p. 99; Gauvreau, Thornton, & Vézina, 2010, p. 365) and reached 13% in 1881 Gaspésie (Gauvreau, Thornton, & Vézina, 2010, p. 365). Record linkage in the Quebec context is complicated by presence of mixed Protestant-Catholic couples as well as some entirely Protestant couples who turned to Catholic priests to bury their deceased children or to baptize a new arrival. Some of these families recorded just one or two events in the Catholic registers and then disappeared; either they recorded subsequent events in Protestant registers or migrated out of Quebec. Crisis years of armed conflict and epidemics, especially in Montreal and Quebec City, coincided with upticks in the proportion of births and deaths which required manual linkage, suggesting that busy priests dealing with frequent burials took less care with names.

According to informal testimony from the PRDH record linking staff, the quality of first name registration also degraded more generally over the course of the 19th century, at least for the cases linked in a manual way, possibly in relation to the increased number of parishioners per priest and in relation to periods of war or epidemics. Identifying and incorporating this population-on-the-margins into our database required extra resources, but has resulted in a more complete file than we would have, had we relied on automatic record linkage techniques alone. These results suggest that family reconstitution of the Quebec population subsequent to 1850 will need to incorporate complete-count census records (soon to be available for the 1852 to 1921 period) into the family reconstitution process to help boost the proportion of automatic linkages. The IMPQ project has already integrated historical censuses with BALSAC civil records for the Saguenay, Gaspésie and Côte-Nord regionns and for the cities of Québec and Trois-Rivières (Vézina & Bournival, 2020, p. 117; Vézina et al., 2018, p. 232 and p. 237). Notwithstanding the advantages posed by linking to censuses, the increasing outmigration of French Canadians to the central and western Canadian provinces and to the United States will pose significant obstacles for automatic record linkage. Innovative use of Canadian and U.S. complete-count census data may prove useful in that regard (see Antonie, Baskerville, Grewal, & Turcotte, 2018; Ruggles, Fitch, & Roberts, 2018, pp. 25–26). Nevertheless, family reconstitution projects will still need to set aside significant resources for manual record linkage to achieve a large percent of complete biographies and to assure representation of Quebec's increasingly multi-ethnic population. While data creators may adopt automatic linkage rules based on neutral criteria that would not apparently select the data in particular ways (for example, by avoiding the use of occupations, place of residence or secondary family members to confirm links), even the most apparently objective family reconstitution rules could lead to some form of selection if external forces such as crises, immigration and diversification of the population affect record quality and thereby linkage success rates. Continuing investment in manual record linkage as a complement to automatic record linkage, to come closer and closer to a 100% observation, would mitigate much of this potential selection bias.

To that end, the PRDH is working with genealogy partners, volunteers and graduate students to augment and complete its family reconstitution. The approach taken by the PRDH is to expand record linkage spatially (expanding beyond the Quebec border) and culturally (expanding beyond French Canadian Catholics) as well as to incorporate complementary information in the first instance, before advancing forward in time by multiple decades. This approach is preferable in order to complete and control as many individual and family biographies as possible for the purposes of historical demographic research. As a result, the PRDH continues to focus on the period prior to 1881, bringing together work on the early censuses of Quebec (1825, 1831, 1844), augmenting IGD parish records with occupation transcriptions and working on the TCP project to prepare complete-count datsets of the 1851 to 1921 Canadian censuses. The new CFI project, Transcending Borders, will allow the PRDH to push Quebec family reconstitution up to 1861, adding Protestant acts from within Quebec and Catholic acts from Ontario parishes across the border, and closing the reconstitution by linking to mid-

19th century censuses. This new project is thus unique for its devotion to 100% family reconstitution, focus on population closure in the period before Canadian Confederation (before 1867), pursuit of mixed Catholic-Protestant marriages and linkage to early franco-Ontarian communities. This initiative is distinct from yet complementary to the concurrent *i-BALSAC* Quebec-based historical data infrastructure project, which focuses on "a joint genealogical, genomic and geographic approach." (Vézina & Bournival, 2020, p. 117).

While the use of complete-count census records outside Quebec will help to bring Quebec family reconstitution forward in the 19th and 20th centuries, researchers also need to reflect on the question "What is our population?" Shall we confine our interest to the core French Catholic population of Quebec, or a population which includes those on the social and geographic margins who intermarried and otherwise moved in and out of the community? The latest PRDH infrastructure project represents a step in this direction. Keeping its eye on the pre-Confederation period (prior to 1867), the PRDH will leverage the resources of the IGD as well as FamilySearch to extend the longitudinal database in a way that incorporates observations of French Canadians "on the margins": those who, via geographic mobility, transcended boundaries to push into new regions and who, via marriage, engaged with Irish, Scottish, English or American newcomers. Can we expand our purview even further? Thus far, family reconstitution of Canada's Protestant population has not been undertaken because historic Protestant records are less well preserved as Catholic records, and because they often lack the first and last names of both mothers and fathers, information necessary to achieve high proportions of automatic record linkage. It is hoped that the extension of Quebec Catholic family reconstitution beyond 1849, the availability of complete-count census microdata, the greater implication of diverse genealogical partners in the production of images and data, and the advent of natural language processing and machine learning has created the conditions to address Protestant record linkage. This may only be feasible on a broad scale for the second half of the 19th century when the census enumeration of entire households at two or more decennial intervals may help to establish and confirm links across birth, marriage and death acts. Finally, we need to expand our notion of our population beyond the limits of colonial settlers to include First Nations persons as well as other non-white residents, namely Afro-Canadians. In some cases, this work will require better identification of persons already included in the database, and in others, the addition of complementary records. The principles of indigenous data sovereignty, or a consideration of "[…] the rights and interests of indigenous peoples relating to the collection, ownership and application of data about their people […]" will also need to inform our approach (Kukutai & Taylor, 2016, p. 2). We have reason to hope that collaborations with genealogical partners, as well as inter-university collaborations and the prompting of our graduate students will open doors to expand our notion of our population and thereby our database developments.

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APPENDIX

Appendix 1 *Principal variables by table*

Variable label	Variable description
Table: Acte	
idActe	Unique identification Number of Act
Type	Type of Act
DateEvenement	Date of Event
Date	Date of Registration
Provenance	Provenance of Act
Consanguinite	Consanguinity declaration by priest
ObiitOndoiement	Emergency baptism or marginal notation on birth act indicating a death occurred
imageTag	IGD image tag
Table: Mention	
idActe	Unique identification Number of Act
idMention	Unique identification Number of Mention
Role	Role of individual in the act (subject, spouse, father, mother)
Sexe	Sex
Rang	Rank of subject in the act (sequential)
idIndividu	Unique identification number of individual
Age	Age in days, weeks, months or years, as declared in act or according to a description indicating that an infant lived a few hours or a few moments
EtatMatrimonial	Marital status as declared in act
nom	Last name as recorded in act
prenom	First name as recorded in act
nomStandard	Standardized version of last name
prenomStandard	Standardized version of first name
Presence	Indication of individual as Present at event, Absent, Living, Deceased or Status Unknown
AptitudeASigner	Whether individual signed their name, did not sign their name or unknown
Profession	Occupation and/or social status
Residence	Place of residence, as described in act
Origine	Origin, as described in act (can be an ethnicity or a place)
Table: Individu	
idIndividu	Unique identification number of individual
idPere	Unique identification number for father (father's idIndividu)
idMere	Unique identification number for mother (mother's idIndividu)
DateNaissance	Date of Birth
CodeLieuNaissance	Code for parish of birth
QualiteDateNaissance	Quality code for date of birth
DateDeces	Code for date of death
CodeLieuDeces	Code for parish of death
QualiteDateDeces	Quality code for date of death
Sexe	Sex
Illegitime	Illegitimate at birth (born to unmarried parents)
Immigrant	Immigrant (born outside Quebec) (0 or 1)

Emigrant	Emigrant (emigrated from Quebec before death) (0 or 1)
Amerindien	Indigenous status (0 or 1)
HorsPopulation	Outside the population (never lived in Quebec) (0 or 1)
CodeOrigineEthnique	Ethnic origin
nomStandard	Standardized version of last name
prenomStandard	Standardized version of first name

Table: Union

idUnion	Unique identification number for the union
idHomme	idIndividu of the groom
idFemme	idIndividu of the bride
Date	Date of Union
QualiteDate	Quality code for the date of union
CodeLieu	Code for parish of marriage

Appendix 2 *Percent distribution of characteristics by linkage status all persons with a birth and/or death and/or first union, IMPQ microdata 1800–1849*

	Births			Deaths			First Unions		
Sex	**M**	**A**	**All**	**M**	**A**	**All**	**PRDH-inferred/ Protestant**	**Balsac F-Catholic**	**All**
Female	49	48	48	47	48	47	50	52	51
Male	52	50	50	49	49	49	50	48	49
Decade of event									
1800–1809	12	12	12	10	12	12	4	10	10
1810–1819	13	15	15	12	15	15	10	15	14
1820–1829	17	20	20	14	21	20	18	20	20
1830–1839	25	24	24	**32**	**24**	**25**	**29**	**24**	**25**
1840–1849	**33**	**30**	**30**	**32**	**28**	**29**	**38**	**31**	**32**
Known Events									
Birth date known				92	94	94	3	69	61
Death date known	27	34	33				2	14	13
Marriage date known	15	17	17	26	26	26			
Urban-Rural status									
Urban parish of birth (Mtl/TR/QCity)	3	2	2	2	2	2	1	12.4	12.3
Urban parish of union 1 (Mtl/TR/QCity)	2	2	2	4	3	3	**41**	**7**	**12**
Urban parish of death (Mtl/TR/QCity)	7	6	6	**23**	15	16	5	13	12
Ethno-Religious Status (from marriage1)									
French Catholic & other Catholic							**0**	**83**	**73**
English-Anglican							**45**	**0**	**6**
Scottish-Presbyterian							**17**	**0**	**2**
Other Protestant							**34**	**0**	**4**
Unknown							**4**	**17**	**15**
TOTAL	127,233	832,331	959,564	73,061	361,310	434,371	50,734	360,429	411,163

Source: File data_INDIVIDU_2019.01.09.sav and UNION_2018-11-02.

Explanation: Births denominator: all persons with a birth recorded from 1800–1849; Deaths denominator: all persons with a death recorded from 1800–1849. First Unions denominator: all persons with a first marriage from 1800–1849. M = Manual or inferred linkage ; A = Automatic linkage ; All = All cases.