Birth and Death certificates from colonial Senegal Coverage, validity, and potential for future research

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Abstract – Résumé

Abstract

This paper provides an overview and quality assessment of Saint-Louis and Dakar's birth and death certificates between 1880 and 1921. While individual-level data sources have an extensive tradition in historical demography, civil registration documents from colonial Senegal have yet to be used in demographic research. The paper describes the available data in the two Senegalese towns between 1880 and 1921 using a sample of 6 935 births, 1 328 infant deaths, and 718 stillbirths. Various measures are employed to evaluate the coverage and quality of the data in the birth and death registries. Registered crude death and birth rates indicate high coverage in Saint-Louis but less so for Dakar. Sex ratios at (still)birth highlight some under-registration of female births. A comparison between birth registration and the 1876 census shows that the birth registry in Saint-Louis covered a large part of the population. A similar analysis for Dakar, based on the 1904 census, indicates that the coverage and validity were probably lower in Dakar's birth registry. An assessment of the completeness of neonatal mortality registration shows that the omission of newborns that passed their first few days of life is limited in Saint-Louis. In both towns, a high degree of age heaping means that age data in the source are rough approximations. Overall, the quality of the source is sufficient for researching certain historical demographic questions after researchers make adjustments. Suggestions for potential research avenues on mortality and fertility using this source are provided at the end of the paper..

Keywords: Senegal, civil registration, historical demography, individual-level data, data quality

Résumé

Cet article présente une vue d'ensemble et une évaluation de la qualité des actes de naissance et de décès de Saint-Louis et de Dakar entre 1880 et 1921. Alors que les sources de données individuelles ont une longue tradition en démographie historique, les documents d'état civil du Sénégal colonial n'ont pas encore été utilisés en recherche démographique. L'article décrit les données disponibles dans les deux villes sénégalaises entre 1880 et 1921, sur la base d'un échantillon de 6 935 naissances, 1 328 décès infantiles et 718 mort-nés. Différentes mesures sont employées pour évaluer la couverture et la qualité des données des registres des naissances et des décès. Les taux bruts de mortalité et de natalité enregistrés indiquent une couverture élevée à Saint-Louis, mais moins à Dakar. Les rapports de masculinité à la naissance (mortinatalité) mettent en évidence un certain sous-enregistrement des naissances féminines. Une comparaison entre les données du registre des naissances et les données du recensement de 1876 montre que l'enregistrement des naissances à Saint-Louis couvrait une grande partie de la population. Une analyse similaire pour Dakar, basée sur les données du recensement de 1904, indique que la couverture et la validité étaient probablement plus faibles dans le registre des naissances de Dakar. Une analyse préliminaire de l'exhaustivité de l'enregistrement de la mortalité néonatale montre que l'omission des nouveau-nés décédés dans les premiers jours de vie est limitée à Saint-Louis. Dans les deux villes, le haut degré d'attirance des âges se terminant par 0 ou 5 signifie que les données sur l'âge ne sont que des approximations. Dans l'ensemble, la qualité de la source est suffisante pour permettre l'étude de quelques questions démographiques historiques après certains ajustements. Quelques suggestions de pistes de recherche potentielles sur la mortalité et la fécondité à partir de cette source sont proposées à la fin de l'article.

Mots-clés : Sénégal, enregistrement de l'état civil, démographie historique, données individuelles, qualité des données

1. Introduction

Individual-level vital statistical sources, like civil and parish registers, are widely used in historical demography. They have been central to exploring questions at the field's core, like levels and trends in mortality, fertility, migration, and family structures (Bideau *et al.*, 1994; Bengtsson *et al.*, 2004). The use of such sources by (historical) demographers of sub-Saharan Africa (SSA) has had a long but slowly developing history (Thornton, 1977; 2021; Katzenellenbogen *et al.,* 1993; Doyle, 2013; Walters, 2016; Siiskonen, 2023). Drawing on parish register data for South Africa, Tanzania, and Namibia, researchers have pushed estimates of mortality and fertility back to at least the 1940s, offering insights into the onset of mortality transitions and the phenomenon of rising fertility around the middle of the century (Katzenellenbogen *et al.*, 1993; Walters, 2021; Siiskonen, 2023).

Although similar historical analyses for West Africa have been absent in recent decades, the first studies using individual-level data from SSA were conducted in the region. Already in the 1960s, Pierre Cantrelle (1965) provided an overview of available demographic sources for Senegal, where he highlighted the potential of individual-level parish register data that could be analyzed using Louis Henry's methods (Fleury and Henry, 1956; Cantrelle, 1965: 29, 117). His call undoubtedly contributed to the surge in interest in using historical parish registers for quantitative demographic analysis in French-speaking West Africa in the 1960s and 1970s (Lacombe, 1970; Benoît and Lacombe, 1978; Benoit *et al.*, 1981). If not the first, this was one of the first times demographers used individual-level data from SSA to generate estimates of trends in mortality and fertility that extended before 1940 (Lacombe, 1970: 93–6; Benoit *et al.*, 1981). Since then, however, similar studies on West Africa have not been published.

The apparent paucity of well-kept civil registration systems in the colonial period likely explains the lack of analyses employing such sources before the 1960s. While Cantrelle (1965: 27–31) was optimistic about the research potential of parish registers in Senegal, he was pessimistic about the Senegalese civil registration system's potential. Even in cities like Dakar and Saint-Louis, where the registry's coverage was high in the second half of the twentieth century, he argued, the registration system was backed by weak laws in the early colonial period (Cantrelle, 1997). The colonial authorities only made registering vital events for non-French citizens compulsory in 1933 (Cantrelle, 1965: 31; 1997), which implies that, even in urban centers, the potential of civil registration sources for pre-1930 historical demographic analysis is limited. Such skepticism about the quality of vital registration sources may have contributed to these sources being barely explored in SSA.

A glance at the historical record and the available certificates reveals that there are reasons to be more optimistic about the civil registration system in colonial Senegal. Already in the mid-nineteenth century, the French West African (FWA) colonial government was intent on strictly enforcing the registration of vital events in the Senegalese Four Communes (*Quatre Communes*), which consisted of Saint-Louis, Gorée, Rufisque, and Dakar (Valière, 1874a). Moreover, the project of the *Archives Nationales d'Outre Mer* (ANOM; National Archives of Overseas Territories) to photo-digitize all colonial civil registration documents uncovers an abundance of available nineteenth-century birth and death certificates from the Senegalese Four Communes (ANOM, n.d.).[1] To my knowledge, besides a study on living standards in early-twentieth-century Dakar (Westland, 2021), no publications have used demographic data from this individual-level data source.

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[1] See, ANOM (n.d.), "Sénégal", *Etat Civil*,
http://anom.archivesnationales.culture.gouv.fr/caomec2/recherche.php?territoire=SENEGAL,
accessed on 30 October 2024.

In this paper, I provide an overview of the source and the data it offers, make some data quality assessments, and explore the potential for historical demographic research based on the available certificates for Saint-Louis and Dakar between 1880 and 1921. For some metrics used in the assessment, such as the crude death rate (CDR; deaths per thousand inhabitants), I use all the certificates available from Saint-Louis and Dakar for 1880–1921. However, individual-level data, such as ages at death and sex, are necessary to assess the coverage (the extent to which the source covers the total population of the towns) and validity (the extent to which the data in the source is accurate) of the source. I draw on a sample of these certificates to produce such metrics, which I transcribed into a pilot database. The pilot database focuses on data on infant mortality and data from all the available birth certificates in 1880, 1891, 1904, 1912, and 1920 in Saint-Louis and the same years, except 1880, for Dakar ($N = 6\ 935$). In addition to birth certificates, it includes data on stillbirths for the same years in both towns ($N = 718$). Finally, the dataset includes death certificate data for those born in the abovementioned years and towns and passed in infancy (first twelve months of life; $N = 1\ 328$). From these 8 981 certificates, information, such as the ages and occupations of every individual mentioned in the document, was compiled into the pilot database.

The combination of towns and years was selected for the pilot database because census data is available for both towns close to some of these years, such as the 1876 and 1904 urban censuses. The other years were selected to get two additional benchmark years at an approximate distance of ten years to trace some of the quality assessment metrics. 1891, 1904, and 1912 were explicitly selected because, as seen below (Figure 1), they appear to be relatively normal years in terms of mortality and fertility. 1920 was added to get data for the most recent year available. Rufisque was excluded from the pilot database due to its proximity to Dakar and the lack of archival census data to which the registry could be compared. Because of its low demographic gravity, Gorée was not included in the database even though several demographic sources are available for the small island.

2. Background

2.1 Historical setting – The civil registration system in colonial Senegal

The colonial Senegalese civil registry started in the earliest French trade outposts in West Africa, the islands of Saint-Louis and Gorée. Despite originating in the early 18th century, continuous registration of more than a few tens of births, deaths, and marriages started after 1820. In the early nineteenth century, the books only contain certificates of the colonial elites in the French-controlled outposts, excluding most of the towns' populations. It seemingly took until the 1850s to make birth and death registration of the so-called "Muslim inhabitants," meaning the African population of Saint-Louis and Gorée, mandatory (Valière, 1874a).

This expansion of the civil registry was attempted at a time when the colonial government increasingly feared epidemics. Historians note that the mandatory registration of vital events for lower classes became part of a system of surveillance that could help prevent future outbreaks by enforcing quick burials (Ngalamulume, 2012: 140, 175; Pam, 2018, 96). Coercive measures, such as fines, were imposed on those failing to register the births and deaths of their direct relatives (Valière, 1874a). By 1874, the authorities legislated that parents had to declare births within five days and deaths within two days (Valière, 1874a). One of the repercussions of not complying with the registration of deaths seemingly included the prevention of burials, as a death certificate had to be signed by the deputy mayor before a burial

permit was issued.[2] Moreover, the fine for non-registration equaled more than fifty daily wages of the highest-paid unskilled laborers (Valière, 1874a; Valière, 1874b). Although it is unclear if the fine was successful and easy to enforce, the mandatory provision of a burial permit at the cemetery would have made it difficult for inhabitants to bury their relatives.

The need for an early signaling system for epidemics explains why the French colonial government would increasingly enforce death registration. However, it does not directly explain why inhabitants would comply with birth registration. What likely made the registration of births important was the role of birth certificates of those born in the Four Communes in defining who was a French subject and who was not (Kopytoff, 2019). Indeed, the French-subject status of Africans born in the Four Communes remained ambiguous until 1916, when Blaise Diagne secured the votes in the French parliament that further solidified citizenship rights for those born in Saint-Louis, Gorée, Rufisque, or Dakar (Kopytoff, 2019). Even before 1916, however, being considered a French subject came with considerably more civil and political rights compared to those who were not (Diouf, 1998; Kopytoff, 2019).

Table 1 Approximate[a] registered births and deaths per Senegalese Commune, 1880–1921

	St. Louis		Dakar		Rufisque		Gorée		Total (period)	
	Births	Deaths	Births	Deaths	Births	Deaths	Births	Deaths	Births	Deaths
1880–1899	15 554	20 585	4 403	6 115	4 872	6 342	1 898	2 047	26 727	35 089
1900–1921	24 978	24 340	13 971	24 203	10 149	10 436[b]	881[c]	1 282[c]	49 979	60 261
Total (town)	40 532	44 925	18 374	30 318	15 021	16 778	2 779	3 329	76 706	95 350

Source: ANOM (n.d.), "Sénégal", État Civil,
http://anom.archivesnationales.culture.gouv.fr/caomec2/recherche.php?territoire=SENEGAL,
assessed on 14 November 2024.

[a] The number of registered events is an approximation because birth and death books contain various other types of acts that slightly inflate the number of events. For example, about three percent of the documents in the birth registry of Saint-Louis between 1880 and 1921 are not birth certificates.

[b] For Rufisque, the deaths of 1914 are missing.

[c] For Gorée, the available books end in 1920.

Table 1 presents the estimated number of photo-digitized, though not transcribed, birth and death certificates by the 1880–99 and 1900–1921 periods for the Four Communes. The table includes events from Rufisque and Gorée to show that births and deaths were registered throughout the Four Communes. In total, the available civil registry books between 1880 and 1921 contain more than 76 000 births and 95 000 deaths. In Saint-Louis, a town of about 15 000 to 30 000 inhabitants in the nineteenth century, the registered births exceeded,

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[2] Although the mandatory showing of a death certificate was not instituted in the 1874 amendment—this measure was likely put into law before that—death certificates of 1891 were signed by the deputy mayor with the message "Après lecture faite et avoir délivré le permis d'inhumation" (see Appendix Figure A1). This indicates that the death certificate had to be signed before a burial permit was issued.

on average, 750 per year in 1880–99. For Dakar, a much smaller town compared to Saint-Louis until the early 1900s (Verrière, 1965: 197; Betts, 1985; Becker *et al.*, 2008: 11, 215; Ngalamulume, 2012: 21), about 220 births and 300 deaths were registered per year on average. These figures indicate that vital event registration was not rare in these towns. Readers can find the approximate number of birth and death certificates available by year and town in Appendix Table A1.

Marriage certificates hardly exceed twenty for most years. That is because marriage between Muslims was considered a family matter that fell under the jurisdiction of the Muslim tribunal, not of the colonial state (Diouf, 1998; Coquery-Vidrovitch, 2001; Yade, 2007). Therefore, certifying a marriage at the civil registry remained optional.

2.2 Data in the registry, 1880–1921

In 1880–1921, the Four Communes' civil servants kept the registry, and the deputy mayor of each town signed the certificates. Almost every event was declared by an adult male who was accompanied by two male witnesses when declaring a birth and by one witness when issuing a death certificate. Generally, fathers declared the births and deaths of infants or children. Based on data from the pilot database, Tables 2 and 3 show the information available for every individual mentioned in a birth certificate, except for the deputy mayor, by sampled year. Appendix Figure A2 presents a birth certificate example.

Available information varies by year and by the position of each person mentioned. Some information is available yearly in birth certificates from both towns, like an infant's sex and the declarant's occupation, age, and ability to sign. Some information is available for almost every year in both towns, like the mother's civil status and age and the father's occupation. Some data is only captured in one of the two towns, like the neighborhood or street of birth, available every year in Saint-Louis but only noted in Dakar in 1891. Other possible variables are available for a limited number of years, such as whether the infant's maternal grandparents are still alive, which was captured in 1880 in Saint-Louis but was no longer recorded by 1891.

Death certificates (example in Appendix Figure A1) capture relatively similar information to birth certificates. However, they could contain additional information on the person of interest—the deceased person. Information like marital status, potential spouse, and occupation can be captured if the deceased person was in a later stage of life when they passed. Data on the parents of the persons who passed at an older age is available to a much lesser extent compared to those who passed in infancy, for whom the information is relatively consistent (Table 4 and Table 5). Because the pilot database contains only data collected from the death certificates of 1 328 infants, I cannot be sure how well the death certificates of adults capture occupational, spousal, and parental information. For infants' death certificates, information on their relatives is complete, except for information on their fathers, who were sometimes unknown or left unmentioned. An unknown father probably means that the father did not recognize the child as his own or that the father and mother were separated before the infant's birth.

Table 2: Data available in Birth Certificates by year, Saint-Louis 1880–1920

Year	1880	1891	1904	1912	1920
Person Born					
First and last name	x	x	x	x	x
Sex	x	x	x	x	x
Place of birth[a]	x (street-level)	x (street-level)	x (street-level)	x (street-level)	x (street-level)
Twin birth[b]	x	x	x	x	x
Declarant					
First and last name	x	x	x	x	x
Occupation	x	x	x	x	x
Age	x	x	x	x	x
Relation to person born	x	x	x (only if father)	x (only if father)	x (only if father)
Ability to sign	x	x	x	x	x
Location of Residence			x (neighborhood)	x (neighborhood)	x (street-level)
Mother					
First and last name	x	x	x	x	x
Occupation	x	x			
Civil Status	x	x	x	x	x
Age	x	x	x	x	x
Birthplace	x	x			
Location of Residence	x (street-level)	x (street-level)	x (street-level)	x (street-level)	x (street-level)
Name parents	x				
Parents alive or not	x				
Father (when known)					
First and last name	x	x	x	x	x
Occupation	x (if declarant)	x	x	x	x
Age	x (if declarant)	x	x	x	x
Ability to sign	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)
Whether alive	x	x	x	x	x
Witnesses					
First and last name	x	x	x	x	x
Occupation	x	x	x	x	x
Age	x	x	x	x	
Ability to sign	x	x	x	x	x
Location of Residence			x (neighborhood)	x (neighborhood)	x (neighborhood)

Source: Author's database; see text

Notes: An "x" designates that the information is available more than 90% of cases. A blank indicates that the information is either unavailable or available for less than 10% of cases.

[a] If the infant is born in one of the three peri-urban settlements of Guet n'Dar, n'Dar Toute, or Bouëtville, no street name is mentioned. "Street-level" means that the street where one was born/lived on the island of Saint-Louis is known. "Neighborhood", means that the data is only available at the neighborhood level.

[b] Twin births are sometimes missed when one of the two births is a stillborn.

Table 3: Data available in Birth Certificates by year, Dakar 1891–1920

Year	1891	1904	1912	1920
Person Born				
First and last name	x	x	x	x
Sex	x	x	x	x
Place of birth[a]	x (neighborhood)			
Twin birth[b]	x	x	x	x
Declarant				
First and last name	x	x	x	x
Occupation	x	x	x	x
Age Declarant	x	x	x	x
Relation to person born	x (only if father)	x	x (only if father)	x (only if father)
Ability to sign	x	x	x	x
Birthplace		x	mostly	x
Location of Residence				
Mother				
First and last name	x	x		
Occupation	x	x	x	x
Civil Status*	x	x	x	x
Age	x	x		
Birthplace		x	x	x
Location of Residence	x (neighborhood)			
Father (when known)				
First and last name		x		
Occupation	x	x	x	x
Age	x	x	x	x
Ability to sign	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)
Whether alive	x	x	x	
Location of Birth			x	x
Witnesses				
First and last name	x	x	x	x
Occupation	x	x	x	x
Age	x	x	x	x
Ability to sign	x	x	x	x
Birthplace		x		
Location of Residence				
Relation to person born		x		

*Source:
See Table 2*

Notes: An "x" designates that the information is available more than 90% of cases. A blank indicates that the information is either unavailable or available for less than 10% of cases. The term "mostly" indicates that the information is available in 50–90% of the certificates.

[a] "Neighborhood", means that the data is only available at the neighborhood level.

[b] Twin births are sometimes missed when one of the two births is stillborn.

Table 4. Data available on death certificates of infants by year, Saint-Louis 1880–1920.

Year	1880	1891	1904	1912	1920
Deceased person					
First and last name	x	x	x	x	x
Sex	x	x	x	x	x
Birth location (town)	x	x	x	x	x
Location of death	x	x	x	x	x
Age at death	x	x	x	x	x
Twin Birth					
Date of birth					sometimes
Declarant					
First and last name	x	x	x	x	x
Occupation	x	x	x	x	x
Age	x	x	x	x	x
Relation to deceased	x	mostly	mostly	mostly	
Ability to sign	x	x	x	x	x
Location of Residence	x (neighborhood)	x (neighborhood)	x (neighborhood)	x (neighborhood)	
Mother					
First and last name	x	x	x	x	x
Occupation	sometimes	x			
Civil Status	sometimes		x	x	x
Age	sometimes		x	x	mostly
Birthplace			x		
Location of Residence	x	x	x	x	x
Name parents	sometimes				
Parents alive or not	sometimes				
Father (when known)					
First and last name	x (if declarant)	x	x	x	x
Occupation	x (if declarant)	x	x	x	x
Age	x (if declarant)	x	x	x	mostly
Ability to sign	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)
Whether alive		x	x	x	x
Location of Residence		mostly	mostly	mostly	mostly
Witness					
First and last name	x	x	x	x	x
Occupation	x	x	x	x	x
Age	x	x	x	x	x
Relation to deceased	x	mostly	mostly	mostly	sometimes
Ability to sign	x	x	x	x	x
Location of Residence	x (neighborhood)	x (neighborhood)	x (neighborhood)	x (neighborhood)	

Source: See Table 2.

Notes: An "x" designates that the information is available more than 90% of cases. A blank indicates that the information is either unavailable or available for less than 10% of cases. The term "mostly" indicates that the information is available in 50–90% of the certificates. "Sometimes" indicates that the information is available in 10–50% of the certificates.

**Table 5: Data available on death certificates of infants by year,
Dakar 1880–1920.**

Year	1891	1904	1912	1920
Deceased person				
First and last name	x	x	x	x
Sex	x	x	x	x
Location of birth	sometimes	sometimes	sometimes	x
Location of death	sometimes (street or quarter)	x (street or quarter)	x (street or quarter)	x (street or quarter)
Age at death	x	x	x	x
Twin Birth				
Date of birth				
Declarant				
First and last name	x	x	x	x
Occupation	x	x	x	x
Age	x	x	x	x
Relation to deceased		mostly	mostly	mostly
Ability to sign	x	x	x	x
Location of Residence				
Location of birth		x		
Mother				
First and last name	x	x	x	x
Occupation	x	x	x	x
Civil Status				
Age	x	x	x	x
Birthplace		x	sometimes	
Location of Residence				mostly[a]
Name parents				
Parents alive or not				
Father (when known)				
First and last name	x	x	x	x
Occupation	x	x	x	x
Age		mostly	x	x
Ability to sign	x (if declarant)	x (if declarant)	x (if declarant)	x (if declarant)
Whether alive		x	x	x
Location of Residence		mostly		mostly[a]
Witness				
First and last name	x	x	x	x
Occupation	x	x	x	x
Age	x	x	x	x
Relation to deceased		mostly	sometimes	mostly
Ability to sign	x	x	x	x
Location of Residence				
Location of birth		x		

*Source:
See Table 2*

Notes: An "x" designates that the information is available more than 90% of cases. A blank indicates that the information is either unavailable or available for less than 10% of cases. The term "mostly" indicates that the information is available in 50–90% of the certificates. "Sometimes" indicates that the information is available in 10–50% of the certificates.

[a] Location of residence can be inferred when the location of the infant's death is the paternal or maternal house.

Certificates from both towns consistently offer information that can proxy for the socioeconomic status of the persons mentioned, such as the occupations of the father, declarant, or witnesses (Van Leeuwen and Maas, 2011; Meier zu Selhausen *et al.*, 2018) or their ability to sign the certificate in French, which can proxy for literacy in French (Nilsson, 1999). For Saint-Louis, one can produce an additional measure of socioeconomic status through information on the neighborhood or street of birth. With this information, one could determine whether one was born on the relatively more affluent island of Saint-Louis or in one of the three peri-urban settlements surrounding the town. These settlements include the two fishing villages of Guet n'Dar and n'Dar-Toute, located on the *Langue de Barbarie* to the west of the main island, and the smaller neighborhood of Bouëtville to the east and were almost exclusively inhabited by less affluent African groups (Ngalamulume, 2012: 24–27).

While the certificates contain a variety of possible research variables, before they can be used to study demographic change, the data quality needs to be assessed. In the next section, I outline the information I draw from the certificates and the methods I use to evaluate the source's quality.

3. Methods of data assessment

To assess the quality of the historical source, I evaluate the source's completeness and validity. Many formal demographic tests to determine the quality of a civil registry require unavailable inputs, such as population distribution by age (Adair and Lopez, 2018). Hence, I cannot offer a coverage rate to estimate the completeness or produce a measure of the civil registry's validity. Instead, I primarily approximate the source's completeness and validity by comparing the demographic rates produced by colonial Senegal's vital event documents to those of later periods or other countries.

The first measure of the source's completeness is the registered CDR and crude birth rates (registered births per thousand inhabitants per year; CBR) for 1880–1921 for Saint-Louis and Dakar. These metrics are the only ones that rely on all registered events in the birth and death registry and the estimated population of the two towns every year between 1880 and 1921. I draw on individual-level data from the pilot database for the other metrics. The second measure of the source's completeness is the registered sex ratio at birth and that of stillbirths, which allows me to evaluate the source's coverage in terms of sex. As a third measure, I compare registry data to census data to examine whether the birth registry systematically excludes certain socioeconomic groups. To do this, I rely on data from the 1876 census drawn from Saint-Louis and available archival data for Dakar from the 1904 urban census. Using a recently developed method of predicting mortality rates at various intervals until the age of five, I assess whether the death registry suffers from substantial omissions of neonatal deaths (see Guillot *et al.*, 2022; Verhulst *et al.*, 2022). Finally, as a measure of age validity, I present estimates of age-heaping for declarants, parents, and witnesses noted in the 6 935 birth certificates. This section introduces each of the indicators in more detail.

3.1 Approximated CDR and CBR

To assess if the birth and death registry captures a reasonable number of events, I compare the registered CDR and CBR to that of other historical examples. Moreover, I check whether the estimates are consistent with the historiography of the two towns. Annual registered CDR and CBR are approximated by tallying up each town's registered vital events in the birth and death registry by year. To arrive at the approximated registered events, I filter out paternal recognition acts (*actes de*

reconnaissance) from the birth registries and registered stillbirths from the death registries. The registered vital events in the two town registries are then divided by each town's population and multiplied by a thousand to produce crude death and birth rates per thousand inhabitants.

Two limitations should be noted in advance. First, the CBR estimates will be slightly inflated because two types of documents that appear scattered in the birth registry—corrective judgments (*jugements rectificatif*; documents issued to correct errors in previously issued birth certificates) and supplementary judgments (*jugements supplétif*; documents issued as retrospective birth certificates)—were not filtered out by the registrar. These documents concern a few events before 1916 but increase after 1916. Hence, before 1916, the estimated births will be marginally inflated. The pilot database includes the number of corrective and supplementary judgments for 1920, which indicate that, after 1916, the estimated CBR will be inflated by 5–15 percent for some years.[3]

The second limitation is that, for both towns, there are no reliable annual population estimates, as no research explicitly focuses on the population developments in this period. To bridge the gaps between available population estimates, I linearly interpolate to complete the time series. Linearly interpolating population estimates may lead to erroneous CDR and CBR estimates for periods with large gaps in available population data. The error should be minor for Saint-Louis, as population turnover was lower than in Dakar, and population estimates are more frequently available (Verrière, 1965: 197; Betts, 1985; Ngalamulume, 2012: 21).

Because of the abovementioned limitations, I use the terms 'approximated CDR/CBR' or 'registered CDR/CBR' throughout this paper.

3.2 Sex ratios at (still)birth

To assess how well the birth registry captures events for both sexes, I present estimates of sex ratios at birth and sex ratios for registered stillbirths. In most historical cases, male preference often led to an underreporting or infanticide of female births (Beltrán Tapia and Szoltysek, 2022). To check for sex preferences, I compare the sex ratios at birth from birth registry data to those from later years (Garenne, 2002). To evaluate whether female infanticide drives the under-registration of female births, I also present the reported sex ratio for stillbirths. Historically, male babies were at a higher risk of stillbirth than females (Beltrán Tapia and Szoltysek, 2022), which means we should expect a ratio of stillbirth above 1.00. Should this ratio be lower than expected, it would indicate a high incidence of female infanticide.

3.3 Spatial and occupational distribution of births

A common issue of historical vital event sources is that higher socioeconomic groups tended to register events more often and with relatively more accuracy than other groups (Bengtsson, 1999; Oris *et al.*, 2004). Hence, even if the coverage of the towns' registries is relatively high, the missing births and deaths might overwhelmingly be those of the least wealthy urban society strata.

The 1876 urban census of Saint-Louis offers the opportunity to cross-examine the birth registry's representativeness of the town's population, as both sources use a similar neighborhood distinction (Becker *et al.*, 2008: 103–104). The pilot database includes location of birth data for the 682 registered births in 1880, which can be

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[3] In Saint-Louis in 1920, an estimated 83 out of 1348 (6.2%) events in the numerator (after removing recognition acts) were either corrective or supplementary acts. In Dakar, this figure was 144 out of 995 (14%).

allocated to the four central neighborhoods of Saint-Louis. Data for the population by neighborhood is also available in the 1876 census (Becker et al., 2008: 103–104), which allows me to test whether less wealthy neighborhoods of Saint-Louis are underrepresented in the birth registry.

The population distribution by neighborhood cannot give a complete impression of what groups are missed by the civil registry. A more suitable indicator of a town's socioeconomic composition is population distribution by occupation. While external sources on the occupational distribution of Saint-Louis are unavailable, an archival report in the National Archives of Senegal (*Archives Nationales du Sénégal*; hereafter ANS) from the 1904 nominal census of French urban possessions in Senegal allows me to reconstruct the male population by occupational class for Dakar. The archival document provides a detailed occupational distribution of Dakar for 1904, classifying 9 405 people into 160 occupations (ANS, 1906). I compare this distribution to the distribution of father's occupations in Dakar's 1904 birth registry.

To facilitate this comparison, I have assigned a unique Historical International Social Categorization of Occupations (HISCO) code (van Leeuwen *et al.*, 2002) to every occupation of declarants and fathers in the birth registry who appear in the HISCO categorization (van Leeuwen *et al.*, 2002). Based on these codes, the occupations can be grouped into a historical class scheme (HISCLASS; van Leeuwen and Maas, 2011). The scheme sees widespread use in historical demographic studies (Vézina *et al.*, 2014; Brea-Martínez and Pujadas-Mora, 2019; Mandemakers and Kok, 2020). So far, studies looking at social mobility, access to healthcare, and group belonging in a sub-Saharan African context have applied the HISCLASS classification scheme (Meier zu Selhausen and Weisdorf, 2016; Meier zu Selhausen *et al.*, 2018; Fourie and Jayes, 2021; Galli, 2022).

The original HISCLASS scheme uses twelve categories, but historians often condense it to fewer groups (Vézina *et al.*, 2014; Paping and Pawlowski, 2018; Meier zu Selhausen *et al.*, 2018). For the comparison between the 1904 registry and the census, I employ the HISCLASS_5 categorization (Mandemakers *et al.*, 2020). In this scheme, the top two classes almost exclusively consist of non-manual, salaried workers; the three bottom classes are almost all manual workers. In the top class, we find the colonial elite, which includes higher administrators, representatives of large French trading houses (*negoçiants*), and highly skilled professionals. This group almost exclusively consists of Europeans and parts of the local mulatto elite, the *Métis*. The second group includes clerical workers, lower military officers, and African merchants (*commerçants* and *traitants*). The third class mainly includes skilled manual workers. The fourth class is the food-producing group of farmers and fishermen, and the bottom class consists of unskilled manual laborers, such as harbor workers and sailors.[4]

To compare the paternal occupation distribution from the registry and the 1904 census data, I establish the distribution of the male population by occupation. Because the 1904 census does not offer a distribution by gender, I removed feminized (in French) occupational titles and occupations in which women may have constituted a large part of the group from the census data to approximate the male occupational

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[4] Some occupations either do not have a HISCO code, like *griots* (storytellers), *marabouts* (North/West African Muslim clerics), and *traitants* (Senegalese merchants) or would be placed in a social class that would not be compatible with the historical context, like fishermen. Based on various historical references to the social structure of colonial urban Senegal, I have slightly altered the HISCLASS position of some occupations (La Tourrasse, 1901: 69–71; Robinson, 2000: 31–32; Ngalamulume, 2012: 20–24). The main alterations are that shopkeepers are in the third social class, and fishermen, being an independent food-producing group in Saint-Louis and Dakar (La Tourrasse, 1901: 71; Ngalamulume, 2012: 11), have been placed in the fourth social class instead of the fifth. Additions of non-existing occupations and alterations made for occupations with more than five occurrences in the database are reported in Appendix Table A3.

distribution. This leaves 7 627 out of the 9 405 working persons spread over 150 occupations. I then assign a HISCLASS_5 category code to every occupation in the census and compare the HISCLASS_5 distributions across the 1904 census and birth registry (van Leeuwen and Maas, 2011; Mandemakers *et al.*, 2020). The detailed occupational distribution in the two sources and the assigned HISCLASS_5 codes can be found in Appendix Table A2.

An important note regarding the comparisons between census and registry data is that the population distribution in the censuses is a metric of population stock, while the distribution of births is a metric of population flows. Therefore, we should not necessarily expect an exact overlap between the distributions. Suppose a neighborhood is inhabited primarily by seasonal male laborers. In that case, the share of the population in the neighborhood need not be equal to the share of births registered in the same neighborhood, as the sex imbalance would drive down fertility rates.

3.4 Completeness of neonatal deaths

An often-cited coverage issue in (historical) demographic sources is the omission of deaths occurring in the first days of life (Oris *et al.*, 2004; Guillot *et al.*, 2022). The non-registration of newborns who pass before relatives report their birth (or baptism) usually drives this phenomenon as, in such cases, parents often elect(ed) not to register the death. This can lead to under-reporting of deaths in the first few days of life or to a high incidence of false stillbirths (neonatal deaths registered as stillbirths; Oris *et al.*, 2004).

A recently developed method by Guillot *et al.* (2022) and Verhulst *et al.* (2022) that uses a log-quadratic model to predict under-5 mortality patterns can be employed to assess the extent of omissions of neonatal mortality (first 28 days) in our source. By using a diverse number of mortality inputs (down to a single one), such as the probability of dying by age five, $q(5y)$, the model predicts cumulative death probabilities for 22 age intervals until age 5.[5]

A previous application of the method, which compared the predicted to observed death probabilities using data from sub-Saharan Africa, has shown that some Western African Health and Demographic Surveillance Sites underestimate neonatal mortality rates (NMR; Verhulst *et al.*, 2022). While historical Senegalese data should not be expected to fit the original model, as it is based on data from developed countries (Guillot *et al.*, 2022), the authors provide a working version that draws on sub-Saharan African Demographic and Health Survey (DHS) data (hereafter DHS model).[6] Although the DHS model is based on sub-Saharan African data, making it more suitable to the Senegalese context, it relies on relatively recent data. The recent contexts on which the DHS model is based might exhibit qualitatively different mortality patterns than our historical case. Therefore, the model should not be expected to fit the observed data perfectly. However, as I show below, the model converges to a sensible solution and can still be used to assess whether observed neonatal mortality rates are improbably low.

To do this, I gathered additional age-at-death data until age five for Saint-Louis and Dakar for two pilot database years, 1904 and 1912. Because I have no available estimates for the population under five at risk of mortality, I estimate cumulative death probabilities by age by dividing the cumulative death counts by the total births for the same year in each town. I generate predicted mortality patterns using the DHS model with two different sets of inputs. First, I use the two towns' 22 observed cumulative probabilities of dying as inputs and match the under-5 mortality rate.

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[5] The interval boundaries are 7, 14, 21, and 28 days. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 18, and 21 months. Finally, it includes yearly boundaries for ages 2, 3, 4, and 5.
[6] See https://github.com/verhulsta/logquad5q0/tree/main.

This means that the predicted rates will be allowed to deviate from those observed in the first 21 rates but will be matched at $q(5y)$. To evaluate the results of the 22-input model, I also run the model using the observed NMR, $q(28d)$, and under-5 mortality rate $q(5y)$ as the only two inputs.

To assess whether there are substantial omissions of early deaths, I check the fit between the predicted and the observed rates in (early) infancy. Both the 22-input and the two-input models will produce a value for the parameter k, which provides insight into the "earliness" or "lateness" in the mortality pattern compared to the DHS model pattern (Guillot *et al.*, 2022). In the original model, the value of k generally fluctuates between -1 and 1 (Guillot *et al.*, 2022), but in the DHS model, it can vary between -1.7 and 1.4. A positive value of k implies a relatively late mortality pattern—a high concentration of deaths toward the end of our 22 intervals compared to the average in the DHS model. A negative value suggests a relatively early mortality pattern—a high concentration of deaths toward the beginning of our 22 intervals compared to the average in the DHS model. In the Dakar and Saint-Louis data, a late pattern would indicate under-registration of neonatal mortality. Another way to test whether deaths are under-registered is to visually check whether the observed NMR falls below the NMR in the predicted lines. Should the observed NMR be below the lower bound of the predicted NMR, it would be evidence of under-registration. The observed mortality rates for 22 intervals, which can be used to recreate the output, can be found in Appendix Table A4.

3.5 Age Heaping

To assess the validity of the registry age data, I review the extent of age heaping and, consequently, the accuracy of reported ages on birth certificates collected in the pilot database. I rely on the Whipple Index, a measure that captures the extent to which a population tends to report ages in numbers ending with a zero or five for the age group 23–62 (Rasul *et al.*, 2024). It divides the number of people with an age that ends in one of these digits by the number of people expected to have an age that ends in zero or five and multiplies this figure by 100. The Index usually takes values between 100 and 500, with 100 indicating no digit preference and an index of 500 demonstrating a total digit preference—everyone in a population registers ages that end in 5 or 0. The closer the Whipple Index is to 500, the more inaccurate the reported age data on aggregate and, therefore, less reliable (Szoltysek *et al.*, 2018; Rasul *et al.*, 2024).

4. Data Quality Assessment

4.1. Coverage: Approximated crude death and crude birth rates

Figure 1 plots the approximated CDR for Saint-Louis and Dakar for 1880–1921. We can observe that death rates in both towns are relatively high, hardly dropping below 30 per thousand. In Saint-Louis, the approximated CDR remains consistently above 30 per thousand, only falling below that in 1913. Dakar exhibits a similar approximated CDR to Saint-Louis on average. However, it dips to about 20 per thousand for some years, which may indicate some larger-than-normal under-registration. Another possible explanation for this low registered CDR is Dakar's different population structure. Below, I describe how, compared to Saint-Louis, Dakar housed a higher share of young male migrant workers, a generally healthier population group.

*Figure 1. Approximated CDR per thousand inhabitants,
Dakar and Saint-Louis, 1880–1921.*
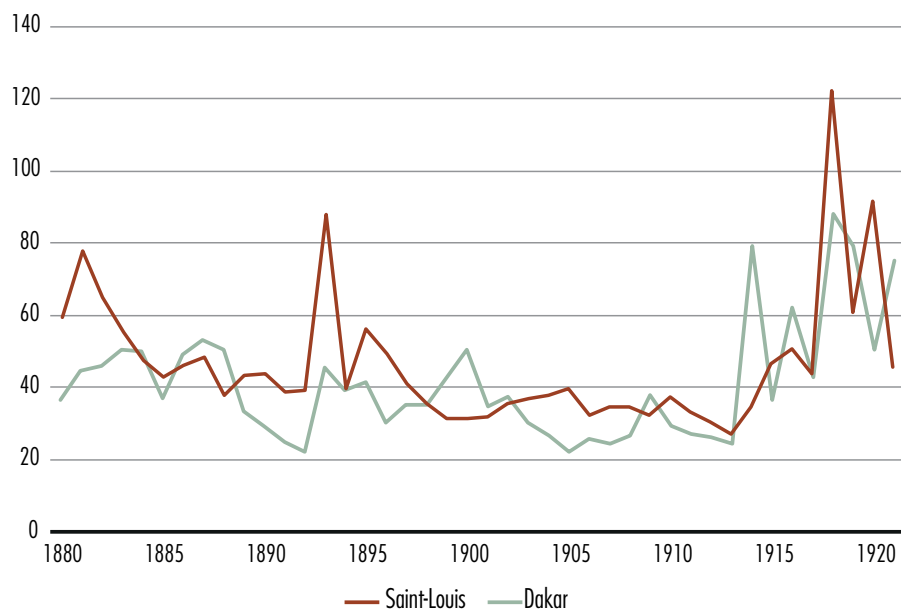
Sources: *For population figures: Guy, 1904; Ribot and Lafon, 1908: 37; Verrière, 1965: 197; Betts, 1985; Echenberg, 2002; Becker et al., 2008; Bigon, 2012; Ngalamulume, 2012, 21. For registered deaths: ANOM (n.d.).*

Note: For absolute annual number of births see Appendix Table A1.

Despite the seeming under-registration for some years in Dakar, the death rates in both towns around 1900 are comparable to the few estimates available for SSA. Compared to Antananarivo, where the CDR stood around 30 per thousand in 1900, the approximated mortality in Saint-Louis was similar; that of Dakar was slightly lower (Masquelier *et al.,* 2014). In the same period, regional death registries in British Uganda reveal a registered CDR fluctuating between 15 and 20 per thousand (Doyle, 2013: 101), although these estimates are not exclusively from urban areas. In most North American and European cities, the non-epidemic CDR had fallen below 30 per thousand by the 1880s and 1890s and, in some cases, already in the mid-century (Pelletier *et al.*, 1997; Vögele, 1998: 36–37). After the turn of the twentieth century, it had fallen below 20 per thousand in almost all urban areas (Haines, 2001; Vögele, 1998: 36–37). The registered death rates of Dakar and Saint-Louis are much closer to the level of towns before or early in the mortality transition phase, like Hermoupolis, Greece, around 1900 (Raftakis, 2022). Thus, when placed in an international context, the CDR approximations for Dakar and especially Saint-Louis show no major under-registration of deaths.

An encouraging sign of the source's quality is that the evolution of the registered CDR for both towns reflects recorded crisis-mortality events for which information is available from other sources. In Saint-Louis, we see spikes for the epidemic outbreaks of 1880–81 (yellow fever), 1893 (cholera), 1895 (smallpox), 1917 (bubonic plague), and 1918–1921 (influenza) (Ngalamulume, 2012: 34). A notable rise in approximated CDR occurred in 1900 Dakar when the town suffered its most deadly yellow fever epidemic. In 1914, when the bubonic plague epidemic hit the capital, a substantial spike to 83 registered deaths per 1000 inhabitants can be seen in the graph (Ribot and Lafon, 1908; Betts, 1971; Echenberg, 2002: 23–24; Ngalamulume, 2012; Bigon, 2012). Excess events in the 1914 death registry, compared to 1913,

amount to about 1,500, which is close to the more than 1,400 plague-associated deaths cited in other sources (M'Bokolo, 1982). After that, we see sudden rises in mortality during the First World War and the ensuing influenza pandemic in Dakar. Even if this is not direct evidence of high coverage for all years, the fact that the registered CDR metric captures these epidemics indicates that death registration throughout 1880–1921 was, at least, consistent.

Looking at the developments in approximated CBR (Figure 2), both towns exhibit a high birth rate of around 30 to 40 per thousand until the early 1900s. Dakar in 1880–3 is an exception, indicating that before 1883, the registry was not well-functioning. For Saint-Louis, the CBR estimate remains consistently around 40 per thousand. This figure is close to the 50 per thousand number cited for many fertility-maximizing societies in historical SSA (Caldwell, 1985; Coquery-Vidrovitch, 1997: 10). For Dakar, the approximated CBR declines to improbably low figures after 1902, causing a divergence between the two towns.

Although the divergence indicates that birth registration in Dakar declined to some extent, part of the decline in registered CBR is probably linked to the changing population structure in the town around 1900. Looking at the population sex ratio in the two towns, we see that women dominated both towns' populations in the nineteenth century (Table 6). Men were, however, the majority of immigrants during Dakar's rapid urbanization around the turn of the twentieth century, which flipped the sex ratio in favor of men by 1904. Moreover, seasonal in-migration of men in the agricultural off-season likely increased as Dakar became the colony's administrative center (Betts, 1985; Coquery-Vidrovitch, 1991; Manchuelle, 1997: 187–190). Contemporary accounts describe the male-dominated composition of Dakar, which drew many workers in the age groups of 20 and 39 (Ribot and Lafon, 1908: 37–38). Observers in 1908 stated that "Dakar n'est pas une ville où les familles se créent au point d'augmenter des naissances. Les célibataires, nomades et passagers forment la majorité" (Ribot and Lafon, 1908: 38).

Figure 2. Approximated CBR per thousand inhabitants, Dakar and Saint-Louis, 1880–1921
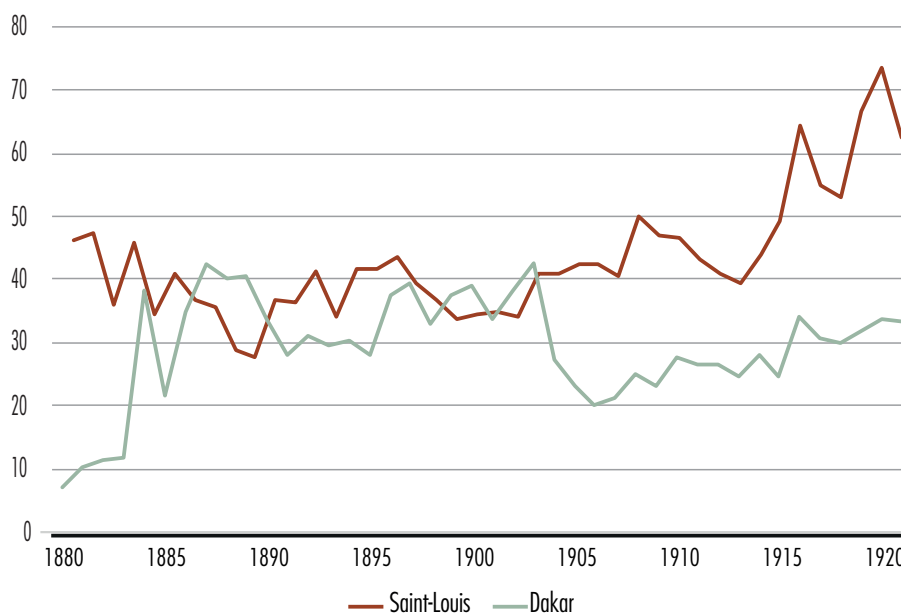
Sources: See Figure 1.
Note: For the absolute annual number of births see Appendix Table A1

Table 6   Number of men, women, and the sex ratio in Saint-Louis and Dakar,
1835–1904.

	Saint-Louis			Dakar		
	Men	Women	Sex ratio (m/w)	Men	Women	Sex ratio (m/w)
1835	4 992	6 684	0,75	–	–	
1876	5 759	9 039	0,64	1 136	1 414	0,80
1882	8 686	10 235	0,85	–	–	
1904	10 209	13 861	0,74	10 500	7 947	1,32

Sources: *Guy, 1904; Becker et al., 2008.*

In 1916, the registered CBR reached an implausibly high 64 per thousand in Saint-Louis, even though there are no references to rising fertility in that period. We see analogous spikes in 1916 and 1920 in Dakar, which point to a common driver. As noted earlier, the French citizenship of those born in the Four Communes was more explicitly defined by a 1916 law (Kopytoff, 2019). This likely led to several requests for corrective or supplementary judgments to adapt the information on one's original birth certificate (see section 3.1). However, this may have led to a rise in demand for certificates from cities like Saint-Louis and Dakar, which were an avenue to French citizenship. This rising demand would, in turn, trigger an increase in false birth registrations (registrations of infants in Saint-Louis and Dakar who were not born in these towns). Future research using registered births as a denominator in infant or child mortality figures should be aware of this suspicious rise after 1916.

There are no available CBR estimates for the early twentieth century to compare the approximations. However, estimates from 1960 suggest that fertility in urban Senegal stood at about 43 per thousand (Verièrre, 1965: 137). Should we take the 1960 nationwide estimate of 50 per thousand as a benchmark (United Nations, 2024), which includes rural regions, the approximated CBR for 1880–1921 (Figure 2) may be slightly underestimated for Saint-Louis and vastly underestimated for Dakar after 1902. However, given the distance between the 1900s and 1960, the difference between 35–40 per thousand in 1900 Saint-Louis and 43–50 per thousand in 1960 could be explained by other factors. One of these is the possible rise in fertility rates around 1950, which occurred throughout much of SSA (Hertrich, 2017; Walters, 2021).

Overall, while a coverage rate estimate for the registries in the two towns cannot be offered, the high CDR and CBR extracted from the registry indicate that the coverage is reliably high for most years. In the absence of an extremely high actual CDR in non-epidemic years in Saint-Louis, the consistently high registered CDR and the spikes during epidemics provide evidence for an acceptable rate of death registration. For Dakar, the under-reporting of deaths was probably more significant, but the age or sex composition of the city may explain the lower approximated CDR. In both towns, the birth registry likely covered a good portion of the births, but the estimates fall short of the CBR estimates available for 1960. Caution should be applied to the birth data after 1916, when the expanded citizenship law likely caused a spike in birth registrations in the Four Communes.

While the civil registry's coverage seems satisfactory, it says little about potential biases. Some groups may have been systematically excluded from the registry or have evaded registration. In the following three subsections, I examine some of these potential issues.

4.2. Completeness: Sex ratio at birth

As noted above, a historical preference for male children in some societies led to a higher incidence of female newborn infanticide, which was partly responsible for the under-reporting of female births (Beltrán Tapia and Szoltysek, 2022). Using data for registered sex of stillbirths and births in the pilot data database, Table 7 shows the sex ratio at (still)birth for Dakar and Saint-Louis. The sex ratio at birth stood at 1.09 for Dakar and Saint-Louis, with the ratio for stillbirths being even higher in both towns.

The ratio of 1.09 is substantially higher than the sex ratio found in more recent figures for Senegal and West Africa, which tend to be around 1.03 and 1.04 (Garenne, 2002; Chao *et al.*, 2019). Dakar's civil registry between 1945 and 1979 returns a sex ratio below 1.05 (Garenne, 2002), much lower than the one found here for 1880–1920.

Table 7. Number of births and stillbirths by sex and the sex ratio,
Dakar and Saint-Louis, 1880–1920

	Live births		Stillbirths	
	Dakar	Saint-Louis	Dakar	Saint-Louis
Male	1 149	2 468	184	208
Female	1 051	2 260	161	160
Sex ratio	1.09	1.09	1.14	1.30

Source: *Author's database; see text.*

Note: Data is based on registered (still)births in the years 1880, 1891, 1904, 1912, and 1920.

One explanation for the higher-than-expected sex ratio at birth could be selective female infanticide. At the same time, however, the vast majority of registered stillbirths in both towns were males (Table 7), indicating the lack of widespread selective infanticide of female newborns. If selective infanticide occurred, the high sex ratio at birth would have to be coupled with a lower sex ratio for registered stillbirths. While the sex ratio figures deserve further analysis than this short description, the dominance of registered male (still)births points to sex-selective registration practices.

4.3. Completeness: Population distributions in the registry and the censuses

To evaluate whether births in some areas of Saint-Louis may have gone unnoticed to a greater extent, Table 8 shows the distribution of registered births by neighborhood in 1880 and the share of the population by neighborhood according to the 1876 census; the distributions are strikingly similar. The census allocates about 39 percent of the population to the peri-urban settlements of Guet n'Dar, n'Dar-Toute, and Bouëtville (forty percent if we include Sor to Bouëtville). Similarly, in the 1880 registry, about 37 percent of mothers are registered as residing in one of these settlements. The remaining sixty percent of the population lived on the island of Saint-Louis, where slightly more than sixty percent of the births were registered. This exercise shows that barring significant differences in fertility by neighborhood, it is unlikely the source misses many births from the three neighborhoods inhabited by the lower socioeconomic classes of Saint-Louis (Ngalamulume, 2012: 24–27).

***Table 8. Distribution of the population (1876) and of the registered births
(1880), Saint-Louis***

	Population, 1876	% of total	Births, 1880	% of total
Saint-Louis island	8 864	59.9	430	63.0
Guet n'Dar	2 118	14.3	97	14.2
n'Dar-Toute	2 561	17.3	110	16.1
Bouëtville	1 065	7.2	45	6.6
Sor	146	1.0	–	–
Civil Hospital	23	0.2	–	–
Civil Prison	21	0.1	–	–
Total	14 798	100.0	682	100.0

Sources: *For reported births, author's database; see text. For population figures,
Becker et al., 2008, 103–104.*

To evaluate whether births in some areas of Saint-Louis may have gone unnoticed to a greater extent, Table 8 shows the distribution of registered births by neighborhood in 1880 and the share of the population by neighborhood according to the 1876 census; the distributions are strikingly similar. The census allocates about 39 percent of the population to the peri-urban settlements of Guet n'Dar, n'Dar-Toute, and Bouët-ville (40 percent if we include Sor to Bouëtville). Similarly, in the 1880 registry, about 37 percent of mothers are registered as residing in one of these settlements. The remaining sixty percent of the population lived on the island of Saint-Louis, where slightly more than sixty percent of the births were registered. This exercise shows that barring significant differences in fertility by neighborhood, it is unlikely the source misses many births from the three neighborhoods inhabited by the lower socioeconomic classes of Saint-Louis (Ngalamulume, 2012: 24–27).

The close distributions of population and registered births by neighborhood in Saint-Louis indicate that the differences in birth registration may not have dramatically differed between various social groups. It may still be the case that some groups still under-register births within these neighborhoods. Unfortunately, I cannot test this in the absence of other data on socioeconomic status differences in the Saint-Louis census.

Differences by occupational class can, however, be estimated for 1904 Dakar. Table 9 presents the two distributions according to the database's five levels of social classes. Although less similar compared to the distributional overlap between the 1876 census and the 1880 birth registry in Saint-Louis, the figures are in close agreement for the top two classes. The comparison between the three bottom classes is less convincing. The difference in the food-producing group is not substantial, but the data point to some under-registration. The difference becomes prohibitive when looking at the skilled manual laborers, representing a mere fifth of the occupations in the census returns but more than half of the people registering birth events. The fifth social class, while being the largest share of the enumerated male workers—more than a third of the census returns—is less than fourteen percent of the registered fathers. This difference in distributions indicates a relative overrepresentation of the third social class in the registry and an underrepresentation of the fifth occupational group.

Table 9 ***Distribution by socioeconomic standing for the 1904 census and birth
registry, Dakar.***

	Census		Father	
Class	#	%	#	%
Elite	129	1.756	9	2.5%
Clerical/salaried workers	915	11.096%	41	11.4%
Skilled manual laborers	1 628	21.4%	190	52.9%
Farmers and fishermen	2 086	27.4%	71	19.8%
Unskilled laborers	2 876	37.7%	48	13.4%
Total	7 627	100	359	100

Sources: *ANS, 1906; Author's database–see text.*

Notes: Fathers are less than the total registered births in 1904 because I removed fathers who appear multiple times in the registry.

Under-registration by unskilled laborers likely explains much of this discrepancy, but (seasonal) population changes may also drive some of this misalignment. As outlined above, Dakar experienced a massive population increase in the first years of the 1900s (Ribot and Lafon, 1908; Betts, 1985). This increase may have been driven by the in-migration of unskilled laborers who did not settle for the long term and, consequently, did not reproduce in Dakar. Another factor could be seasonal migration. Evidence suggests that the peak season for rural-urban migration in Dakar was around April (Westland, 2021). Given that the 1904 census was a *de facto* count for everyone in Dakar on the first of May (Guy, 1904: 1), deep into the dry season, it may have captured a significant number of men who were in Dakar seasonally. Short-term migration, be it multiannual or seasonal, may drive part of the difference between the two sources. Such an explanation, however, relies on the assumption that skilled laborers permanently settled in Dakar, representing even more than 53 percent of the permanent population, which is unlikely.

The population and birth distribution estimates for Saint-Louis indicate that the birth registry's coverage in terms of neighborhoods was of fair quality. It is difficult to draw the same conclusion for Dakar. Coverage of certain groups was likely lower than that of Saint-Louis, but given the different population and age structure, this issue may be exaggerated here.

4.4. Completeness of neonatal deaths

Figure 3 illustrates the observed and the DHS-model-predicted mortality pattern for Saint-Louis and Dakar by month. Plots *a* and *c* focus on the first 12 months, and *b* and *d* look at the full five years. For the first year, the observed probabilities are close to the predicted ones and fall within the confidence intervals generated for the model. In both towns, the estimated *k* parameter is strongly negative, which assuages concerns about substantial omissions of deaths in the first few days. For Saint-Louis, the earliness in our mortality data is striking; most infants who pass do so in the neonatal period. Moreover, the observed data for the first four weeks falls above the predicted points. For Dakar, the predicted and observed lines are almost identical. However, this may be the result of a high degree of false stillbirth registrations in today's capital. Stillbirths are not included in these models even though the stillbirth rate per thousand live births stood at 156 in Dakar through 1880–1921; in Saint-Louis, the rate was 78 per thousand (see Table 7).

Figure 3. Observed and DHS-model predicted mortality rates using 22 mortality rates as inputs, Saint-Louis and Dakar (1904 & 1912).
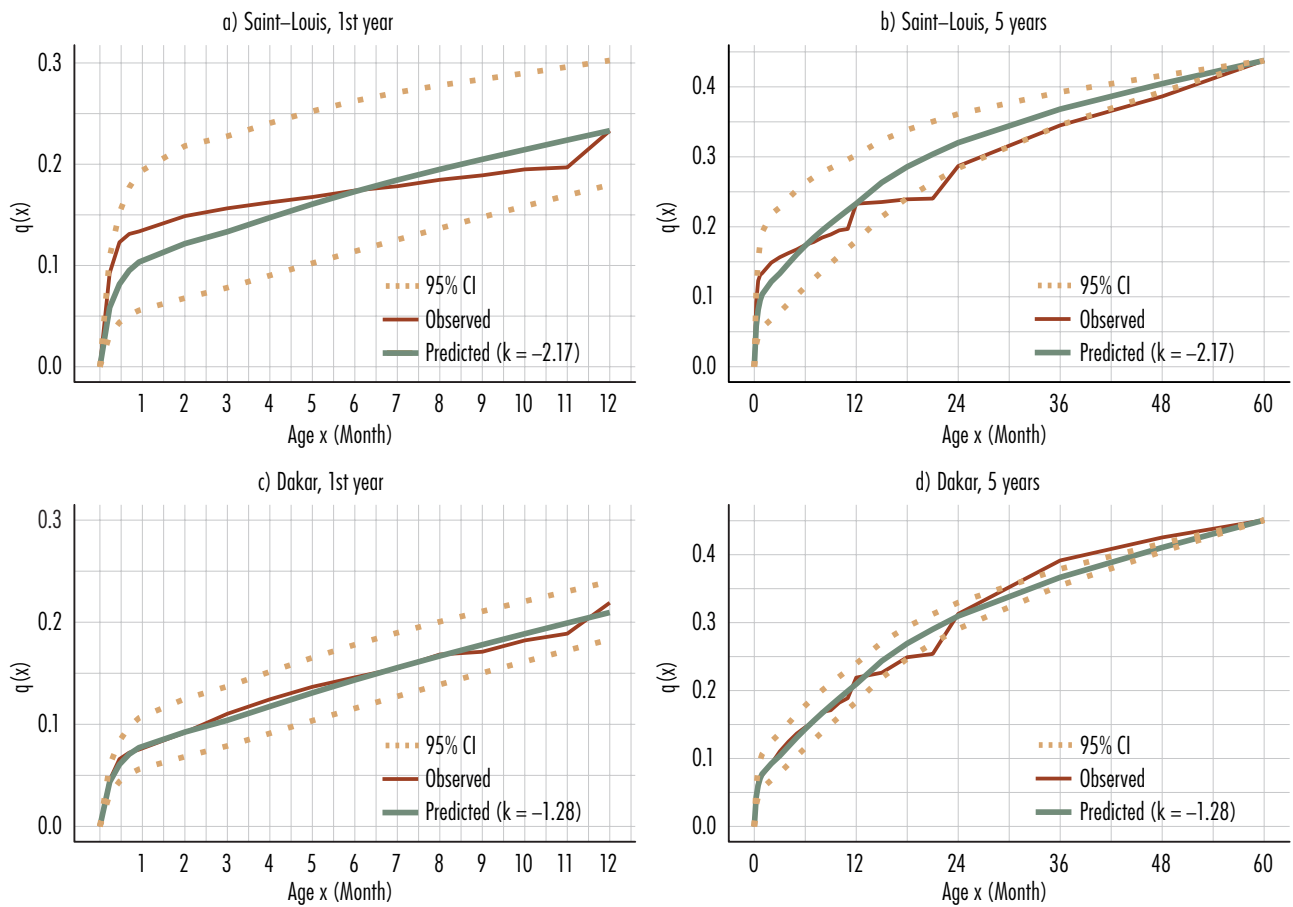
Source: Author's database, see text.

Figure 4. Observed and log-quadratic predicted mortality rates using q(28d) and q(5y) as inputs. First three months only, Saint-Louis and Dakar, 1904 & 1912.
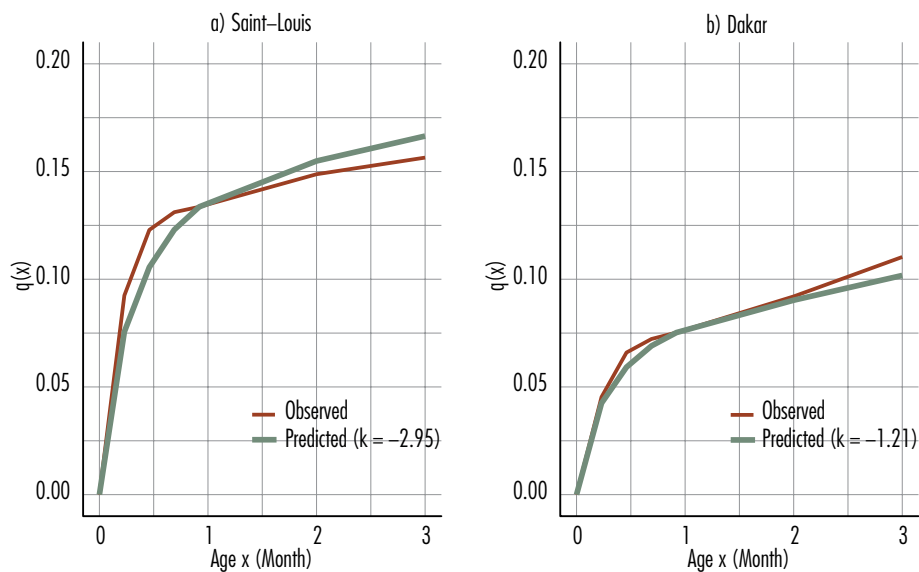
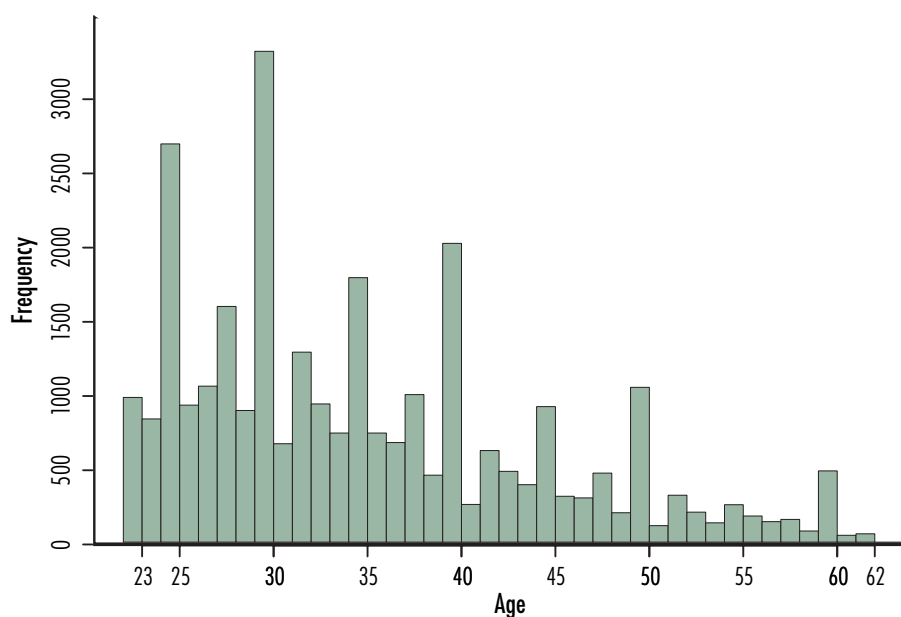*Source: Author's database, see text.*

Figure 4 shows the observed and predicted lines for the first three months using only two inputs: the probabilities of dying in the neonatal period and the probabilities of dying by age 5. Using only two inputs does not substantially alter the results compared to Figure 3. Because, in this version, both selected probabilities of dying ($q(28d)$ and $q(5y)$) are matched, the observed and predicted NMR are identical. The predicted line remains below the observed one till point $q(28d)$ for Saint-Louis, which is encouraging for the coverage of newborns. For Dakar, the two lines coincide again.

The overall result supports that under-registration of mortality in the first days of life was not a significant issue in the Saint-Louis death registry. However, this does not necessarily indicate that "correct" early-life mortality rates can be estimated from the source, as some births may have gone unreported (see section 4.1). Unregistered births would lead to an underestimation of the denominator in mortality rate estimations, consequently causing an overestimation of mortality rates in all 22 intervals. For Dakar, the low registered CBR and high number of registered stillbirths indicate this was probably the case (see Table 7). Nonetheless, regarding mortality registration, the evidence suggests that infants passing in the first days of life did not go unregistered in Saint-Louis. In Dakar, many were likely registered as stillbirths.

4.5. Validity: Age-heaping

Plotting the frequency by every one-year age group for all persons (declarants, parents, and witnesses) between 23 and 62 in the birth certificate database shows substantial age heaping at ages ending in zero and five (Figure 5). We see the highest frequencies at ages 25 and 30, driven by the reported ages of mothers on the birth certificates, who tend to be registered as 20, 25, or 30.

Figure 5. Frequency by age for everyone between 23 and 62 in the database (1880–1921)

Source: Author's database; see text.

It has been argued that whether one reports one's age is important when looking at the Whipple Index, as higher age-heaping should occur when third persons are asked to report someone's age (Szoltysek *et al.*, 2018). Therefore, differences in age

heaping should exist depending on the function of a person in a birth certificate. Table 10 shows the Whipple index by declarants, fathers, and mothers for 1880–1920. In the birth registry, declarants always self-report their age, fathers mostly self-report (when they are the declarants), and mothers never self-report their age, as, in the pilot database, they never appear in front of the registrar. The table confirms that mothers are subject to the most considerable age-heaping in both towns.

**Table 10. Whipple index by declarants, fathers, and mothers by town, 1880–1920.**

Declarants (always self-reported)		Fathers (mostly self-reported)		Mothers (never self-reported)	
Dakar	Saint-Louis	Dakar	Saint-Louis	Dakar	Saint-Louis
192	195	199	208	241	259

Source: Author's database; see text.

Note: The table is based on the birth certificates of 1880, 1891, 1904, 1912, and 1920.

Nevertheless, the Whipple Index is high regardless of whether one looks at heaping at the level of declarants or mothers. Taking the United Nations (1990: 18–19; UN) standard, which classifies age data in datasets with a Whipple index of over 175 as of "very rough" quality, age data across persons are indicative at best. From a historical perspective, however, it is not unique for historical age data to produce a Whipple index above 175 (Szoltysek *et al.*, 2018). Moreover, the Whipple index for the 2019 Senegalese DHS stands at 141, which means that even in the most recent period for Senegal, age data falls in the category of "rough" (125–175; Rasul *et al.*, 2024). Plotting the Whipple index for 1880, 1891, 1904, 1912, and 1920 shows that age-heaping trends in Dakar and Saint-Louis were declining (Figure 6). For declarants, the index stood just above 160 by 1920, which would bump the quality of age data for those who self-report their age close to the level found in the 2019 DHS.

Figure 6. Whipple index trends, Dakar and Saint-Louis, 1880–1920
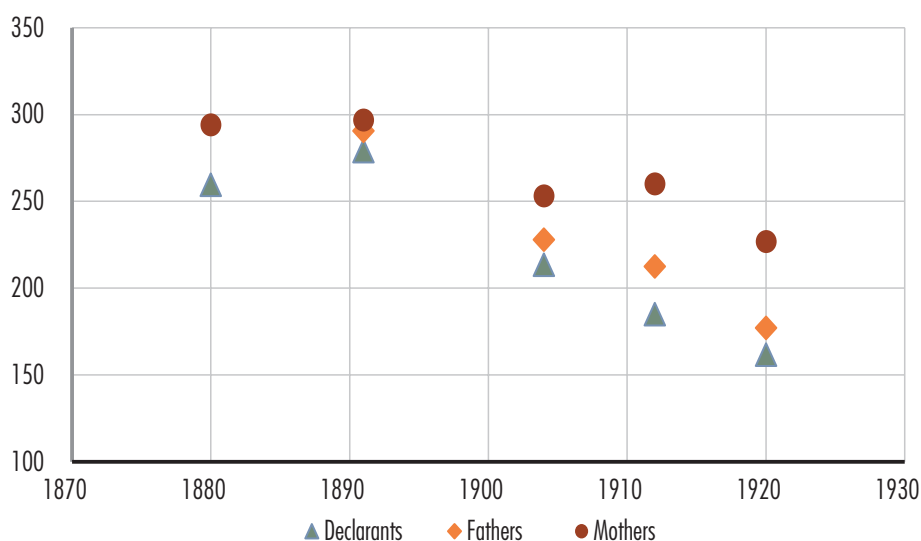
Source: Author's database; see text.

Notes: The year 1880 only contains data for Saint-Louis. Father's ages start in 1891 because no ages are reported for fathers who are not declarants in Saint-Louis in 1880.

Overall, the civil registration age data should be considered rough approximations, especially for mothers. Researchers using age data from birth certificates should consider these caveats and make adjustments or conduct sensitivity analysis whenever they use age data from 1880–1921.

5. Possibilities and limits of the civil registry sources

The Senegalese urban civil registry could offer possibilities for empirical research on various (historical) demographic concepts. Even with small samples, it could add to the literature on mortality by generating trends in infant and child mortality or by analyzing epidemic mortality. The source's use for research on fertility would likely be more complex but should be possible.

Death registration documents could help test theories of mortality decline in SSA through data-driven historical studies for the early colonial period (Vallin, 1992). Information from the certificates can be operationalized as proxies for factors such as wealth or access to specific amenities (occupational class, ability to sign in French, or neighborhood of birth; Ekamper and van Poppel, 2019) and environmental/weather aspects (season of birth; Fargues and Nassour, 1992; Breschi and Livi Bacci, 1994; Pozzi and Fariñas, 2015). Causes of death information has been employed in research on West Africa (van Ginneken and Teunissen, 1992), but not in a historical context. Contemporary accounts indicate that causes of death information should be available on the death certificates after 1923 (Lefrou and Allard, 1932).[7] The source could thus contribute to causes of death research in the future. Another mortality research avenue is to link mothers' deaths following births to estimate maternal mortality (Manfredini *et al.*, 2019). While maternal mortality in various European contexts underwent several phases of decline in the nineteenth and twentieth centuries (Loudon, 1992: 151, 410), it remains high throughout West Africa (Alkema *et al.*, 2016).

The source can be used to study epidemics' demographic and health impact as far back as 1830, when yellow fever caused mass deaths in these settlements (Ngalamulume, 2012: 53, 126). Assessing excess deaths by different population groups is also possible. Historians have noted, for example, that cholera in Saint-Louis, especially after the epidemic of 1868, became a disease of the poor urban classes, as the wealthier segments of society were able to protect themselves when the disease caused another epidemic less than 25 years later, in 1893 (Ngalamulume, 2012; Echenberg, 2002: 24).

Large historical demographic databases from Europe and North America have extensively linked individuals in the civil registry to census microdata (Mandemakers and Kok, 2020; Vézina and Bournival, 2020; Oris *et al.*, 2023). Although colonial censuses should be used with care due to their deficiencies (Gervais and Mandé, 2010), several relatively reliable nominal censuses were conducted in the Senegalese urban centers, like the 1904 nominative census (Guy, 1904). Unfortunately, to my knowledge, from this census, only the household forms of the demographically marginal Gorée are available in the national archives of Senegal (ANS, 1904). These forms include data on nationality, civil status, occupation, birth location, religion, literacy, and ethnic background.[8] Should they still exist, similar forms for Saint-Louis and Dakar could allow for linkage between the census and the registry.

[7] The 1923 books are still under privacy embargo but should become digitally available in the future.
[8] A downside of these forms is that age information is often limited to the distinction between minors (younger than fifteen years) and adults (older than fifteen years).

While there are some advantages to civil registry data, compared to parish registers, the latter are generally more suitable for studying fertility. Parish registers sometimes group related individuals through household or family cards (Walters, 2016), making it easier to assess the population that does not experience vital events between birth and death. For example, the lack of documentation on marriage in the Senegalese civil registry means that only women who had children or passed in the towns are captured, while women without a birth or stillbirth remain invisible between their birth and their passing. This limits the possibilities of producing fertility estimates, as we lack a population at risk of birth or, at least, the married female population.

Using additional sources could overcome some of these issues. Historical demographers have recently called for and attempted to use a combination of sources (Doyle, 2013; Walters, 2021; Bras, 2023). Currently, attempts are made in East Africa to link parish register data to hospital records (Doyle, 2021). Similar work could be conducted using information from the Christian parishes in urban Senegal, should the documentation still exist (Cantrelle, 1965: 117).

Research on fertility with data from the registry alone is much more difficult. Some questions can be explored if linking mothers across birth certificates proves feasible. Linkage of mothers could allow researchers to study changing birth intervals across cohorts. Such analyses would provide an invaluable contribution to questions surrounding long birth intervals in the Senegalese context and whether they had declined in urban areas (Ferry, 1976; Schoenmaeckers *et al.*, 1981).

Conclusion

This article has shed some light on the rich individual-level information in the civil registers of colonial Senegal's Four Communes. From the mid-nineteenth century, the French colonial authorities tried to capture the birth and death events of the whole population of towns like Saint-Louis and Gorée, making the span of the source particularly long for historical individual-level data sources in SSA. Although based on a small sample of birth certificates from Dakar and Saint-Louis, the data one can draw from the birth and death registers cover a large part of the two towns' population. Nonetheless, like with many historical registration sources, issues such as under-registration of female births and age-heaping should be taken into account. Differences in quality between Saint-Louis and Dakar are likely significant. For Saint-Louis, the risk of fines, the increased civil rights offered by a Four Communes' birth certificate, and the mandatory showing of a death certificate for a burial to take place were likely solid incentives for all socioeconomic groups to register births and deaths throughout 1880–1921. Differential registration between socioeconomic groups in Dakar was sizable. Moreover, registered CBR and CDR in Dakar were improbably low for some years. Nevertheless, careful use of the source and considering the local context should render research with the documents from today's Senegalese capital viable from the 1890s onwards. After 1915, the registered CBR likely includes many false birth registrations in both towns due to the role of birth certifications in determining citizenship status.

For now, sampling data from this rich source could allow researchers to explore several research questions. Soon, however, automated data transcription processes should be able to efficiently perform large parts of data input with sources like the Four Commune civil registry. Constructing a large-scale database from the civil registers would open up several avenues of research into questions of mortality and fertility but could also be valuable to historians from other specializations.

Data availability statement

The dataset used for most of the source's evaluation and referred to in this paper
as the "pilot database" is currently incomplete and, therefore, under embargo. The
database will be finalized when the funding for the project of which it is part ends.
This will be in November 2025, which will also be the date on which the embargo
on the database will be lifted. By the end of November 2025, the database will be
anonymized and uploaded to the DataverseNL data repository (dataverse.nl).

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Appendix

Figure A1. Example death certificate from Saint-Louis, 1891

Source:
ANOM (n.d.),
"Sénégal",
État Civil.

Figure A2. Example birth certificate from Saint-Louis, 1904

Source:
ANOM (n.d.),
"Sénégal",
État Civil.

Table A1. Detailed number of events by year and by town available on ANOM (n.d.), 1880-1921.

Year	St. Louis Births	St. Louis Deaths	Dakar Births	Dakar Deaths	Rufisque Births	Rufisque Deaths	Gorée Births	Gorée Deaths	Total (year) Births	Total (year) Deaths
1880	683	913	31	181	4	13	116	131	834	1238
1881	776	1284	51	223	233	465	143	162	1203	2134
1882	694	1287	60	250	253	347	107	193	1114	2077
1883	876	1132	61	275	338	405	124	123	1399	1935
1884	673	969	208	300	428	371	98	102	1407	1742
1885	793	906	123	226	371	388	116	126	1403	1646
1886	717	956	212	314	336	300	123	94	1388	1664
1887	705	1001	253	365	324	364	89	104	1371	1834
1888	573	775	256	386	171	302	97	126	1097	1589
1889	555	870	284	273	211	266	104	119	1154	1528
1890	744	922	259	253	212	256	114	97	1329	1528
1891	737	802	227	225	236	304	89	70	1289	1401
1892	840	804	273	203	199	293	97	92	1409	1392
1893	692	1790	263	420	159	309	65	108	1179	2627
1894	836	869	273	393	193	282	86	68	1388	1612
1895	831	1199	246	386	208	434	69	97	1354	2116
1896	958	1137	336	313	247	264	80	51	1621	1765
1897	955	1048	354	356	250	297	71	58	1630	1759
1898	957	975	294	354	250	316	56	57	1557	1702
1899	959	946	339	419	249	366	54	69	1601	1800
1900	1036	1014	346	506	248	312	50	78	1680	1910
1901	998	963	307	383	245	329	66	46	1616	1721
1902	927	1174	344	380	315	418	50	56	1636	2028
1903	1050	1013	381	535	411	467	57	50	1899	2065
1904	990	1018	413	658	430	424	62	52	1895	2152
1905	1033	1065	458	672	326	280	41	62	1858	2079
1906	1047	905	509	785	376	417	52	62	1984	2169
1907	1009	976	534	708	299	395	62	67	1904	2146
1908	1126	872	618	736	431	400	39	71	2214	2079
1909	1090	859	557	786	337	428	42	61	2026	2134
1910	1129	1009	504	666	387	396	43	67	2063	2138
1911	1124	945	537	649	387	391	46	89	2094	2074
1912	1120	921	570	686	465	363	26	86	2181	2056
1913	1109	873	573	700	448	366	39	63	2169	2002
1914	1288	1125	693	2182	510	-	27	66	2518	3373
1915	1297	1260	666	1004	639	515	35	65	2637	2844
1916	1562	1214	872	1656	704	598	37	95	3175	3563
1917	1184	987	812	1254	566	521	18	46	2580	2808
1918	1043	2337	886	2556	476	1117	30	46	2435	6056
1919	1293	1182	989	2455	600	905	24	20	2906	4562
1920	1374	1736	1253	1684	776	757	35	34	3438	4211
1921	1149	892	1149	2562	773	637	-	-	3071	4091
Total	40532	44925	18374	30318	15021	16778	2779	3329	76706	95350

Table A2. Occupations in 1904 census and on birth certificates in Dakar, divided by HISCLASS_5

#	Occupation	Assigned HISCLASS	Enumerated in Census	Fathers in birth certificates
1	Gouverneur des Colonies	1	1	
2	Trésorier particuliers	1	1	
3	Administrateurs des Colonies	1	6	
4	Adjoints et Commis des Secrétariats généraux et affaires indigènes	1	58	1
5	Receveur de l'entregistrement	1	1	
6	Receveur des Postes et télégraphes	1	1	
7	Secrétaire Municipal	1	1	1
8	Directeur du Lazaret	1	1	
9	Capitaine de port	1	1	
10	Dessinateurs	1	8	
11	Vérificateur	1	1	
12	Médreur	1	1	
13	Directeur des Travaux	1	1	
14	Chef des carrièrs	1	1	
15	Ingenieurs	1	7	
16	Chef d'exploitation	1	1	
17	Architects	1	1	
18	Directeur du chemin de fer	1	1	
19	Entrepreneurs	1	4	
20	Chefs de train	1	3	
21	Chefs de gare	1	1	1
22	Chefs de cantonnier	1	1	
23	Chefs de la traction	1	1	
24	Agent-Voyer	1	1	
25	Mesureur	1	1	
26	Docteurs en médecine	1	3	1
27	Pharmaciens	1	2	
28	Hotelier-Restaurateur	1	4	
29	Magistrats	1	4	
30	Notaire	1	1	
31	Avocats Conseile Commissionne	1	3	
32	Homme de lettre	1	1	
33	Commissairre de police	1	1	
34	Régisseur de la prison	1	1	
35	Commisaure priseur	1	1	

#	Occupation	Assigned HISCLASS	Enumerated in Census	Fathers in birth certificates
36	Secrétaire du parquet	1	1	
37	Serigne	1	1	
38	Préfet apostolique	1	1	
39	Chef de district	1	0	1
40	Conseiller municipal, jardinier	1	0	1
41	Employé de la Compagnie Hersent	1	0	1
42	Negoçiants	1	0	2
43	Gérant du cercle	2	0	1
44	Commis des secrétariat généraux	2	0	1
45	Capitaine d'infanterie coloniale	2	0	1
46	Controleur des contributions	2	1	
47	Controleur des Douanes	2	1	
48	Brigadiers des Douanes	2	2	
49	Sous-brigadiers des Douanes	2	2	
50	Préposés des Douanes	2	13	2
51	Commis des Douanes	2	6	
52	Canotiers des Douanes	2	5	
53	Interprètes	2	4	1
54	Commis surnuméraires et employès des postes et télégraphes	2	12	
55	Facteurs des postes	2	12	
56	Comptables	2	17	
57	Écrivains	2	50	2
58	Garçons et aides de pharmacie	2	8	
59	Pilotes	2	2	
60	Conducteurs de Travaux	2	9	
61	Contre-maître	2	11	
62	Pointeur	2	1	
63	Géomètre	2	2	
64	Traitants	2	43	3
65	Marchands de Colas	2	43	
66	Marchands de Bois	2	7	
67	Commerçants divers	2	90	4
68	Commerçants divers	2	4	
69	Représentants de Commerce	2	3	
70	Fabricant Liquorestè	2	1	
71	Propriétaires	2	72	
72	Infirmiers	2	9	
73	Sage-femme	2	2	
74	Accoucheuse	2	1	
75	Charbonnier	2	1	

#	Occupation	Assigned HISCLASS	Enumerated in Census	Fathers in birth certificates
76	Agents de Culture	2	2	
77	Restaurateurs	2	3	1
78	Cafetiers cabaretiers	2	9	
79	Maitresses de café	2	2	
80	Huissier	2	1	
81	Greffier commis-greffier	2	2	
82	Artistes-Acteurs	2	5	
83	Agents d'affrétements de transports	2	4	
84	Porteuses	2	4	
85	Armateurs de côtre	2	5	
86	Marabouts et elèves marabouts	2	125	12
87	Frères des ecoles-instituteurs	2	12	
88	Professeurs	2	3	
89	Vicaire	2	2	
90	Elèves	2	211	
91	Officièrs	2	62	
92	Sous-officiers	2	29	
93	Chef de manoeuvre aux Menagerie	2	0	1
94	Chef facteur des postes et télégraphes	2	0	1
95	Chef surveillant des postes et télégraphes	2	0	1
96	Collecteur des marchés	2	0	1
97	Commis du commissaire	2	0	1
98	Conducteur des Ponts et Chassées	2	0	1
99	Employés de commerce	2	0	3
100	Garçon de magasin	2	0	1
101	Premier maitre pilote	2	0	2
102	Premier maitre pilote de la marine	2	0	1
103	Brigadier conducteur	3	0	1
104	Employès divers	3	121	4
105	Plantons et garçons de bureaux	3	50	3
106	Magissiers	3	14	
107	Criéur-tambour	3	2	
108	Gardiens et gardes	3	38	2
109	Gardiens de pisare et aides	3	8	
110	Patrons de mafoupes et côtes	3	12	
111	Chef d'équipe	3	12	4
112	Surveillants	3	14	3
113	Employès du Chemin de fer	3	36	
114	Boutiquiers	3	48	13
115	Ferblantier	3	2	
116	Forgerons	3	54	4

#	Occupation	Assigned HISCLASS	Enumerated in Census	Fathers in birth certificates
117	Chaudronniers	3	15	5
118	Horlogers	3	2	
119	Mécaniciens	3	64	16
120	Tourneurs	3	7	1
121	Bijoutiers	3	64	3
122	Ajusteurs	3	10	2
123	Selliers Bourreliers	3	6	1
124	Maçons	3	250	31
125	Menuisiers	3	245	39
126	Charpentiers	3	38	7
127	Fondeur-Bétonnier	3	11	
128	Peintres	3	17	3
129	Poseurs de pierres	3	4	
130	Tailleur de pierres	3	1	
131	Bardeur	3	1	
132	Ravaleurs	3	2	
133	Maître-compagnon	3	1	
134	Boulangers	3	22	5
135	Charcutier	3	1	
136	Patissiers	3	3	
137	Bouchers	3	26	4
138	Tailleurs et Coutùriers	3	121	3
139	Tisserands	3	61	9
140	Matelassiers	3	4	
141	Cordonniers	3	62	2
142	Tapissier	3	1	
143	Teinturier	3	2	
144	Maîtres Coiffeur - Garçons coiffeur	3	7	
145	Porteur de contrainte	3	1	
146	Brigadier de gendarmerie	3	1	
147	Gendarmes	3	3	
148	Agents de police	3	12	1
149	Griots	3	59	
150	Parleur	3	1	
151	Chameliers	3	15	
152	Charrétiers	3	47	
153	Caporaux et soldats	3	26	
154	Conciérge	3	4	
155	Calfat	3	0	1
156	Cannonier	3	0	1
157	Canonnier d'artillerie	3	0	1

#	Occupation	Assigned HISCLASS	Enumerated in Census	Fathers in birth certificates
158	Caporal tirailleur	3	0	1
159	Commis local des postes et telegraphes	3	0	1
160	Conducteur	3	0	2
161	Frappeur	3	0	1
162	Maître au cabotage	3	0	1
163	Maître maçon	3	0	1
164	Ménétrier	3	0	2
165	Mineur	3	0	1
166	Mouilleur	3	0	1
167	Quarter maître du port militaire	3	0	1
168	Riveur	3	0	1
169	Second maître à bord	3	0	3
170	Serre-frein	3	0	1
171	Tirailleur	3	0	4
172	Pêcheurs	4	253	29
173	Cultivateur, laboureur et Bécheurs	4	1828	42
174	Ménagers et Économes	4	5	
175	Matèlots et laptots	5	504	11
176	Mousses	5	8	
177	Chauffeurs	5	147	10
178	Carriers	5	447	1
179	Bergers et pâtres	5	20	
180	Jardiniers et maraichers	5	47	5
181	Lampiste et allumeurs	5	5	2
182	Portefaix	5	21	
183	Manoeuvres divers	5	1676	18
184	Colporteur	5	0	1
185	Léveur	5	0	0
186	Ménagères		787	
187	Pileuses		607	
188	Blanchisseuses et Lingères		88	
189	Tailleuses en ecole		2	
190	Coutùrières		60	
191	Domestiques-Cuisinières		195	5
192	Maître d'hôtel		1	
193	Gouvernante		1	
194	Camionneur	5	1	
195	Réligieuses		25	
196	Desservant		1	
197	Missionaires dont un procureur		4	

Table A3. HISCLASS_5 adaptations and additions of occupations not in HISCLASS

Occupational Title	Occupational title (eng)	HISCO	HISCLASS_5	Adapted HISCLASS	notes
Tamsir/Cadi	Islamic judge			1	La Tourrasse, 1901: 69-70; Robinson, 2000: 80-81; Ngalamulume, 2012: 95-96
Président du tribunal Musulman	head of the islamic tribunal			1	See «Tamsir/Cadi»
Suppléant du cadi	Deputy judge of the islamic tribunal			1	Ngalamulume, 2012: 95-96
Negoçiant	commercial representative			1	Representative of French trading houses (Ngalamulume, 2012: 21-22)
Représentant de commerce	commercial representative			1	See «negoçiant»
Interpreteur	Interpreter	19540	1	2	Although considered influential, they are not placed at the top of the social hierarchy in Saint-Louis (See Ngalamulume, 2012: 21-23.)
Chef de village	Village chief			2	Like marabouts, these are community leaders representing African inhabitants. While influential, they are not assumed to be at the top of the hierarchy. Robinson (2012: 69) describes chiefs as filling «the lower levels of the administrative hierarchy».
Chef de canton	Canton chief			2	See «Chef de Village»
Agent d'hygiène	hygiene officer	6140	1	2	Hygiene officers were Senegalese workers who were responsible for eliminating mosquito breeding sites. They are placed a category below the top of the hierarchy because they were salaried workers but were not part of the elite (Ngalamulume, 2012: 176-180).
Marabout	Muslim cleric			2	Christian clerics are placed in the first class in the HISCLASS (HISCO = 14120). The Muslim clerics are placed in the second class because while being local community leaders, they did not belong to the colonial elite.
Traitant	Senegalese merchants			2	Senegalese merchants who sometimes reached the elite. Because the group is too broad, however, they are placed in the second class (Ngalamulume, 2012: 21-23; Robinson, 2000: 31-32).
Sous-traitant	Senegalese merchants			3	Agent of a «Traitant»
Boutiquiers	shopkeeper	41030	2	3	It is unclear if this category refers to itinerant traders or owners of shops. Placed in class 3, but sensitivity analyses placing them in the second class should be conducted.
Griot	West African storyteller			3	A distinct caste of African storytellers. While part of the «lower castes», they did not perform manual labor (Ngalamulume, 2012: 23).
Planton	orderly/concierge			3	
Tirailleur sénégalais	Senegalese soldier			3	
Spahis sénégalais	Senegalese soldier			3	
Crieur public	town announcer			3	
Pêcheur	fisherman	64100	5	4	Placed in the food-producing group. Fishermen constitute a semi-closed group that enjoyed a large degree of independence (Ngalamulume, 2012: 11, 23).
Laptot	port worker or sailor			5	La Tourrasse, 1901: 14; Ngalamulume, 2012: 23

**Table A4. Observed cumulative probabilities of dying
per thousand births by interval, 1904 and 1912**

Lower age	Upper age, x (Months)	Upper age, x (Days)	q(x) Saint-Louis	q(x) Dakar
0	0	7	0	0
0	0.229979466	14	0.09247897	0.04531795
0	0.459958932	21	0.12289403	0.0659656
0	0.689938398	28	0.13112277	0.07225714
0	0.919917865	60.875	0.133622775	0.07524084
0	2	91.3125	0.14874499	0.09201827
0	3	121.75	0.15646403	0.11033049
0	4	152.1875	0.16228971	0.12444834
0	5	182.625	0.167605635	0.13670728
0	6	213.0625	0.174037805	0.14598252
0	7	243.5	0.17828594	0.15493363
0	8	273.9375	0.184621265	0.16840323
0	9	304.375	0.189014735	0.1710628
0	10	334.8125	0.194937205	0.18219695
0	11	365.25	0.19687906	0.18881262
0	12	456.5625	0.23304596	0.21905964
0	15	547.875	0.23540068	0.2262377
0	18	639.1875	0.23933284	0.2490684
0	21	730.5	0.240303795	0.25391101
0	24	1095.75	0.286811975	0.31287028
0	36	1461	0.34499681	0.39152414
0	48	1826.25	0.38633435	0.42540313
0	60	1826.25	0.4377433	0.45089339