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RESEARCH ARTICLE

The socio-colonial history of Surinamese surnames applied to a validated surname list to identify ancestry in health research

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Abstract

Around half of the population of Suriname, who are mainly of African and South Asian descent, migrated to the Netherlands at the end of the previous century, where they face higher perinatal and maternal mortality and up to 5 years lower life expectancy than European-Dutch. Analyses by ancestry are needed to address these inequalities, but the law prohibits registration by ancestry. Therefore, a list of Surinamese surnames was compiled and validated to identify the largest groups, African-Surinamese or South Asian-Surinamese ancestry in health research. A complete database of Surinamese surnames was provided by the National Population Registry of Suriname. Surname recognition by researchers of Surinamese ancestry was used. Disagreement was resolved using historical registers and through discussion. The list was further validated against contemporary lists of Surinamese surnames with self-defined ancestry, obtained during population and clinical studies in Suriname and the Netherlands. All 71,529 Surinamese surnames were encoded, as African-Surinamese (34%), South Asian-Surinamese (18%), Brazilian or other Iberian (17%), Indonesian-Surinamese (13%), Chinese-Surinamese (5%), First Nation (2%), and other (10%). Compared to self-defined ancestry, South Asian-Surinamese surname coding had 100% sensitivity, 99.8% specificity, and 99.9% accuracy. For African-Surinamese, who may have Dutch surnames, these values depended on geocoding. With a known Surinamese origin, sensitivity, specificity, and accuracy were, respectively, 97.3%, 100%, and 98.6%, but without this information, there was interference of African-Surinamese with European-Dutch surnames in the Dutch validation sample. In conclusion, the Surinamese Surname List has a high accuracy in identifying persons of Surinamese ancestry. This quick, inexpensive, and nonintrusive method, which is unaffected by response bias, might be a valuable tool in public health research to help address the profound health disparities by ancestry.

Keywords: continental ancestry groups; health inequities; surname analysis

Background

Ancestry is an important determinant of social inequalities and health disparities in the Netherlands (Central Bureau of Statistics, www.cbs.nl), but legal restrictions in registration of ancestry data hamper the management of these disparities (Brewster, 2020). In particular, Surinamese-Dutch of sub-Saharan African and South-Asian ancestry have a lower health span and lifespan than European-Dutch, while Surinamese-Dutch mothers experience up to five times higher mortality during childbirth in sparse studies, without a national program in place to

monitor and reduce these inequities (Central Bureau of Statistics, www.cbs.nl; Brewster, 2020; Kallianidis *et al.,* 2022).

Currently, estimations based on the country of birth (first and later generations migrant populations), data from non-governmental organisations, or local or small-scale studies have been used in public health research (Fernald *et al.,* 2016; Snijder *et al.,* 2017; Brewster, 2019; Diemer *et al.,* 2020; Kallianidis *et al.,* 2022). However, country of birth is not a proxy for ancestry, and these methods are incomplete and insufficient to adequately research or monitor Surinamese of African and Asian ancestry, who have important differences in history, socio-economic characteristics, culture, and health (Fernald *et al.,* 2016; Brewster *et al.*, 2016; Snijder *et al.,* 2017; Brewster, 2019; Diemer *et al.,* 2020; Brewster *et al.*, 2020).

Surname lists have shown to be useful in identifying ancestry from secondary data sources. These lists have been used in public health to study outcomes by ancestry with well-acceptable precision but need to be specifically developed per subpopulation, region, or country (Man A Hing, 1990; Nanchahal *et al.,* 2001; Fiscella and Fremont 2006; Shah *et al.,* 2010; Aribowo and Herawati, 2016). Therefore, this study aimed to develop and validate lists to identify people of Surinamese sub-Saharan African, South Asian, or other Suriname ancestry.

Methods

A brief history of colonialism and surnames in Suriname

Suriname is a country on the northeast coast of South America, sized around 165,000 km^2 and inhabiting around 550,000 citizens of diverse ancestry. Since Christopher Columbus sighted its coast in 1498, colonisation has been attempted by the Spanish, Portuguese, French, Germans, English, and Dutch (van Sijpesteijn, 1854). Jewish migrants from Brazil are thought to have brought the first enslaved Africans to Suriname in the 1640s, while the English attempted to establish a settlement in 1650 that lasted until the Dutch invaded Suriname in 1667. Except for three decades of British rule (with a brief second period early in the 19th century), Suriname remained a Dutch colony for around 300 years, until 1975, when Suriname became a sovereign state (Warren, 1667; van Sijpesteijn, 1854; Davis, 2015; da Silva, 2011; Paul, 2014; The World Bank, n.d.). As summarised below, the anthroponymy of the Surinamese population was highly affected by colonial powers, slavery, and indentured labour (Figure 1).

1492–1863

From their arrival in the 15th century in what they would name the American continent, Europeans had relied on the labour of enslaved First Nations and African people. From the 17th to the 19th century, Dutch and other Europeans transported between 200,000 and 300,000 enslaved Africans to Suriname. The extremely harsh treatment of African enslaved persons under Dutch rule, even considered inhuman by other contemporary European enslavers, resulted in massive mortality during and after the trans-Atlantic passage. However, it was considered cheaper to buy new Africans than to take care of the existing population (Stedman, 1796; Teenstra, 1842; de Kom, 1934; Davis, 2011; Schokkenbroek and van den Broeke, 2022). In 1863, the year slavery was abolished in Suriname, there were approximately 38,500 enslaved left. Around 17,500 formerly enslaved persons, mainly children of the enslavers with their mothers, had been manumitted (set free) by then. Another estimated 10,000 Maroons who had escaped slavery and a decimated population of 2000 First Nations (from around 70,000 at the start of the colonisation) lived in the tropical rainforest. First Nations included the Tarëno ('people from here'), Wajana, Waiwai, and others. Less than 100 Chinese indentured labourers (arriving from 1858) and around 3500 persons of European and Jewish ancestry, mainly enslavers, inhabited the coastal area (National Archive of the Netherlands, https://www.nationaalarchief.nl; Inter-American Development Bank, n.d.;
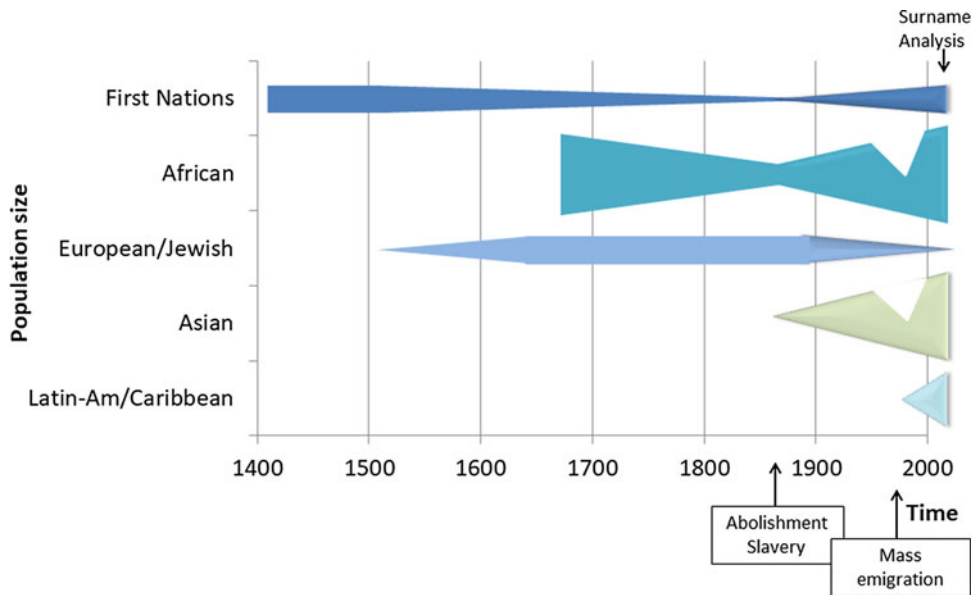
Figure 1. Historical overview of the populations of Suriname. Highly schematic overview of the historical developments among the different populations of Suriname. First Nations inhabited the area probably from 7000 BC. The arrival of Europeans decimated the population size from an estimated 70,000 in the year 1500 to around 2000 in the year 1863, slowly increasing after the plantation economy was increasingly abandoned and Europeans gradually left. Furthermore, of the estimated 200,000–300,000 Africans brought to Suriname, there was no population growth due to the extremely high mortality, with less than 40,000 enslaved African persons having survived when slavery was abolished in 1863. South Asian indentured labourers were brought to Suriname to replace the enslaved. Later, Indonesian (Javanese) indentured labourers followed. In 1975, mass migration of around 50% of the African and Asian ancestry population to the Netherlands surrounding the independence of Suriname was followed by rapid population regrowth. The recent regional immigration of persons from mainly Brazil is related to gold mining in the tropical rainforest. Currently, African ancestry persons are the largest group in Suriname (around 42% of the population of 550,000, estimated in 2019), with negligible White European and Jewish populations (Central Bureau of Statistics, www.cbs.nl; The World Bank, n.d.; Stedman, 1796; Teenstra, 1842; de Kom, 1934; Davis, 2011; Schokkenbroek and van den Broeke, 2022).

Hoogbergen and ten Hove, 2001). Except for the Maroons and First Nations, every person living in the colony and every single Asian migrant was meticulously registered by the Dutch, usually with a single name or mononym (National Archive of the Netherlands, https://www.nationaalarchief.nl). Surnames were used by White Europeans and persons of Jewish ancestry, but not for the enslaved. Surnames in Suriname were inherited patrilineally or matrilineally when children were born out of marriage. Manumitted persons had been given surnames that were often a minor modification of the surname of their (white or Jewish) father, such as 'van Adams' (literally from or belonging to Adams) for the manumitted children of Mr. Adams (National Archive of the Netherlands, https://www.nationaalarchief.nl).

1863–1919

At the abolition of slavery in 1863, surname-giving of formerly enslaved persons was exclusively by the enslavers, as dictated by Dutch colonial ruling. This is the basis of the Germanic origin of many surnames of African-Surinamese persons. The 1863 registry holds 8205 surnames given by the enslavers to around 38,500 formerly enslaved African ancestry persons, generally to a nuclear family of 4 to 5 persons consisting of a mother, her children, and the children of her daughters. Male heads of families were not allowed, and fathers were often sold off by the enslaver (National

Archive of the Netherlands, https://www.nationaalarchief.nl; Stedman, 1796; Teenstra, 1842; de Kom, 1934). Men without female relatives on the same plantation generally received their own, personal surname (National Archive of the Netherlands, https://www.nationaalarchief.nl), and enatic ancestry (with matrilinear transmission of surnames) remained important in formerly enslaved.

Although some are no longer in use, these surnames of the formerly enslaved Africans are unique, largely unchanged, and easily recognised as being of African-Surinamese origin by Dutch speakers. This is because newly constructed, non-existing but nonetheless Dutch-sounding surnames or unusual words were often used by the enslavers (such as 'Liesdek', which is a surname unique to Suriname) (Forebears, n.d.). Sometimes these names given to the formerly enslaved were rather ridiculing, such as Dutch words for poor ('Arm'), poverty ('Armoede'), or presumed negative characteristics such as sneaky ('Gluipert'), sexist surnames (e.g. attractive, 'Bevallig' for a woman and her daughter). Also, many Dutch word reversals became surnames (e.g. 'Madretsma' from 'Amsterdam') (National Archive of the Netherlands, https://www.nationaalarchief.nl). Maroons and First Nations mostly carried self-chosen names in their own languages (Inter-American Development Bank, n.d.; Algemeen Bureau voor de Statistiek, 2005).

The Dutch government also compiled detailed registries of (sur)names of indentured Asian labourers brought to Suriname, including Chinese (1853–1930, n≈2000), South Asians, mainly from Uttar Pradesh and Bihar (1873–1916, n≈34,000), and Indonesian (Javanese)-Asians (1890–1930, n≈33,000) (National Archive of the Netherlands, https://www.nationaalarchief.nl). After their indentured labour, nearly all Chinese and South Asians and around 24,000 Javanese stayed in Suriname. The names of all indentured labourers brought to Suriname can be found by hand search in public sources, often as a mononym supplemented with a unique person or contract number. The number was an integral part of the name, to be used for marriage and other legal matters and referred to the ship and date of arrival in Suriname, for example, 'Sikam No. 55/Ee' was a man who had arrived in 1902 with the ship Mersey II from Calcutta (migrants on this ship had received number Ee 1–679) (National Archive of the Netherlands, https://www.nationaalarchief.nl).

1919–1975

From around 1919, Maroons and First Nations were encouraged, and Asian ancestry citizens were obliged to adopt a given and a family name by law (National Archive of the Netherlands, https://www.nationaalarchief.nl; Man A Hing, 1990). In contrast to African ancestry persons, indentured labourers were allowed to choose their surnames. Largely very different from the European-sounding surnames of the Creoles, Surinamese South Asians constructed surnames using Hindi, Sanskrit, Sarnami, or Arabic (-derived) words. Surinamese South Asians did not originate from Goa, and none is known to carry Portuguese surnames (National Archive of the Netherlands, https://www.nationaalarchief.nl).

In Java, persons used to have a mostly (Hindu or Javanese) mononym expressing the hope of the parents for a child's future (Aribowo and Herawati, 2016). This unique person's name was not passed to the spouse or the children (Aribowo and Herawati, 2016). The obligatory given and surnames in Suriname were derived from the ancestors who migrated from Java, and the newly constructed surnames generally do not occur in Java and are therefore considered typically Javanese-Surinamese. Although there is some overlap in Arab-derived surnames of South Asians and Javanese, the spelling is often specific for one group (National Archive of the Netherlands, https://www.nationaalarchief.nl).

Chinese-Surinamese surnames also differ from surnames used in China, which are usually composed of a short mononym or *xing* followed by a given name or *ming* (Man A Hing, 1990; Shah *et al.*, 2010). In Suriname, the complete traditional Chinese 'surname-given name of the father (e.g. Tjon A Ten, with 'Tjon' being the surname or xing and 'A Ten' the given or ming)

came into use as the new legal surname (e.g. '*John* Tjon a Ten' for the child), with the Chinese pronunciation romanised to the Dutch spelling (National Archive of the Netherlands, https://www.nationaalarchief.nl). Finally, some Surinamese are descendants of other, mainly White European, Lebanese, or Jewish settlers, consisting of few families with well-known, distinct surnames specific for these small family groups (Boeroe kon Makandra Foundation, https://boeroes.nl; Samson, 1989; de Bruijne, 2006).

Notably, in what was effectively a social Dutch-Surinamese apartheid system, ancestry was documented, and different population groups of colour were placed in different parts of the country, with different legislation regarding name-giving, living, work, and marriage per group (de Kom, 1934; Man A Hing, 1990). This Dutch policy of separation restricted intermarriage and social movement (National Archive of the Netherlands, https://www.nationaalarchief.nl), and currently, these surnames are retained in largely unmixed ancestry groups (Algemeen Bureau voor de Statistiek, 2005).

1975 to currently

Around half of the population, est. 175,000 persons migrated to the Netherlands within a decade surrounding the independence of Suriname from the Netherlands in 1975, creating new population subgroups of predominantly South Asian and African-Surinamese-Dutch in the Netherlands (Central Bureau of Statistics, www.cbs.nl). Emigration to other countries, including the United States of America, Belgium, and France remained modest, and total figures are very small in comparison to migration to the Netherlands (Vezzoli, 2014).

In Suriname, the population currently consists of persons of sub-Saharan African ancestry (43%), South Asian (27%), and Javanese-Surinamese (14%), the local population of First Nations (4%), and other and mixed ancestries, including migrants from regional Caribbean communities and Latin America (Algemeen Bureau voor de Statistiek, 2005). In the late 20th century and the 21st century, the Maroons' migration from the tropical rainforest to urban areas, with a large influx of persons from Brazil and other surrounding countries, introduced surnames not present in the Dutch historical databases (Algemeen Bureau voor de Statistiek, 2005).

Due to stricter Dutch migration laws, emigration from Suriname to the Netherlands has dropped to negligible numbers (< 1% of the total migration of foreigners to the Netherlands) (Central Bureau of Statistics, www.cbs.nl). Hence, the recent influx of persons from Brazil to Suriname, est. between 20,000 and 30,000 persons, is unlikely to affect the Surinamese-Dutch population demographics in the Netherlands, currently around 350,000 persons of mainly African and South Asian ancestry, of whom around half were born in Suriname (Central Bureau of Statistics, www.cbs.nl; Algemeen Bureau voor de Statistiek, 2005).

Outcome

The main outcome was the categorisation of contemporary surnames into Surinamese South Asian or Surinamese-African ancestry, the major population groups in Suriname and the Netherlands.

Name classification

The procedures used are summarised in Figure 2. A database of all Surinamese surnames currently in use was obtained from the Surinamese government (2018). The maiden surname was used for women. Surnames were hand-coded by Surinamese researchers and volunteers of Asian and African ancestry in the Netherlands and Suriname. Ambiguous surnames were checked against historical registers and contemporary databases. The historical databases included the 1863 register of all formerly enslaved African ancestry persons with the surnames given by the enslavers
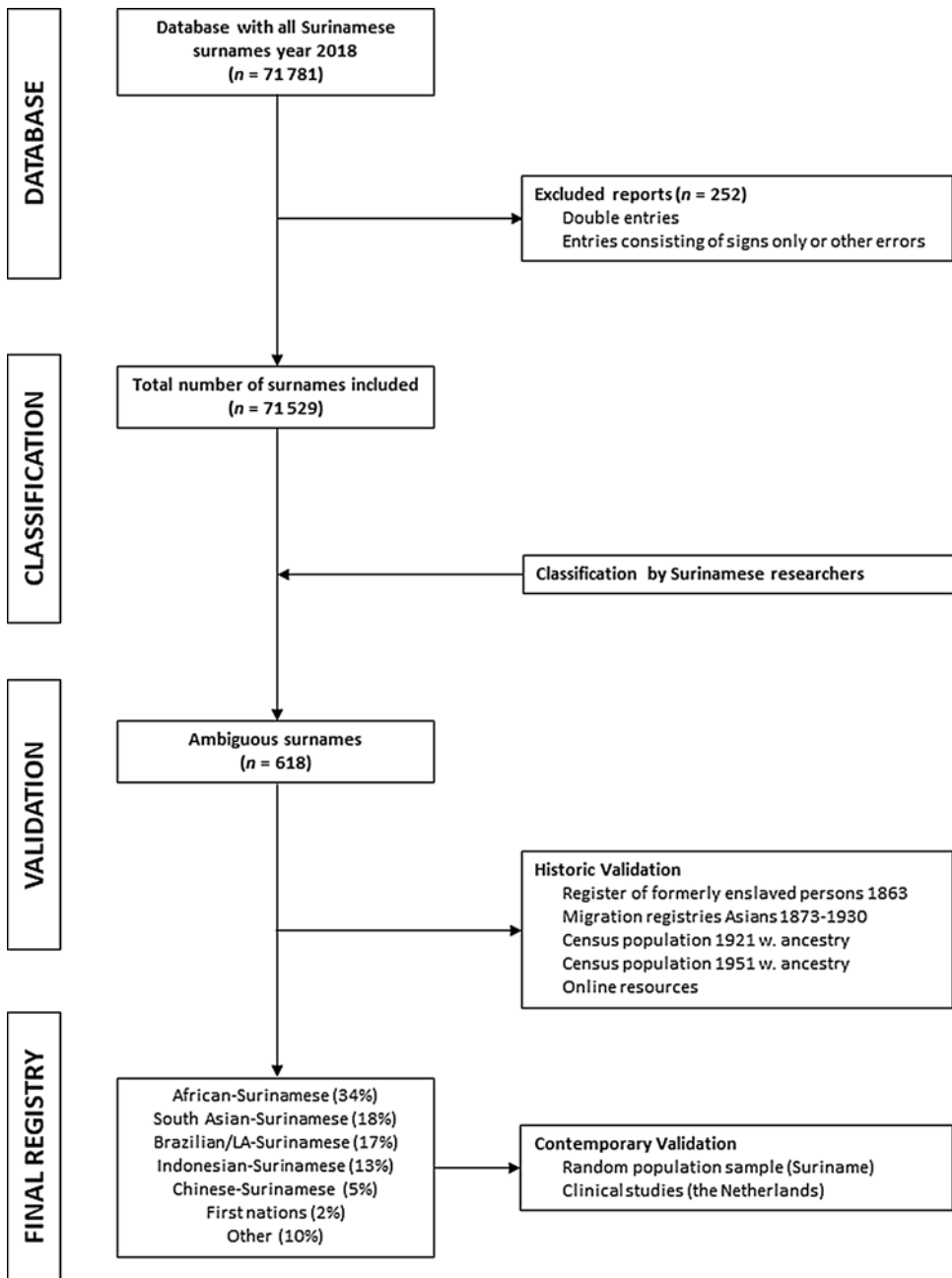
Figure 2. Flow diagram of the methods. Overview of the methods used for surname classification and validation. The consistent central registration of (sur)names and ancestry throughout the history of Suriname by the Dutch rulers, and of surnames by the Surinamese government since 1975, was instrumental to the analysis.

at the abolishment of slavery; the complete late 19th- and early 20th-century migration registers of Chinese, Indian, and Indonesian indentured labourers who migrated to Suriname; and the national census of 1921 and 1950 in Suriname, where ethnicity was recorded or could be inferred based on the individual migration number provided (National Archive of the Netherlands, https://www.nationaalarchief.nl). Two contemporary validation databases were compiled from large,

representative population health studies and clinical studies in Suriname and the Netherlands in the 21st century, where ancestry was self-defined. Surname coding was supported by an internet search where needed, especially for non-Surinamese and non-regional surnames.

Ancestry was definitively categorised by at least two independent researchers, one of Asian and one of African ancestry, creating a list of all Surinamese surnames by ancestry. Two researchers of African and South Asian ancestry (LB and AI) supervised the review of the list for completeness and further identified the surnames as unique, contemporary 21st-century African ancestry, South Asian, Javanese, Chinese, other Asian, White European, or other surnames with at least two other persons of South Asian or African ancestry.

All surnames in Hindi or Sarnami (the local language of Surinamese of South Asian ancestry) (Damsteegt, 2002, p. 249) were considered South Asian-Surinamese. As many of the surnames chosen by South Asian Surinamese in the first half of the 20th century do not exist in India, an expert in South Asian languages and Sarnami (TD) reassessed the surnames of this major population group. The surnames of the then British-South Asians underwent transliteration into Dutch, for example, with 'oo' replaced by 'oe', whereby spelling errors were introduced by Dutch-speaking clerks, creating rather specific Dutch-South Asian surnames. Also, the word 'Singh' was often incorporated into South Asian-Surinamese surnames. For example, it was added to the given Hindi or Urdu name Umrao ('Noble or Queen') to become the exclusively South Asian-Surinamese surname 'Oemrawsingh'.

Typical Javanese-Surinamese surnames included phrasing such as 'Kromo', 'Redjo', and 'Pawiro', and as with the Indian surnames, these surnames do not exist in Java. As with other Asian migrants, fantasy or newly constructed names that sound Chinese but do not occur in China, such as 'Fa Sie Oen', were used by Chinese (Man A Hing, 1990). The Dutch colonial government romanised Chinese surnames ('xings'), mainly from Chinese Hakka and Cantonese, to Dutch-sounding words. There was no standard system available for this transliteration, for example, the Pinyin 'Zhāng' (International Phonetic Alphabet [International Phonetic Association (IPA), 1999], 'ʈʂáŋ') became the Dutch 'Tjon' or 'Tjong', yielding, for example, 'Tjon Sie Fat' as a Chinese surname, which is uniquely Surinamese (Man A Hing, 1990).

Finally, contemporary Brazilians typically have two surnames (mother's and father's paternal surnames, with the husband's surname often replacing the mother's in married women) of mostly Iberian, but also Italian, Japanese, German, or East European origin. Silva, Santos, Oliveira, Souza, and Pereira are included in around half of these surnames (Monasterio, 2017). Except for a few well-known historical, Surinamese Iberian-origin surnames as validated with historical registers (National Archive of the Netherlands, https://www.nationaalarchief.nl), such as Fonseca, Fernandes, Robles de Medina, and Bueno de Mesquita, often indicative of paternal (Sephardic) Jewish heritage (Samson, 1989), the large majority of Iberian-origin names were classified as Brazilian or Latin American. Disagreements were resolved by discussion, with historical registers, or other resources. Surnames that could not be traced back to any specific ancestry group were coded as 'other'. Surnames that could be traced back to multiple ancestry groups were coded as such, in the category 'ambiguous'.

Validation assessment

After completing the list with reference to historical databases, the ancestry assignment was further validated against two contemporary lists with surnames and self-defined ancestry. A random sample of the 'Healthy Life in Suriname' (HeliSur) population study that included 1794 persons between 18 and 70 years old, with self-defined ancestry, was used (Diemer *et al.*, 2014). These surnames had been collected by health workers using household sampling. Households had been selected by randomisation of geographical areas and were visited at home (Diemer *et al.*, 2014).

The second sample (N = 708) was compiled from clinical studies of healthy volunteers in the Netherlands between 18 and 70 years old. These studies had included participants of self-defined

White European, Surinamese, and other ancestries. This list was used as a validation sample, and the data were assessed as conditional (vs. unconditional) on the presence of information about Surinamese ancestry.

Sensitivity, specificity, and accuracy were the main validation output parameters. These were defined as follows, for example, for South Asian ancestry: true positive, the number of persons who self-identified as South Asian and were South Asian according to the Surname List, and true negative, the number of persons who did not self-identify as South Asian and were not South Asian according to the Surname List. False positives were the persons who did not self-identify as South Asian but were according to the list, and false negatives were the number of persons who self-identified as South Asian but were not according to the list. Sensitivity was the proportion of South Asian ancestry persons who were South Asian according to the list compared to all persons who self-identified as South Asian (regardless of the classification by the list), and specificity was the proportion of persons who were not South Asian according to the list, compared to the total number of people who were not South Asian by self-identification, no matter their classification result with the list. Finally, accuracy is the ratio of correct classification to all classification results.

Positive and negative predictive values (PPV and NPV) were also assessed. These measures estimate the precision of a test, respectively, the probability that a positive or negative classification (e.g. South Asian or non-South Asian) is indeed correct. PPV and NPV depend on the size of an ancestry group within the population ('prevalence'). These values are calculated from sensitivity, specificity, and prevalence, as PPV = (Sensitivity × Prevalence)/[(Sensitivity × Prevalence) + ((1 - Specificity) × (1 - Prevalence))] and NPV = (Specificity × (1 - Prevalence))/[((1 - Sensitivity) × Prevalence) + (Specificity × (1 - Prevalence))].

Sample size calculation validation study

We took the prevalence into account when calculating the sample size needed for the validation. For the main outcome, based on an expected sensitivity and specificity of 80%, a confidence level (1 - alpha) of 0.9, and a population prevalence of 0.4, at least 109 persons in the sample of each ethnicity were needed. With a population prevalence of 0.3, 145 persons were needed in the validation sample.

Results

Name categories

The Suriname Surname List included all 71,529 unique surnames in Suriname (2018), coded by the researchers as African ancestry (Creole and Maroon) (34.2%), South Asian (17.9%), Javanese (13.3%), Chinese (5.3%), First Nations (2.5%), and Brazilian/Iberian/Hispanic (17.4%). The group of other surnames was 9.5%, including non-Hispanic whites (<0.5%) (Figure 3). Please see Table 1 for the most frequently occurring Surinamese surnames.

Of the 8204 surnames given to 38,545 formerly enslaved persons, around half were still in use, mostly unchanged. Other surnames of persons of African ancestry were from manumitted persons (mainly Gallo-Germanic surnames derived from enslavers), migrants from the Guyana's and Caribbean region (e.g. 'Wade' or 'Nesty'), or migrants from the tropical rainforest to the coastal areas (mainly African surnames in the tribal languages of the Maroons).

Very few (<1%) surnames were originally in multiple categories, such as 'Amat', which occurred as a surname of Indonesian ancestry persons as well as a surname of formerly enslaved Africans. The majority of ambiguous surnames were either foreign, including from Eastern European countries, the Middle East, or the Philippines. A separate category were families of mixed ancestry such as 'Artist', a surname of the 1863 Enslavement Register given to a small formerly enslaved family, but also currently recognised to represent First Nation heritage.
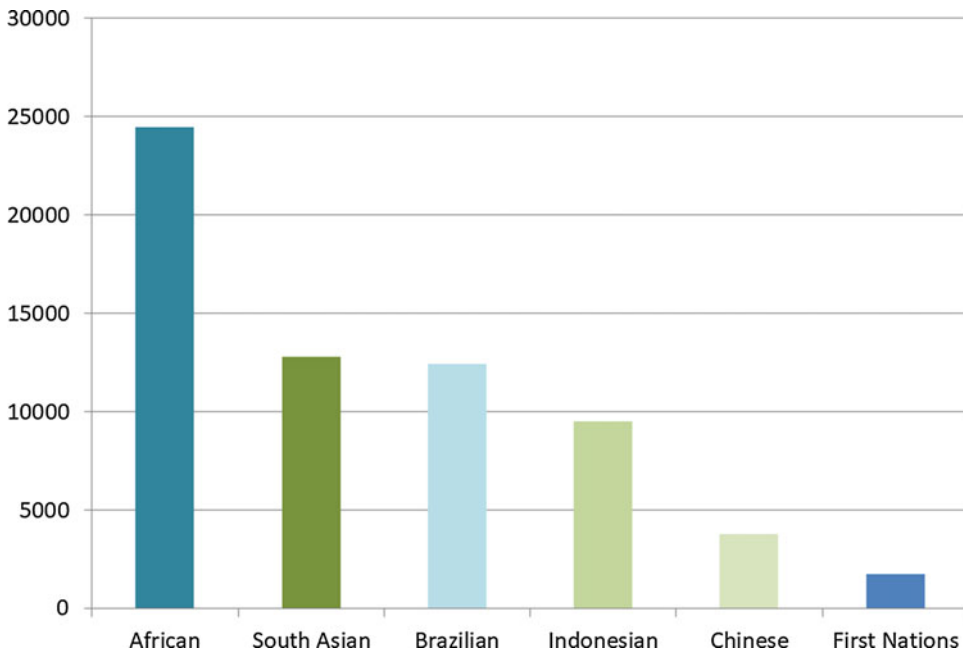
Figure 3. Number of surnames by ancestry. Number of unique surnames per ancestry group. Persons of African ancestry, one of the oldest population groups (and currently the largest), held the greatest number of unique surnames. Please note that this bar graph, although an indication of population size, does not represent the frequency of the surnames (please see Table 1). The (mostly double) Brazilian surnames are highly variable and change with each generation, as the surnames of the father and mother (or one parent and spouse for married women) are combined. All other Surinamese strictly follow patrilineal surnaming for children when married (or matrilineal when not), resulting in a single surname with less name variation over generations. Surnames categorised as 'other' (around 10%) are not shown.

Validation in Suriname

The Surinamese validation dataset consisted of 785 self-identified African-Surinamese, 546 South Asian Surinamese, 150 Javanese, and groups of other or mixed ancestry. The analysis was limited to persons born in Suriname (95.4%). Sensitivity, specificity, and accuracy were very high, >90% for both the African and South Asian groups (Table 2A and 2B) for the Surinamese Surname List validated in a random, contemporary population sample from Suriname. Around 0.5% of the surnames from the random population sample did not occur in the national registry, almost exclusively from Maroons. When these missing surnames were scored as 'incorrect classification', sensitivity, specificity, and accuracy became, respectively, 91%, 100%, and 94% for African ancestry persons. For Javanese, sensitivity, specificity, and accuracy were, respectively, 96.2%, 99.9%, and 99.6%, with 99.5 for PPV and 99.4 for NPV. The small number of First Nations and Chinese persons (n<30) was not further assessed.

Validation in the Netherlands

All Surinamese surnames of the validation sample were present in the Surname List. When the condition of being of Surinamese ancestry was taken into account, South Asian-Surinamese surname coding had 100% sensitivity, 99.8% specificity, and 99.9% accuracy. For Creole Surinamese with a known Surinamese origin, these scores were, respectively, 97.0%, 100%, and 98.6%. However, when inferences were made without the condition 'Surinamese ancestry', there was interference between European-Dutch surnames and surnames of the African-Surinamese ancestry group, yielding a sensitivity, specificity, and accuracy of, respectively, 97%, 73%, and

Table 1. Most Frequently Occurring Surinamese Surnames

Surnames in Suriname				Surinamese surnames in the Netherlands			
All		South Asian	African	All		South Asian	African
1. Pinas[a]	26. Adipi	1. Autar	1. Pinas[a]	1. Pinas[a]	26. Gajadhar	1. Autar	1. Pinas[a,b]
2. Pansa	27. Eduards	2. Mohan	2. Pansa	2. Autar	27. Binda	2. Ramautar	2. Linger[b]
3. Sabajo	28. Lugard	3. Singh	3. Misiedjan	3. Ramautar	28. Abdoel	3. Lachman	3. Cairo[b]
4. Misiedjan	29. Persaud	4. Persaud	4. Adjako	4. Lachman	29. Ramadhin	4. Ramcharan	4. Esajas[b]
5. Adjako	30. Mahabier	5. Mahabier	5. Doekoe	5. Ramcharan	30. Ramdas	5. Mahabier	5. Pengel[b]
6. Doekoe	31. Banai	6. Narain	6. Aloeboetoe	6. Mahabier	31. Mangal	6. Kalloe	6. Boldewijn
7. Aloeboetoe	32. Paulus	7. Racharan	7. Amiemba	7. Kalloe	32. Badloe	7. Kanhai	7. Pique[b]
8. Amiemba	33. Narain	8. Ramautar	8. Jackie	8. Kanhai	33. Orie	8. Ramlal	8. Macnack[b]
9. Lin	34. Amoida	9. Sardjoe	9. Haabo	9. Ramlal	34. Bhoelai	9. Sardjoe	9. Mijnals[b]
10. Jackie	35. Kwasiba	10. Soekhoe	10. Main	10. Sardjoe	35. Doerga	10. Sital	10. Winter
11. Haabo	36. Ramcharan	11. Ramlal	11. Anakaba	11. Sital	36. Baldew	11. Biharie	11. Mac Donald[b]
12. Main	37. Vola	12. Kalloe	12. Afonsoewa	12. Biharie	37. Ramdin	12. Badal	12. Plet[b]
13. Anakaba	38. Ceder	13. Mahes	13. Vorswijk	13. Badal	38. Bhageloe	13. Narain	13. Wijngaarde[b]
14. Afonsoewa	39. Jubitana	14. Lachman	14. Ngwete	14. Linger	39 Kalpoe	14. Mohan	14. Grootfaam[b]
15. Vorswijk	40. Ramautar	15. Kanhai	15. Linga	15. Narain	40. Ganpat	15. Soekhoe	15. Vrede[b]
16. Chen	41. Tooy	16. Ramdin	16. Finisie	16. Mohan	41. Gopal	16. Boedhoe	16. Felter[b]
17. Autar	42. Sardjoe	17. Rampersad	17. Landveld	17. Soekhoe	42. Boldewijn	17. Rampersad	17. Blokland
18. Mohan	43. Koedemoesoe	18. Ramadhin	18. Weewee	18. Boedhoe	43. Pique	18. Ramkhelawan	18. Simons
19. Ngwete	44. Geddeman	19. Boedhoe	19. Djoe	19. Rampersad	44. Harpal	19. Gajadhar	19. Hasselbaink[b]
20. Linga	45. Soekhoe	20. Sital	20. Adipi	20. Cairo	45. Macnack	20. Binda	20. Fraser[b]
21. Finisie	46. Cairo	21. Ramkhelawan	21. Eduards	21. Esajas	46. Ganesh	21. Abdoel	21. Emanuels[b]

(*Continued*)

Table 1. (Continued)

Surnames in Suriname				Surinamese surnames in the Netherlands			
All		South Asian	African	All		South Asian	African
22. Landveld	47. Poeketie	22. Binda	22. Lugard	22. Jagroep	47. Chedi	22. Ramadhin	22. Hiwat[b]
23. Weewee	48. Kwadjani	23. Harpal	23. Banai	23. Sabajo	48. Poeran	23. Ramdas	23. Belfor[b]
24. Singh	49. Ramlal	24. Biharie	24. Paulus	24. Pengel	49. Mijnals	24. Mangal	24. Dors
25. Djoe	50. Jubithana	25. Sadhoe	25. Amoida	25. Ramkhelawan	50. Mathoera	25. Badloe	25. Renfurm[b]

Source: Dutch surname bank (CBG.nl), National Archive of the Netherlands (https://www.nationaalarchief.nl), Delpher (Delpher.nl), Forebears (https://forebears.io).
The top 50 most frequent Surinamese surnames and the top 25 most frequent African and South Asian-Surinamese surnames (the largest groups) in Suriname and the Netherlands.
[a]Pinas (probably derived from *Pinus*) is the most commonly occurring name for Surinamese persons in the Netherlands and in Suriname since the abolition of slavery in 1863, referring to a large African-Surinamese family (names of trees were among the surnames given to formerly enslaved). The name frequency is 1 in 70 persons in Suriname and 1 in 260 Surinamese in the Netherlands.
[b]Many African-Surinamese surnames are neologisms given by the Dutch enslavers to formerly enslaved persons during the abolition of slavery in 1863, yielding names unusual for European-Dutch and typically African-Surinamese-Dutch (defined as rarely occurring in the Netherlands before 1950 (0–47 times, median 3), with a surge to up >100-fold after the great migration of Surinamese to the Netherlands around 1975. South Asian surnames are also typically Surinamese.

Table 2A. Performance Characteristics of the Surname List for South Asian-Surinamese

Test sample	Sensitivity	Specificity	Accuracy	PPV/NPV	Prevalence
Suriname	100	100	100	100/100	27.4[b]
The Netherlands					
Conditional[a]	100	99.8	99.9	99.7/100	44.5
Unconditional[a]	100	99.8	100	81.1/100	0.9

[a]Conditional (and unconditional) refers to the presence or absence of information on Surinamese ancestry (birth in Suriname or birth of at least one parent in Suriname), as assessed in the Netherlands.
[b]Population prevalence of this ancestry group in Suriname. This number tends to be higher than the proportion of unique surnames of this ancestry group in Suriname (18%), probably related to the relatively large proportion of Brazilian surnames (around 18%), relative to their estimated population size (<10%) (Central Bureau of Statistics, www.cbs.nl; Algemeen Bureau voor de Statistiek, 2005). PPV/NPV, respectively, positive and negative predictive values.

Table 2B. Performance Characteristics of the Surname List for African-Surinamese

Test sample	Sensitivity	Specificity	Accuracy	PPV/NPV	Prevalence
Suriname	100	100	100	100/100†	42.5[b]
The Netherlands					
Conditional[a]	97.3	100	98.6	100/98.1	42.1
Unconditional[a]	97.4	73.7	79.0§	3.2/100§	0.9

[a]Conditional (and unconditional) refers to the presence or absence of information of Surinamese ancestry (birth in Suriname or birth of at least one parent in Suriname), as assessed in the Netherlands. †When surnames of persons not in the registry, mainly self-identified Maroons, are taken into account, the sensitivity, specificity, and accuracy are, respectively, 90.5%, 100%, and 93.5%.
[b]This number tends to be higher than the proportion of unique surnames of this ancestry group in Suriname (34%), probably related to the relatively large proportion of Brazilian surnames (around 18%), relative to their estimated population size (<10%) (Central Bureau of Statistics, www.cbs.nl; Algemeen Bureau voor de Statistiek, 2005). §A reflection of the Dutch surnames of many African-Surinamese, rendering many of these persons' surnames indistinguishable from European-Dutch, when information on Surinamese ancestry was not used. This is in contrast with the South Asian Surinamese, who are more easily recognised, even within the Netherlands. PPV/NPV, respectively, positive and negative predictive values.

79.0% and low PPV (Table 2A and 2B). The number of Javanese and Chinese persons (10 in total) was too small for further assessment.

Discussion

Around 40% of the population of Suriname lives in the Netherlands, where they face major inequities in health compared to white Dutch (Fernald *et al.*, 2016; Snijder *et al.*, 2017; Brewster, 2019; Diemer *et al.*, 2020; Brewster, 2020; Kallianidis *et al.*, 2022). Centuries of enslavement of African ancestry persons, as well as decades of indentured labour of Asian ancestry persons, still seem to resonate in the health of these population groups today (Stedman, 1796; Teenstra, 1842; de Kom, 1934; Davis, 2011; Oehlers *et al.*, 2016; Schokkenbroek and van den Broeke, 2022). Surinamese persons have a lower life expectancy than European Dutch whether living in Suriname or in the Netherlands (Central Bureau of Statistics, www.cbs.nl; The World Bank, n.d.; Brewster, 2020). The lifespan of Surinamese-Dutch is up to 3 to 5 years shorter than European-Dutch, with higher child and maternal mortality (Central Bureau of Statistics, www.cbs.nl; Fernald *et al.*, 2016; Snijder *et al.*, 2017; Brewster, 2019; Diemer *et al.*, 2020; Brewster *et al.*, 2020; Brewster, 2020; Kallianidis *et al.*, 2022). However, national public health research on inequities among Surinamese-Dutch is hampered by the lack of data segregated by ancestry (Brewster, 2019; 2020).

Surname analysis could be a helpful tool to address these issues, but research related to the onomastics of the contemporary Surinamese population is scarce. A previous paper assessing Suriname ancestries in 339 patients and 1500 controls (<1% of the Surinamese population) did not report the test characteristics of this small sample (Garssen *et al.,* 2007). In this study, records with all Surinamese surnames were used for inferential classification by ancestry. A Surinamese Surname List was compiled and validated against historical registers and contemporary databases that provided information on ancestry. As far as known, it is one of the largest surname lists compiled (Perkins, 1993; Abrahamse *et al.,* 1994; Lauderdale and Kestenbaum, 2000; Nanchahal *et al.,* 2001; Fiscella and Fremont, 2006; Elliott *et al.,* 2008; Shah *et al.,* 2010; Aribowo and Herawati, 2016) and the first validated surname list including all Surinamese surnames.

The validity of the Surinamese Surname List was comparable with other published surname lists (Perkins, 1993; Abrahamse *et al.,* 1994; Lauderdale and Kestenbaum, 2000; Nanchahal *et al.,* 2001; Fiscella and Fremont, 2006; Elliott *et al.,* 2008; Shah *et al.,* 2010; Aribowo and Herawati, 2016). The 1990 USA Census Spanish list showed an overall sensitivity of 79% and a specificity of 90% compared with self-reported ethnicity (Perkins, 1993). Lauderdale and Kestenbaum's surname list, derived from USA Social Security records and validated using a census, showed conditional positive predictive values ranging from 99% for Japanese to 87% for Vietnamese in householders identifying as Asian (Lauderdale and Kestenbaum, 2000). Nanchahal *et al.* (2001) reported a sensitivity and specificity of >85% for South Asian-origin persons in British studies.

A main strength of this study is that the Surinamese Surname List can identify persons of African and (South) Asian ancestries from secondary data sources with a high degree of accuracy due to the relatively recent construction of unique Surinamese surnames, the detailed historical registers, and the low grade of intermarrying between the largest population subgroups of South Asian and African ancestry (currently around 0.8%) (Algemeen Bureau voor de Statistiek, 2005). Although the direct collection of ancestry data is preferred, the Surinamese Surname List represents a valid and cost-effective method for datasets that do not contain information on ancestry (Perkins, 1993; Abrahamse *et al.,* 1994; Lauderdale and Kestenbaum, 2000; Nanchahal *et al.,* 2001; Fiscella and Fremont, 2006; Elliott *et al.,* 2008; Shah *et al.,* 2010; Aribowo and Herawati, 2016). Ancestry could be inferred when direct corroboration is not feasible, such as from death certificates, disease registers, or other administrative data, including the size of a population over time or social parameters of inequity. Inferential classification of ancestry could help address the disparities in health of Surinamese-Dutch and analyse healthcare delivery such as hospitalisation rates, procedures, and outcomes, as well as emergency response times. Also, the list could be useful to oversample certain ancestry groups to participate in a study (Perkins, 1993; Abrahamse *et al.,* 1994; Lauderdale and Kestenbaum, 2000; Nanchahal *et al.,* 2001; Fiscella and Fremont, 2006; Elliott *et al.,* 2008; Shah *et al.,* 2010; Aribowo and Herawati, 2016; Monasterio, 2017).

Limitations include that we did not assess the prevalence of the names globally. We only included external validation samples from Suriname and the Netherlands, where most Surinamese migrants travelled to around 1975 (which was before the current influx of Brazilian migrants to Suriname). However, the distinctiveness of Surinamese surnames as linguistic, colonial, and geographical markers of the past could support international follow-up studies. Further limitations are that the prevalence of members of a particular ancestry group in the community has a powerful effect on surname accuracy. The validation sample sizes of Indonesian-Surinamese persons living in the Netherlands and other discrete population groups were too small to analyse, and further research is needed to validate the list these small groups in the Netherlands. The substantial number of Brazilian surnames within Suriname (but not in the Netherlands) was surprising. This finding is not only related to recent migration but also to the Brazilian custom of changing the surname with each generation. Brazilian surnames and ancestry have been extensively evaluated elsewhere (Monasterio, 2017). Because of the multinomial character and predominantly Portuguese idiom, these surnames are easily recognised among Surinamese

surnames. In addition, the strict new Dutch migration laws render this group of new Surinamese unlikely to affect Dutch demographics. Therefore, Brazilian surnames are unlikely to affect the validity of the Surinamese Surname List in Suriname or the Netherlands (Central Bureau of Statistics, www.cbs.nl). However, since we compiled a list of surname ancestry, which is currently highly associated with person ancestry, another limitation of this study is that in time, with increasing intermarriage, the validity of the Surinamese Surname List will probably need to be reassessed (Lauderdale and Kestenbaum, 2000). The validation samples had restricted age ranges (18–70 years). Larger validation samples and wider representation of population and age groups may further validate the performance of the Surname List, as will the availability of electronic (rather than manually assessed) historic Surinamese surname data. Finally, surname analysis will likely be more useful to assess groups than individuals.

To overcome the limitations to the validity of the Surname List on African ancestry persons in the Netherlands, it is suggested to add geocoding in the form of the country of birth of the index person or the (grand) parents. The accuracy of geocoding can be further improved by using information on the likelihood of the presence of each ancestry group in a certain geographical area to generate prior probabilities before assigning ancestry based on surnames. This method, with preliminary analyses using prior probabilities to refine estimates based on Bayes' theorem, may improve accuracy compared to surname analysis alone or in combination with geocoding (Lauderdale and Kestenbaum, 2000; Fiscella and Fremont, 2006; Elliott *et al.*, 2008). For example, the majority of Amsterdam South East's population is of African-Surinamese origin (Statistics Amsterdam, https://www.amsterdam.nl/ois/), and this high probability should be sufficient to identify persons of African-Surinamese origin in this region based on the Surname List. Aside from geocoding, future analysis of individual-level pairings of given and family names may aid in the estimation of ethnicity (Lan and Longley, 2023), in particular for the distinction between African Dutch of Surinamese ancestry and European Dutch, as the former might carry existing Dutch surnames.

In conclusion, a surname classification is presented that is based on all contemporary Surinamese surnames. The validation assessments in Suriname and the Netherlands suggest that the list has high sensitivity, specificity, and accuracy in identifying the main populations of African and South Asian persons of Surinamese ancestry, with potentially broad applications in addressing health disparities in national public health research.

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