Smallpox, Vaccinations, and Demographic Divergences in Nineteenth-Century Colonial Indonesia

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Abstract

Existing literature and available demographic data suggest a strong divergence between Java and the Outer Islands with regard to nineteenth-century demographic trends. In this article, I argue that such a divergence is highly plausible, because of the inchoate vaccination efforts against smallpox in the Outer Islands in contrast with those on Java during the nineteenth century. I suggest that further research is needed into other factors that might also have contributed to the perceived divergence. These include relatively low birth rates in the Outer Islands as well as the ubiquity of slavery in this part of the Indonesian archipelago and its exposure to slave-raiding and the slave trade. The article concludes by arguing that, in all likelihood, demographic growth was very limited in most, but not all, of the Outer Islands up to the late nineteenth century.

Keywords

Indonesia – Outer Islands – demography – smallpox

Introduction

The first serious census of Indonesia’s Outer Islands took place in 1930 and counted 19 million people, compared with 40 million for Java. It confirmed Java’s status as the political centre of gravity, in spite of the fact that the island’s surface area accounts for only 7% of the whole archipelago. The reason why many of the Outer Islands were sparsely populated, whilst people huddled together on the relatively small island of Java, seems to be obvious at first
sight. Whereas Java and neighbouring Bali are exceptional within the tropical world for their fertile, volcanic soils, most parts of the Outer Islands suffer from ecological fragility. At the beginning of the nineteenth century, however, the Outer Islands had probably not yet been demographically overshadowed by Java. Early-nineteenth-century estimates in colonial government reports and other, less official statistics converge with regard to listing at least half of the people of the archipelago as living outside of Java (Junghuhn 1847, ii:387; Koloniaal Verslag 1849:112–3; De Hollander 1868:28).

Most historians assume a population of 7–8 million for Java by the early nineteenth century and believe that this number had increased to about 12 million by around 1850.¹ This implies that Java attained demographic growth figures of approximately 0.5% by the late eighteenth century, rising to about 1.5% just before the mid nineteenth century. This sharply contrasts with the situation in the Outer Islands at that time, where most authors calculate at best 0.3% growth, if not stagnation or even outright decline.² The latter was reported, for example, for most of northern Sulawesi, which was regularly affected by smallpox and piracy, a fate that was far from exceptional in the eastern part of the Indonesian archipelago.³ Some contemporaries noted that many of the Outer Islands’ populations had declined after the seventeenth century. One of these writers was the Semarang apothecary H.F. Tillema (1921), whose multi-volume standard work on health in the archipelago appeared in the early twentieth century.⁴ It is plausible that for the Indonesian archipelago in general the mid seventeenth century marked the beginning of demographic stagnation and decline, which continued a century longer in the Outer Islands than in Java. On the other hand, we know that demographic growth was generally marginal throughout the world at the time, and that the first demographic transition from low birth and high death rates to higher birth rates and lower death rates

¹ Koloniaal Verslag 1856:632. The total figure for Java and Madura stood at 10,911,241 by the end of 1855.
² For the growth rates of Java, Boomgaard (1989a:202) mentions a figure of 0.5% for the late eighteenth century, 1.25% for the first half of the nineteenth century, and 1.6% for the second half of the nineteenth century. Ricklefs (1986:30) and Reid (1987:35) claim that in the latter part of the eighteenth century, population growth in Java may have neared 1.0% per annum, but the figure from Boomgaard is better substantiated. For the Outer Islands, see Gooszen 1999, Henley 2005a and 2005b, and Knapen 2001.
³ ‘Opgaaf der bevolking der Moluksche eilanden 1840’, Nationaal Archief, The Hague (NA), Ministerie van Koloniën 1 (MvK) inv. no. 3089.
⁴ For the nineteenth century, see for example Bleeker 1856, 1:230, Horsfield 1850:371, and Kolff 1828.
only came with the Industrial Revolution and its global reverberations. The low annual demographic growth rate of 0.1% or 0.2% for pre-modern Asia, which has been suggested by Reid (1987:35), is therefore perfectly plausible and may have been true for many of Indonesia’s Outer Islands well into the nineteenth century.

I argue that smallpox vaccinations were an important factor in the transition from pre-modern growth, to growth figures of 1.5% and higher. Consistent vaccination policies were introduced in Java—and the Christian parts of the Philippines, for that matter—from the early nineteenth century onwards, whereas vaccination policies in the Outer Islands were inchoate and haphazard well into the nineteenth century. There are some additional factors that we need to consider when comparing the Outer Islands with Java in terms of demography. Foremost are natural disasters, the impact of which is, however, not that important in the long run. The same applies to colonial warfare. Apart from the 200,000 casualties of the Java War (1825–1830), which more or less equalled the death toll of the Padri War (1803–1837), the brunt of colonial warfare was taken by the Outer Islands. Yet, with the exception of the Padri War and the Aceh War (1873–1906), most of these expeditions to the Outer Islands were of limited duration and the death toll must have remained within the thousands. Cholera could be another potential candidate to explain divergent mortality rates. However, although cholera affected many of the Outer Islands, it did not spare Java. Other factors that should be taken into account are the occurrence of slavery and slave-raiding, as well as forced commodity production. These factors played out differently for different parts of Island Southeast Asia, as I will argue.

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5 In this respect I agree with Henley, who does not attribute much weight to volcanic disasters as factors in demographic stagnation or decline (Henley 2005b:358). The same can be said for tsunamis and cyclones, which did cause many casualties but did not occur as frequently as epidemics.

6 Junghuhn estimates the death toll from the Padri War at 232,995 (Junghuhn 1847, i:264 and 1847, ii:56). The Java War, according to Carey (2008:620, 653), killed 200,000 people and disrupted the lives of another two million.

7 To mention some important cases of cholera in the Outer Islands: in the 1840s a terrible cholera epidemic struck Ambon, the Batak lands, and the Kei and Aru islands (and the same islands again in the 1880s), whereas the Tanimbar Islands and various cities on Kalimantan were scourged by cholera in the mid nineteenth century (Tillema 1921:47, 49). According to Bosscher (1855:325), 25% of the population of the Aru Islands died from cholera in 1849. Other examples are Bali, which was struck by an epidemic in the late 1860s, and the Nias and Mentawai islands, which were ravaged by cholera in the 1880s. Java faced severe cholera epidemics in 1821, 1847, and in the 1880s. For the Philippines, see Worcester 1909.
In contrast to Java, where Boomgaard, for example, was able to isolate the impact of the introduction of the Cultivation System on demographic growth,\(^8\) demographic and economic statistics that can help to disentangle the multiple causalities involved are practically absent for the Outer Islands. However, important work on the demography of the Outer Islands that may help us to quantify relevant factors has been carried out by Boomgaard (2003a, 2003b), Gooszen (1999), Henley (2005a), and Knapen (2001). Alluding to this literature, and to the extensive literature on slavery in the Indonesian archipelago, I argue it is highly plausible that demographic growth in most, but not all, of the Outer Islands was minimal up to the late nineteenth century (see Appendix). I conclude this article by suggesting some avenues for further research.

**Smallpox Vaccination and Demographic Divergence in Java and the Outer Islands**

According to Boomgaard (2003a:599–600), areas that barely saw any vaccinators but were regularly affected by smallpox may have experienced an average increased mortality of 1% per annum compared with areas that were almost free of the disease. Conversely, one might argue that by eradicating smallpox, a population could increase by an additional full percent per annum if all other factors stayed the same. There is also a consensus that population growth in Java accelerated from 0.5% in the late eighteenth century to almost 1.5% by the mid nineteenth century; yet, it is still not entirely clear what role vaccination may have played in this acceleration.

The importance of smallpox vaccination may become clearer, however, if we do not consider the Indonesian archipelago in isolation, but also look at the neighbouring Philippines (Owen 1987). Java's demographic growth is not that exceptional, neither was its early-nineteenth-century vaccination policy. At precisely the same time, in the early nineteenth century, the Philippines also went through a demographic transition and attained an estimated 1.7% growth per year from then until 1870 (Doeppers and Xenos 1998:4). Moreover, the likely causes for this population growth appear to be remarkably similar to those of Java. Smallpox vaccination and other measures against incoming diseases in all likelihood played an important role in these high demographic growth figures.

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\(^8\) The same was done by Henley for forced coffee cultivation in the Minahasa in the 1870s (Henley 2011).
As early as 1806, most of the Christian parts of the Philippines had been visited as part of the famous vaccination voyage around the world by Francisco Xavier Balmis, who toured all the Spanish colonies. Thanks to a centrally organized vaccination programme in the Philippines, which was backed up by the colonial army and ecclesiastical authorities, smallpox casualties were soon reduced to a minimum (Colvin 2006; Franco-Paredes, Lammoglia and Santos-Preciado 2005; Robles 1969). Furthermore, the Spanish king had ordered the expulsion of all Chinese, as a result of which by 1824 only 5,442 Chinese immigrants were living in the entire Philippine archipelago. In practice, this meant that the entire archipelago was out of bounds to Chinese from mainland China, which in turn—and, again, unintentionally—may have contributed to a diminishing influx of the smallpox virus (Escoto 1999:70).

Boomgaard points out that smallpox was an old disease in Java, returning every six to seven years, with most of its victims children. Vaccination started in 1804 and was intensified by Thomas Stamford Raffles, Lt Governor General from 1811 to 1816, who placed smallpox vaccination on a solid footing in Java, particularly in the port cities of Surabaya, Semarang, and Batavia (Schoute 1937:110–11). His efforts were further expanded by the Dutch Godert van der Capellen, Governor General from 1816 to 1826. The latter succeeded in mobilizing priests (penghulu) and other village notables to support vaccination in most of Java.9

Within the first three years after 1820, about 355,000 people, mainly children, were vaccinated in Java, and to this figure another 200,000 to 250,000 may be added as a result of earlier vaccinations (Boomgaard 1987:63). In all, the number of people vaccinated in Java may well have approached 800,000, or 12 to 15% of the population, before the Java War (1825–1830). In those years, the annual number of vaccinations may have gone down—because of a combination of budgetary constraints and war conditions—but it is hard to believe that vaccinations stopped altogether in the key port cities of North Java. The overall picture is that by about 1840, more than a third (and by 1860, about half) of Java’s population had been vaccinated, and that the impact of smallpox on the mortality rate had become negligible.10 An important caveat concerns the lack of effectiveness of the vaccinations, which also explains why smallpox epidemics still occurred in West Java in the late 1840s (Swaving 1852:290–1; Breman 1963:199).

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9 Boomgaard 1987:64; De Vriese 1858:280; Roorda van Eysinga 1841:115–6; Encyclopaedie van Nederlandsch-Indië 1917, IV:498.
Nonetheless, smallpox vaccinations in early-nineteenth-century Java reduced mortality figures considerably. First, as Boomgaard has suggested, because vaccination teams could confine themselves to vaccinating children, as most of the adults would have been immune as the result of earlier epidemics, and second, because as soon as cases of smallpox were discovered, teams were sent out to vaccinate the surrounding area and isolate the nidus of the disease (Boomgaard 2003a). Furthermore, as the vaccination programme started in Surabaya, Semarang, and Batavia—the port cities where the virus was most likely to enter Java—the locations for the first vaccinations were a perfect choice from an epidemiological point of view. While urban vaccination acted as the first firewall, restricting the movements of foreigners (Europeans and Chinese) into the interior of Java to those who had obtained a permit from the Governor General may have acted as the second (Bosma 2007:278). Although this restriction had no medical basis, as it was driven by economic and political motives, it in all likelihood contributed to containing the spread of smallpox.

The situation in the Outer Islands was glaringly different from Java, in spite of the fact that smallpox vaccination had started here, as in Java, in the early nineteenth century. In 1814 vaccination had begun in the Moluccas, followed in 1818 by Bengkulu (still under British rule at the time) and in 1819 by Kupang, Bandjarmasin, Pontianak, Padang, and Bangka. Makassar and Ternate might have been included in these vaccination efforts in the same year. From these locations, vaccination spread to surrounding areas. However, efforts faded in most places in the Outer Islands, partly because of underpayment to vaccinators and a lack of supervision by the civil service and doctors. Training programmes for vaccinators were often conducted in a haphazard way, and authorities could hardly be expected to oversee vaccinations on the myriad islands in their districts.

In 1851, only 46,067 vaccinations were carried out, of which some 22,000 were on Sumatra’s West Coast and 17,000 in Palembang (Koloniaal Verslag 1851:262). One of the reasons for this was that, up to about 1860, vaccine had to be brought in from the Netherlands and was barely available in sufficient quantities in Java. While it sometimes took weeks before an epidemic was discovered on remote islands, a further few weeks might pass before vaccine from Java had arrived on the spot. The situation only improved after 1860, when vaccine was

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12 Zollinger 1850:94; Encyclopaedie van Nederlandsch-Indië 1917, IV:498; Pruys van der Hoeven 1864:21; Tillema 1921:22; De Clerq 1890:33.
produced in Java and could be distributed more generously and easily over the archipelago (Encyclopaedie van Nederlandsch-Indië 1917, IV:499). By the late nineteenth century, an inhabitant of Java had three times more chance of being vaccinated than someone in the Outer Islands, where many villages had never seen a vaccinator at that time.13

Inconsistent vaccination as well as inferior vaccines explain why as late as 1855 a smallpox epidemic could strike with some severity in North Sulawesi and the Moluccas, despite earlier vaccination efforts—though still with less serious consequences than if no vaccination had taken place at all. Pieter Bleeker, the outstanding mid-nineteenth-century specialist in biology and demography, estimated the casualty rate of this epidemic among the Ambonese at about 5%, whereas data from the civil servant E.W.A. Ludeking concerning the effects of the same epidemic on Buru—where no vaccination had taken place at all—show a decline in the population of over 25%.14 Smallpox killed 6,000 inhabitants of the Sangir Islands (over 20% of the population) in 1860, because the vaccinations of the early 1820s had not been followed up (Van der Crab 1862:386). The consequences of the same epidemic elsewhere in the Moluccas, where apparently no vaccinations had taken place at all—Buru, the Kei Islands, the north coast of Seram, and the South Moluccan islands Roma, Keffling, and Aru are specifically mentioned in nineteenth-century sources—were even more severe, resulting in a death toll of between 30% and 70% of the populations that were affected by smallpox (Tillema 1921:15, 19, 21, 26; Van der Crab 1862:60; Van Eijbergen 1864:138, 166, 223).

That the death toll seems to have been particularly high on the small islands might be attributed to two factors. First, in contrast to key settlements in Sumatra and Kalimantan, these islands were of little strategic interest and hence rarely visited by colonial authorities and vaccinators. Second, the populations of these islands could hardly escape to the interior upon the news of the arrival of an epidemic. The islands south of the coast of New Guinea were also particularly vulnerable and exposed to the virus through the annual visits by Chinese vessels that came via or from Makassar, as well as brigs that arrived from Surabaya to buy the harvest of sea cucumbers (trepang), pearls, and other commodities (Tillema 1921:23, 30; Netscher 1854:116; Kolff 1828:213). Conversely, the fact that in West Sumatra’s coastal cities of Padang and Bengkulu vaccination had started as early as the 1820s, and that beyond these cities traffic over sea

14 Bleeker 1856:104; Ludeking 1868:130–1. This can be supported by another example: in 1843, the population of the partially vaccinated island of Bawean, located north of Java and counting 29,133 occupants in 1845, lost 800 people to smallpox; see Van der Aa 1857:422.
was limited, may have resulted in a relatively low number of casualties from smallpox in this part of the archipelago (Tillema 1921:29).

The intensification of maritime connections and the increasing exploitation of natural resources heightened the chances of transmitting the virus from island to island. As a result of increased traffic over sea, even the more remote islands of Halmahera, New Guinea, and a range of small islands in the Banda Sea became increasingly exposed to smallpox (Bernstein 1885:338–44). The relatively isolated island of Sumba, only affected by smallpox once before in 1844, fell prey to the disease in 1872, and this time it was transmitted by boats from the nearby islands of Timor, Rotti, and Savu. The Tanimbar Islands, also near Timor, had barely been affected until they lost half of their population to smallpox in 1864, and suffered again severely in 1900 (Goudzwaard 1863:101–3; Van Eijbergen 1864:166; Tillema 1921:21–2). In 1884, villages on the coasts of New Guinea and in Central Sulawesi were decimated, although they had seldom experienced smallpox before. The same story applies to the interior of Sumatra, where smallpox had rarely been seen in the early nineteenth century, but where epidemics became a regular feature in its final decades (Tillema 1921:13, 16, 25, 27–8; Veth 1882:66; Locher-Scholten 1994:141). In Central Sumatra, as well as in many other areas in the eastern part of the archipelago, smallpox was still very much present in the early twentieth century. Clearly, smallpox had become a growing health hazard in the Outer Islands because of increased mobility and contacts.

Apart from the geographical disadvantages of the sparsely vaccinated Outer Islands, the religious factor played its part in impeding protection against smallpox. An elaborate vaccination system was in place from the mid nineteenth century onwards in Java and people usually trusted the vaccinators, which was largely due to the efforts of the Muslim clerics who approved of vaccination. Resistance was exceptional and only occurred among Madurese and in Banten.15 For the Outer Islands, one can draw up a long list of cases of resistance, ranging from North Sulawesi, Tapanuli, Timor, Nias, and the Mentawai Islands, Seram, Bali, and even the Christian Sangir Islands.16 The most notorious case was Bali, where even in the government-controlled part of the island—comprising less than 10% of its population by the nineteenth

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15 As late as 1900, the authorities of the residency of Banten, which was in close contact with Lampung, felt compelled to resort to introducing stiff fines to eliminate resistance against smallpox vaccination; see Winkler and Noordhoek Hegt 1906:33.

16 For some of these stories, see Van der Crab 1862:384 and Ludeking 1868:156. Surprisingly, the Dayaks of Kalimantan welcomed vaccination; see ‘Berigten—Vaccine’ (1869), Tijdschrift voor Geneeskunde 2–5: 317–8.
century—vaccination was fiercely and successfully resisted by Brahmins. In
indeed most, if not all, incidences of resistance occurred in non-Muslim areas.
The exception to the rule was Tapanuli, but resistance here was the upshot of
the introduction of forced coffee cultivation, which made the population wary
of any colonial presence; it was not religious in character (Godon 1862:215, 25–6).

Again, control by colonial authorities and vaccination in zones of contact
were crucial in containing smallpox epidemics. In general, from the mid nine-
teenth century onwards, the imposition of direct rule and military surveillance,
as well as the emergence of colonial mining and plantations, did a lot both to
diminish resistance against vaccination and to contain the disease. When parts
of South and West Kalimantan were brought under direct rule by about 1860,
vaccination could start and cases of smallpox were detected early on (Knapen
2001:148; Tillema 1921:26; Van Rees 1858:278). In coastal areas of Kalimantan and
the northern part of the Moluccas, including the eastern part of the residency
of Manado, smallpox was more or less under control after the 1860s (Tillema
1921:24). It is always difficult for states to control human mobility, but mili-
tary control and conflict at least reduced mobility and the spread of disease,
which may explain why during the thirty years of colonial war Aceh was spared
from smallpox. Maritime access to the region was difficult and no one without
proper vaccination was allowed in by the military authorities (Jacobs 1894:306–
9). In East Sumatra, plantations that started off in the 1870s were keen to keep
contagious diseases at bay, knowing very well that smallpox travelled easily
from China and Singapore. Companies bringing in migrant coolie labour had
their own responsibility to check the health condition of the workers, though
these checks apparently were not always watertight (Tillema 1921:28).

What can be said in more general terms about the incidence and demo-
ographic consequences of smallpox epidemics? First, that increasing vaccina-
tion efforts were partly undone by the fact that in some areas mortality from
smallpox actually increased in the course of the nineteenth century. As a result,
smallpox epidemics continued to be an important factor in mortality up to the
twentieth century. In Jambi, Bali, and Lombok the disease was still endemic at
that time. Where smallpox affected a region once every 20 years the death
toll was about 20% of the population, leading to an average 1% reduction

17 Van Eck’s assertion that the population that had come under direct rule was thriving and
grew rapidly should be taken with a grain of salt (Van Eck 1880, 2:86–7, 1886, 1303).
18 Winkler and Noordhoek Hegt 1906:222; Borger 1914; Fenner 1987:37; Tillema 1921:32. In
smaller islands and less densely populated areas, smallpox could not become endemic,
because the virus can only be endemic in areas with population concentrations over
100,000; see Fenner, 1987:34–37.
in natural demographic growth per annum. In most of Sumatra and Central Kalimantan, the frequency seems to have been once in every 30 to 60 years. In North Sulawesi, a smallpox epidemic struck every 20 years from 1669 until 1909 (Henley 2005a:275). In nineteenth-century North Central Timor, Halmahera, and Bali, it seems that smallpox returned every eight to ten years (Tillema 1921:21, 23, 30). For Southeast Kalimantan, Knapen found smallpox epidemics every 12 years prior to 1820 and every six years between 1821 and 1860 (Knapen 2001:143–4). In the most southern region of Sumatra, in Lampung—which was also heavily exposed to the slave trade and slave-raiding—smallpox returned probably almost every six to seven years after the first terrible outbreak in 1786.

If we project the above findings onto the map of Indonesia, it would appear that—with the exception of Lampung and the Nias and Mentawai islands, which were infested by smallpox as well as regularly visited by pirates and slave traders—west of the 115th latitude, until the 1860s smallpox occurred perhaps once in two generations, increasing mortality by 0.5 %. This is half the increased mortality Boomgaard (2003a:599–600) reported for regions that were not vaccinated and affected by smallpox once in a generation. In areas where at least some vaccination had been carried out, which was the case in the old colonial settlements in the Moluccas, a mortality rate of 5% for each epidemic would lead to an average 0.25 % reduction in annual population growth over the years. Likewise, the existence of a ‘firewall of vaccinations’ around important colonial settlements could bring down the frequency of smallpox epidemics. At the same time, it is clear that these firewalls became increasingly porous because of the growing mobility over land and sea. For most of the archipelago east of the 115th latitude, excess mortality from smallpox must have been around 1% annually, which contributed substantially to demographic stagnation.

**Low Demographic Growth in the Outer Islands: Additional Factors?**

So far, I have looked at smallpox as a cause of increased mortality in isolation from actual data on demographic growth. For most of the Outer Islands, it is impossible to do otherwise, because of a lack of data. However, for a few locations in the Outer Islands a more extensive colonial presence allows us to zoom in. Detailed counts exist for some islands of the residency of Amboina, the island of Ternate, the Banda Islands, and the Minahasa. In spite of vaccinations, smallpox was still present in these locations by the mid nineteenth century, and focusing even closer, we can see the precise effects of a regular occurrence of the disease. Sapurua, for example, lost 10 % of its population to smallpox in the early 1850s (Bleeker 1856, ii:183), and the small Christian population of Buru...
Table 1. Demographic data for some locations in the Moluccas and northern Sulawesi

<table>
<thead>
<tr>
<th>Department</th>
<th>Year</th>
<th>Population</th>
<th>Year</th>
<th>Population</th>
<th>Average population growth per annum (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minahasa</td>
<td>1829</td>
<td>79,031</td>
<td>1854</td>
<td>92,546</td>
<td>0.64</td>
</tr>
<tr>
<td>Hila</td>
<td>1820</td>
<td>8,460</td>
<td>1854</td>
<td>11,053</td>
<td>0.67</td>
</tr>
<tr>
<td>Ambon city</td>
<td>1820</td>
<td>11,446</td>
<td>1854</td>
<td>9,100</td>
<td>-0.6</td>
</tr>
<tr>
<td>Ternate</td>
<td>1829</td>
<td>10,132</td>
<td>1854</td>
<td>8,489</td>
<td>-0.54</td>
</tr>
<tr>
<td>Saparua</td>
<td>1820</td>
<td>8,051</td>
<td>1854</td>
<td>11,665</td>
<td>1.16</td>
</tr>
<tr>
<td>Nusalaut</td>
<td>1820</td>
<td>2,539</td>
<td>1855</td>
<td>3,479</td>
<td>0.92</td>
</tr>
<tr>
<td>Buru (partial)</td>
<td>1820</td>
<td>1,220</td>
<td>1858</td>
<td>1,490</td>
<td>0.5</td>
</tr>
<tr>
<td>Banda (nutmeg islands)</td>
<td>1820</td>
<td>6,000</td>
<td>1852</td>
<td>5,880</td>
<td>-0.005</td>
</tr>
</tbody>
</table>

Sources: For the Minahasa, Van Doren 1857, 1:40; for Hila, De Vriese 1858:456; for Ambon City, Bleeker 1856, 1:80; for Ternate, Bleeker 1856, 1:93; for Saparua, De Vriese 1858:453 and Bleeker 1856, 11:83; for Nusalaut, Bleeker 1856, 11:93 and De Vriese 1858:453; for Buru, Ludeking 1868:130−1; for Banda, De Vriese 1858:422 (for the year 1820) and Kolonial Verslag 1852 (for the year 1852).

As much as 25% in the mid 1850s (Ludeking 1868:130−1). The small Christian community of Buru, for example, experienced an average annual population growth of only 0.5% between 1820 and 1858, but here the population had gone down from 1,818 in 1854 to 1,490 in 1858. If smallpox had not visited Buru, the average increase would have been 1.5% per annum. In other words, under ideal conditions—educational facilities, a sense of community, and vaccination—a demographic growth rate of 1.5%, equal to that of Java, would not have been impossible. That smallpox was still present in the mid 1850s had a negative impact of at least 0.5% and in case of complete absence of vaccination of 1% on population growth.

At the same time, it is clear that other factors, which can only be cursorily dealt with in this article, played their role, too. Ambon City, for example, was a disease-infested place, affected by a range of diseases and epidemics between 1830 and the mid 1850s. This town was no exception to the rule that urban populations in the archipelago experienced negative natural growth prior to 1850. Ternate also experienced serious population decline, but this time mainly because natural disasters had destroyed the local plantation economy and had set substantial outward migration in motion. Finally, the Banda Islands housed slave plantations, where the enslaved population did not reproduce itself, making the nutmeg groves reliant upon the constant arrival of new slaves.
Again, in order to arrive at more definite conclusions about the impact of the absence of consistent smallpox vaccinations in the Outer Islands, we need to look at other factors as well. First, it seems to be a realistic assumption that for most of the nineteenth century the large majority of the populations of the Outer Islands experienced low birth rates and hovered around an equilibrium between crude birth rates and crude death rates in the low thirties per 1,000. That these birth rates were much lower than in Java at that time was regularly reported by civil servants and geographical explorers. Lucieer (1924) made an extensive literature survey compiling a number of these observations. The gist of his article is that birth rates were low, due to hard labour conditions for women, various indigenous means of birth control, late weaning and, to a lesser degree, infanticide. Three or four births, with a survival rate of two or three children per household, seems to have been common in those parts of the Indonesian archipelago that were outside the purview of colonial commodity production. In fact, this was also the case in North Kalimantan (Lucieer 1924:549, 557; Roth 1896, 1:106).

Because birth control apparently played an important role in keeping families small, one would expect that the effects of smallpox vaccination would soon be offset by even lower birth rates. However, such an effect may only become apparent after a while, or not at all, as was the case in Java. It has been observed that under the Cultivation System, with its economic incentives and additional burdens, birth rates were much higher than the low 30s per thousand quoted for the Outer Islands, and ranged between 48 and 57 per thousand, while mortality rates went down (Breman 1963:276; Boomgaard 1989a:172; White 1973). More or less the same can be said for the Minahasa, in their reaction to the introduction of forced coffee cultivation (Henley 2005a:390–2, 395; Henley 2011:6). If this would have been the rule, then the introduction of forced coffee production on Sumatra’s West Coast must also have had positive effects on demographic growth. This would be in line with Henley’s findings that the means of subsistence, or how these were perceived, partly determined demographic history (Henley 2005a:610).

There are still two other factors that need to be considered when explaining the demographic divergence between the Outer Islands and Java: slavery and slave-raiding. Both were abundant in the Indonesian and Philippine archipelagos, and the demise of the Dutch East India Company’s fleet in the early 1780s exposed even the island of Java to the enslaving practices of pirates (Teitler, Van Dissel and À Campo 2005:55; Cornets de Groot 1847:5–6). There is ample evidence of the depopulating effects of piracy in the Philippines during the seventeenth and eighteenth centuries, which began to diminish by about 1800 (Corpuz 2005). The slave raids on the Philippine coasts reached
their peak between 1750 and 1770, and ravaged the coastal areas. However, they began to diminish in the final years of the eighteenth and early nineteenth century, when the colonial government of the Philippines pursued defences against piracy with increasing vigour (Warren 2002:143–4; Mallari 1986:269–78; De Comyn 1821:238). Java suffered from slave raids from the 1780s onwards, but these sharply diminished in the early nineteenth century (Teitler, Van Dissel and À Campo 2005:205). By contrast, the Outer Islands may even have been subject to an increase of slave raids up to the mid nineteenth century. The history of slave raids and slavery in the Outer Islands of Indonesia has not yet been systematically researched,19 but there is abundant evidence that both featured prominently well into the nineteenth century.

The demographic consequences of slave-raiding may have been even more substantial than those of the slave trade. Up to the early nineteenth century, pirates had several bases within the Indonesian archipelago. These pirates creamed off part of the population of the Nias and Mentawai islands, of North Sulawesi, of East and West Kalimantan, of the Moluccan Islands, and of Flores. In addition, they staged almost annual raids on Bali and Lampung, after the sultan of Banten had lost his grip on his territory early on in the nineteenth century (Du Bois 1852:320). Pirate fleets could sometimes capture up to 2,000 people in a single raid (Kniphorst 1875–1897:22). One of their raids, in 1822, swept away in a single, massive stroke the entire population of Buton at the south-eastern tip of Sulawesi (Cornets de Groot 1847:19). It was only by 1860 that piracy had been effectively reduced by the colonial navy, but marauding continued well into the 1880s. Many more people were raided than eventually reached the slave markets, as many died during the passage and many casualties resulted from the raids themselves.20 Moreover, slave raids, as well as slave sales for that matter, also impacted heavily on birth rates, because they affected younger people the most. A second important indirect effect concerns the fact that people all over the Indonesian and Philippine archipelagos fled to the interior and less fertile areas, where population growth could barely be sustained (Henley 2006:313).

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19 The exception to be mentioned here is Ruibing 1937. Because most of the archipelago was barely under colonial control, registration of slaves was confined to Java and to the old colonial settlements and port cities in the Outer Islands (Besluit Gouverneur-Generaal 15 January 1819, no. 16). For an overview of slavery and its abolition in the Netherlands Indies, see Kerckhoff (1891), who provides some figures for the later part of the nineteenth century.

20 Van der Aa 1857:422; Henley 2005a:208; Moor 1837:16; Brumund 1853; Lange 1850:30.
With regard to slavery and the slave trade, it has been observed that in the Outer Islands widespread slavery in all likelihood had substantial adverse effects on birth rates. Henley and Lucieer cite a case of two comparable communities in Central Sulawesi (one keeping slaves, the other not) producing significantly (30%) lower birth rates for the slave holders, to which we can add the fact that slave populations usually show demographic decline (Lucieer 1924:557–8; Henley 2005b:366–8). In all, the demographic consequences of slavery must have been considerable, but for reliable estimates far more research is again required. With regard to the sale of slaves, it would not be an exaggeration to claim that in the early nineteenth century between 2,000 and 3,000 slaves from the Outer Islands were deported annually outside the Indonesian archipelago to the Mascarenes, and the grand slave market of Sulu. Lampong, Bali, Timor, Nias, the Mentawai Islands, South Sulawesi, Sumba, and New Guinea all provided slaves for sale, and the available sources suggest that this may have involved hundreds of slaves per transaction.

We can therefore conclude that the slave raids and sales exerted a constant drain on the population. This occurred particularly in those parts of the Indonesian archipelago that had already suffered most from smallpox. Moreover, most of these islands were not particularly fertile or, if they were volcanic islands and potentially fertile, they were comparatively small, as was the case for the Banda Islands, Ternate, and even Bali. As early as 1940, a study by Tammes (1940:197) had concluded that North Sulawesi and the Sangir and Talaud islands were moving around a Malthusian equilibrium, in which epidemics and invasions were responsible for the downturns, and the new, expanding opportunities for food production for the upturns. These Malthusian cycles may have been the rule in many islands that were regularly visited by pirates and affected by smallpox. In some islands, such as Nias and Sumba, decline may have continued over many decades.

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21 Between 1770 and 1870, the slave raiders of the Sulu Islands traded between 200,000 and 300,000 slaves, but it is not clear how this divides up between the Philippine and Indonesian archipelagos (Warren 1981:156–65; De Comyn 1820:246). It has been estimated that 1,200 slaves were sold from Bali annually until the mid nineteenth century. Between 5,000 and 10,000 slaves from Bali ended up in the Mascarenes in the early nineteenth century (Allen 2010:63; Needham 1983:47).

22 Needham 1983:26, 33; ‘Beschrijving van Soemba’ 1855:297; Van der Kraan 1983:337; Rappard 1903:496, 514. For slave transactions in Timor, see, for example Gouvernements Besluit 5-12-1826, no. 5, NA, MvK 1 inv. no. 2797 and GB 12-1-1827, no. 9, NA, MvK 1 inv. no. 2798. For the slave trade for Bugis, see Bigalke 1983:344.
Smallpox and the Reconstruction of Demographic Trends in the Outer Islands: Suggestions for Further Research

On the basis of the sections above, we can perceive two poles in the demographic situation in the Outer Islands during the nineteenth century. The worst conditions existed where vaccination against smallpox was practically absent and piracy and slavery abounded. We can safely assume that there demographic stagnation, if not decline, was the rule. In some locations, however, smallpox vaccination was introduced early on in the nineteenth century. Nevertheless, pirates did not raid all the islands and some locations were producing commodities for foreign markets. In other words, demographic conditions in the Outer Islands varied along a scale between stagnating demographic growth and a growth figure that may have approximately equalled that of Java.

So far, only Boomgaard and Gooszen (1991) and Gooszen (1999) have attempted to reconstruct population figures and demographic growth rates for the entire Outer Islands, though only from the 1880s onwards. Important, in-depth regional studies have been conducted for North Sulawesi by Henley (2005a; 2005b) and for Southeast Kalimantan by Knapen (2001). Moreover, Knapen (2001:35–6) and Gooszen (1999:227) arrive at growth figures close to 0.5% for late-nineteenth-century South Sulawesi and South Kalimantan, whereas in some other parts of the Outer Islands figures of 1.2 to 1.5% are given for those years (Gooszen 1999:44). Data from the Koloniale Verslagen (see Appendix-Table 1) suggest an average 0.8% demographic growth for most parts of the Outer Islands in the final decades of the nineteenth century. Indeed, in some regions much higher growth rates may have occurred, but these regions had either been under direct rule for a long time or had experienced immigration for mining and plantation activities, as was the case for Bangka, Bilitung, Sumatra’s East Coast, and Lampung. Much lower growth rates in all likelihood continued to exist, however, in the eastern part of the archipelago, where smallpox and slavery lingered on until the early twentieth century.

The main point to be made here is that smallpox, slavery, and slave-trading seem to have coincided spatially. This strongly suggests that for some parts of the Outer Islands minimal demographic growth or stagnation was the rule, but that elsewhere figures of 0.65 to 1.0% were attained, as illustrated in Table 1 above. This may have been the case in western Sumatra and Palembang. Conversely, for smallpox-infested islands, such as the Nias and Mentawai islands or Bali, zero population growth, if not decline, would have been the most plausible outcome. In view of the entangled relationships described in this article, it would be helpful to further develop the comparison with the Philippines, and probably Malaysia. This would produce a better insight into the connections
between trade, smallpox, slavery, and forced labour for the entire area. There is still a lot of material waiting to be examined with these questions in mind.

References


Appendix I

In Table 2 below, an attempt is made to visualize my argument that for most, but not all, of the Outer Islands demographic growth was minimal up to the late nineteenth century. I started with the general, and digitally available, data from the *Koloniale Verslagen* concerning the Netherlands Indies. Precisely in the areas where slavery and smallpox were abundant, however, colonial rule was at best superficial, and hardly any data collection was conducted. Moreover, data from the *Koloniale Verslagen* usually seriously undercount actual populations, particularly in areas beyond direct colonial rule. Even if colonial administrators were in charge, they were reliant on information from locals, such as village heads, who had a distinct interest in keeping the numbers down, as head counts were the basis for taxes and conscription services that had to be provided to the central authority.\(^\text{23}\) However, while the *Koloniale Verslagen* undercount the Outer Islands for most of the nineteenth and the early twentieth century, any projections based upon these data will therefore exaggerate demographic growth rather than underestimate it.

Furthermore, there are reports made by geographical explorers and other scientists who were trained to carry out field research and had a good sense of statistics. They travelled around the many islands of the archipelago and their reports are of crucial importance. Counting villages and people was a fixed part of nineteenth-century expeditions. As early as 1820, Caspar Reinwardt toured the Moluccas and he was followed a few years later by D.H. Kolff, who visited the most remote islands of the Moluccas as well as the shores of south-west New Guinea. Franz Junghuhn made an extensive survey of the Batak lands in 1840–1841, and H. Zollinger went to Sumbawa in 1847 and had visited Lampung a few years before. Some expeditions, such as the one by Salomon Muller to the interior of Timor, were gargantuan operations with 1,200 porters (Ormeling 1957:3). The Dutch Geographical Society, for example, organized an extensive explorative expedition across Jambi and the Batak lands under Veth’s auspices in the 1870s.\(^\text{24}\) The extensive reporting by the explorers sometimes directly informed the *Koloniale Verslagen*, but for our purpose mostly serve as

\(^{23}\) In fact, for local rulers it was as difficult as it was for colonial authorities to hold head counts, because of resistance by their populations (Zollinger 1850:101; ‘Volkstelling op Lombok’ 1869; Willer 1861).

\(^{24}\) For Jambi see Locher-Scholten 1994:Chapter vi, 137–77; For the expedition under the auspices of P.J. Veth, see Veth 1882, 11:76. For Veth and the Geographical Society, finally, see Van der Velde 2006:197–230
### Table 2  Reconstruction of demographic growth in the Outer Islands*

<table>
<thead>
<tr>
<th>Outer Provinces/Year</th>
<th>1820</th>
<th>1852</th>
<th>1882</th>
<th>1905</th>
<th>1920</th>
<th>1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt. Sumatra’s west coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Padangsche Bovenlanden</td>
<td>492,400</td>
<td>525,140</td>
<td>648,130</td>
<td>905,039</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Padangsche Benedenlanden</td>
<td>140,000</td>
<td>209,175</td>
<td>294,955</td>
<td>403,431</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Nias &amp; Mentawai islands</td>
<td>131,467</td>
<td>135,744</td>
<td>143,285</td>
<td>153,536</td>
<td>160,614</td>
<td></td>
</tr>
<tr>
<td>Tapanuli (incl. part Batak)</td>
<td>150,595</td>
<td>156,025</td>
<td>172,891</td>
<td>413,301</td>
<td>683,197</td>
<td>1,041,301</td>
</tr>
<tr>
<td>Bengkulu</td>
<td>91,672</td>
<td>111,140</td>
<td>145,984</td>
<td>204,269</td>
<td>257,140</td>
<td>322,619</td>
</tr>
<tr>
<td>Lampung</td>
<td>78,415</td>
<td>84,000</td>
<td>130,495</td>
<td>156,518</td>
<td>233,993</td>
<td>359,950</td>
</tr>
<tr>
<td>Jambi</td>
<td>90,833</td>
<td>100,000</td>
<td>115,070</td>
<td>132,350</td>
<td>233,344</td>
<td>245,342</td>
</tr>
<tr>
<td>Palembang</td>
<td>252,395</td>
<td>305,996</td>
<td>355,105</td>
<td>796,354</td>
<td>828,004</td>
<td>1,096,555</td>
</tr>
<tr>
<td>East coast Sumatra</td>
<td>116,206</td>
<td>127,933</td>
<td>175,860</td>
<td>568,417</td>
<td>1,197,554</td>
<td>1,673,623</td>
</tr>
<tr>
<td>Aceh and ‘Onderhoorigheden’</td>
<td>397,938</td>
<td>438,097</td>
<td>479,419</td>
<td>582,175</td>
<td>736,365</td>
<td>1,002,900</td>
</tr>
<tr>
<td>Riau and ‘Onderhoorigheden’</td>
<td>54,645</td>
<td>56,423</td>
<td>105,217</td>
<td>112,216</td>
<td>223,122</td>
<td>298,329</td>
</tr>
<tr>
<td>Bangka</td>
<td>30,000</td>
<td>47,746</td>
<td>70,877</td>
<td>115,189</td>
<td>154,141</td>
<td>295,433</td>
</tr>
<tr>
<td>Bilitung</td>
<td>5,926</td>
<td>5,715</td>
<td>32,210</td>
<td>36,858</td>
<td>68,582</td>
<td>73,409</td>
</tr>
<tr>
<td>Kalimantan ‘Wester afdeeling’</td>
<td>250,372</td>
<td>245,651</td>
<td>376,034</td>
<td>450,929</td>
<td>605,402</td>
<td>827,898</td>
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<tr>
<td>Kalimantan ‘Zuider and Oостerafdeeling’</td>
<td>673,849</td>
<td>695,772</td>
<td>749,289</td>
<td>782,726</td>
<td>1,020,599</td>
<td>1,366,635</td>
</tr>
<tr>
<td>Sulawesi and ‘Onderhoorigheden’</td>
<td>269,796</td>
<td>278,574</td>
<td>385,058</td>
<td>1,449,969</td>
<td>2,347,645</td>
<td>3,087,335</td>
</tr>
<tr>
<td>‘Onafhankelijke Rijken’ Sulawesi</td>
<td>992,355</td>
<td>1,024,640</td>
<td>1,055,861</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manado</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Minahasa</td>
<td>80,000</td>
<td>92,546</td>
<td>136,768</td>
<td>188,438</td>
<td>241,909</td>
<td>294,571</td>
</tr>
<tr>
<td>– Sangir and Talaud islands</td>
<td>85,000</td>
<td>90,000</td>
<td>85,000</td>
<td>120,000</td>
<td>135,774</td>
<td>144,170</td>
</tr>
<tr>
<td>– Gorontalo</td>
<td>85,000</td>
<td>75,000</td>
<td>98,290</td>
<td>115,000</td>
<td>134,307</td>
<td>186,038</td>
</tr>
<tr>
<td>– Bolaang and Mongondou</td>
<td>46,884</td>
<td>48,410</td>
<td>51,099</td>
<td>54,755</td>
<td>55,910</td>
<td>71,989</td>
</tr>
<tr>
<td>– ‘Midden’ Sulawesi</td>
<td>127,487</td>
<td>131,635</td>
<td>144,064</td>
<td>166,858</td>
<td>192,792</td>
<td>264,680</td>
</tr>
<tr>
<td>Ambon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Amboina (island incl. Hila)</td>
<td>30,000</td>
<td>31,510</td>
<td>38,918</td>
<td>44,992</td>
<td>50,520</td>
<td></td>
</tr>
<tr>
<td>– (Buru, Seram, Haruku, Nusalaut)</td>
<td>81,298</td>
<td>99,181</td>
<td>93,145</td>
<td>115,534</td>
<td>136,397</td>
<td></td>
</tr>
<tr>
<td>– Banda islands</td>
<td>6,000</td>
<td>5,880</td>
<td>11,848</td>
<td>22,148</td>
<td>10,366</td>
<td></td>
</tr>
<tr>
<td>– Other Islands Banda Residency</td>
<td>98,876</td>
<td>108,843</td>
<td>113,037</td>
<td>116,252</td>
<td>80,683</td>
<td></td>
</tr>
<tr>
<td>Ternate (incl. Tidore and Halmaheira, Bacan)</td>
<td>81,245</td>
<td>89,444</td>
<td>100,147</td>
<td>108,415</td>
<td>149,425</td>
<td>492,973</td>
</tr>
</tbody>
</table>
Table 2

Reconstruction of demographic growth in the Outer Islands (cont.)

<table>
<thead>
<tr>
<th>Outer Provinces/Year</th>
<th>1820</th>
<th>1852</th>
<th>1882</th>
<th>1905</th>
<th>1920</th>
<th>1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timor and 'Onderhoorigheden'</td>
<td>949,363</td>
<td>980,250</td>
<td>1,064,503</td>
<td>1,114,665</td>
<td>1,146,660</td>
<td>1,656,636</td>
</tr>
<tr>
<td>Bali and Lombok (Direct rule plus Principalities)</td>
<td>1,095,255</td>
<td>1,199,888</td>
<td>1,341,422</td>
<td>1,357,079</td>
<td>1,556,014</td>
<td>1,802,146</td>
</tr>
<tr>
<td>New Guinea</td>
<td>176,851</td>
<td>182,604</td>
<td>188,168</td>
<td>192,549</td>
<td>195,460</td>
<td>200,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>7,162,033</td>
<td>7,682,962</td>
<td>9,082,149</td>
<td>10,979,962</td>
<td>14,358,069</td>
<td>19,034,410</td>
</tr>
</tbody>
</table>

* Figures in bold are my own conjectures based upon the above assumptions, figures in italics are derived from sources other than the *Koloniale Verslagen* or local government reports, and figures in standard type are from *Koloniale Verslagen* or figures reported by government officials.

Valuable additions, comments, and corrections to the official data. These data allow us to assess the quality of at least part of the data included in the *Koloniale Verslagen*.

No doubt, we are left with many empty spots that can only be filled by making conjectures. I have made assumptions about the demographic impact of smallpox in conjunction with other factors in Table 2. These assumptions are based on the observations made in this article. I have assumed a 0.1% demographic growth for regions suffering heavily from smallpox and where slavery or slave-raiding was ubiquitous; 0.3% for regions suffering heavily from smallpox but without much slavery; 0.3% also for regions with moderate levels of smallpox and slavery; and 0.6% in the case of some presence of vaccination and a practical absence of slavery. The assumptions do not take into account that actual demographic growth may have been negative in some instances.

The entire procedure outlined above leads to a rather conservative estimate of the early-nineteenth-century population of the Outer Islands. One may argue that my estimate is too low, but that would, however, only strengthen my argument about minimal demographic growth for most of the Outer Islands.

A graphical representation of Table 2 in comparison with Java is given in Figure 1 below. This suggests that the discrepancy in growth between Java and the Outer Islands for the period from 1820 to 1880 was more or less constant at 1.0%. For the final decades of the nineteenth century this diminished to about 0.8%, whereas for the early twentieth century growth rates were more or less the same.
Sources Table 2

Explanation for Columns
For 1820: Various sources (in italics) and extrapolations (in bold); for 1852: Koloniaal Verslag 1852 (in roman type), various sources (in italics), and extrapolations in (bold); for 1882: Koloniaal Verslag 1884, various sources (in italics), and extrapolations (in bold); for 1905: Boomgaard and Gooszen 1991:224–30, Koloniaal Verslag 1907, various sources (in italics), and extrapolations (in bold); for 1920 and 1930: Volkstelling 1920, ii:165–241 and Census 1933–1936, supplemented with various other sources (in italics).

Explanation for Rows
Padangsche Bovenlanden: The figure for 1820 is derived from Junghuhn’s figure for 1816 (Junghuhn 1847, ii:55). For the 1820 figure for the Padangsche Benedenlanden, see Nahuys (1827:52–3). Nias and Mentawai islands: Backwards extrapolation from the 1920 census, assuming 0.3% annual population growth between 1870 and 1920 and 0.1% before 1870. For most of the nineteenth century, the population of the Nias and Mentawai islands was estimated at 200,000 or even 215,000 (De Hollander 1868:28), but these estimates must have been too high in view of the 1920 census. Independent Batak lands: In 1879 the population (estimated at 80,000) of this area was brought under direct rule and added to Tapanuli. On the basis of this figure of 80,000, an extrapolation has been made assuming 0.3% population growth from 1850 onwards, accounting for slavery and a moderate presence of smallpox, and 0.1% between 1820 and 1850, because of widespread slavery, a moderate level of smallpox, and the consequences of the Padri War. Tapanuli: For the year 1852, I deducted 200,000 for the Nias and Mentawai islands. The extrapolation for 1820 was made on the basis of the same assumption as for the independent Batak lands. Bengkulu: The figure for 1820 is an extrapolation from 1852, assuming 0.6% annual pop-
ulation growth. Lampung: For 1820, I used the estimate by Zollinger for 1840 as a starting point (Du Bois 1852:247). Because of extensive slave-trading, slave-raiding, and the presence of smallpox, I extrapolated a 0.1% annual population growth. Jambi: As a result of the demographic surveys of the expedition under the supervision of P.J. Veth in the 1870s, the population of Jambi was set at 76,000; this is probably too low, though, since, as Locher-Scholten has noted, the adult male population of Jambi stood at 40,000 as early as 1852. A modest estimate based on that figure would give us a population of 100,000 for Jambi in 1852 (Locher-Scholten 1994:26). I have used the figure given by Locher-Scholten to make an extrapolation for 1820 (0.3% annual population growth, because of modest incidence of smallpox) and coupled it with the figure of Van Kol (1914:128) for 1905 to make an extrapolation for 1882. Palembang: For 1820, I extrapolated backwards from the 1852 figure, assuming 0.6% population growth, because of the early start of vaccinations and the, presumably, relatively low number of slaves in this residency. For 1882, the figure of 76,000, being the official estimate for Jambi, has been deducted. East Coast Sumatra: For 1852 and 1820, the estimated non-immigrant population of 1882 (140,000) has been taken and extrapolated backwards on basis of 0.3% growth per annum, assuming a moderate level of smallpox and widespread slavery. Aceh and ‘Onderhoorigheden’: The figures for 1852 and 1820 are extrapolations from the 1882 figure, assuming 0.3% population growth, because of a moderate incidence of smallpox and widespread slavery. Riau and ‘Onderhoorigheden’: I took Willer’s (1861:8) much-debated figure for 1853–1854 and extrapolated it with 0.3% population growth both for 1852 and 1820. Bangka and Bilitung: For Bangka 1820, see Bleeker (1850:350), who rejected Horsfield’s (1850:371) figures as being much too low. The extrapolation for Bilitung is based on 0.1% population growth, because of extensive piracy.25 Kalimantan ‘Wester afdeeling’: As the figures given for 1820 are far from complete, I took the 1825 figure mentioned by Francis without further extrapolation.26 For 1852, the Koloniaal Verslag of 1852 did not give a figure. I therefore took the figure for 1854 from the Koloniaal Verslag of 1855. Kalimantan ‘Zuider and Oosterafdeeling’: The figure from the Koloniaal Verslag of 1856 for this part of Kalimantan is 454,735, which is unrealistically low in comparison with the first detailed count of 1892. I therefore made a backwards extrapolation assuming −0.3% population growth

25 This figure was extrapolated from the 1840 figure derived from ‘Residentie Banka bevolking’, NA, MvK 1, inv. no. 3079.

26 For the 1820 figure, see ‘Gegiste staat der bevolking van Borneo’, NA, MvK 1 inv. no. 3081; for the 1825 figure, see ‘Rapport over den afloop der zending van de kommissaris voor Westkust van Borneo, M. Francis in 1832’, NA, MvK 1 inv. no. 3084.
between 1892 and 1860 and −0.1% between 1860 and 1820. Knapen (2001:423) gives lower figures for South-East Kalimantan, but with comparable growth figures between 1800 and 1840, namely from 250,000 to 270,000. Sulawesi and ‘Onderhoorigheden’: For the area under direct rule, I extrapolated from 1852 back to 1820 assuming 0.1% annual growth in view of widespread slavery and smallpox. ‘Onafhankelijke rijken’ Sulawesi: I extrapolated the figure of 1852 with 0.1% annual population growth for the same reasons as for Sulawesi under direct rule. Minahasa: In view of the somewhat contradictory data presented by Reinwardt (De Vriese 1858:582), and taking into account a range of other government sources given by Henley (2005a:167–74), I have taken Van Doren's figure for 1829 (1857:40) as the baseline for 1820. The assumption of a modest population growth between 1820 and 1850 seems reasonable, as forced coffee cultivation was introduced in the Minahasa in 1822. Sangir and Talaud islands: For all years, with the exception of 1920, I have used the figures given by Henley (2005a:127–63). Gorontalo: There are various estimates that present a lower figure than Henley for 1820 and 1852, but I have used Henley’s extensively motivated figures (Henley 2005a:208; Henley 2005b:345). For 1920, I have followed Henley by deducting the figure for Buol and adding it to Central Sulawesi. Bolaang and Mongondou: As Henley (2005a:183–95) demonstrated that for the nineteenth century practically all figures given for this area are underestimations, the figures before 1920 are based upon a backwards extrapolation from the figure given by Henley (2005a:188) for 1905, with 0.3% per annum for 1860–1905 and 0.1% for 1820–1860. ‘Midden’ Sulawesi: The 1905 figure is an extrapolation forward from 1893 with 0.6% population growth. For 1852 and 1820, an extrapolation has been made of 0.6% per annum from 1893 backwards to 1870, and with 0.1% from 1870 backwards because of smallpox and slavery. The 1920 figure is the ‘Midden’ Sulawesi figure plus Buol given by the Volkstelling 1920 (11:221). Amboina—the island: The figure for 1820 is given by Reinwardt (De Vriese 1858:456) and for 1852 by Bleeker (1856, 11:33). For 1882, the same figure is used as for 1871, which is close to the figure given by Riedel (1886:31) for 1882, namely 30,380. Amboina—residency: The figure for 1820 is based on the figures given by Bleeker (1856, 11:13) for 1830 plus an estimated 60,000 for Seram. For 1882, the figure is based upon the Koloniaal Verslag of that year, which, however, includes the island of Amboina proper. I have therefore deducted the figure for Amboina for 1871 from this 1882 figure. Banda: For 1820, see De Vriese (1858:422). The 1882 figure is based upon an extrapolation of the 1872 and 1905 figures of

27 De Vriese 1858:512; ‘Opgaaf der bevolking der Moluksche eilanden 1840’, NA, MvK i inv. no. 3089; Bleeker 1856, 11:28; Van der Crab 1862:379.
the Koloniale Verslagen. Other islands Banda Residency: The 1820 figure is based upon the figure of 1840, extrapolated assuming 0.3% population growth.28 The figure of 1852 is also an extrapolation of 1840, which is slightly lower than the figure Bleeke (1856, 306) gives for the mid 1850s, namely 127,974. The 1882 figure is an extrapolation of the 1852 and 1905 figures. Ternate: Since the pre-1855 figures given by Reinwardt (De Vriese 1858:503) and Van der Crab (1862:302) are far from complete, I opted to extrapolate the 1855 figure of the Koloniaal Verslag with 0.3%, reckoning on moderate degrees of slavery and smallpox. Timor and ‘Onderhoorigheden’: Smallpox and slave-raiding were widespread in this part of the archipelago. I therefore assumed a figure of 0.1% growth per annum in the first half of the nineteenth century. The figures for the years 1882 and 1905 are extrapolations. Bali and Lombok (‘direct rule’ plus principalities): For 1820, I extrapolated backwards from 1852 with a population growth rate per annum of –0.1%. Because the census of 1905 does not present any serious estimation of the total population, I took the figure from the 1895 Koloniaal Verslag and, on the assumption of 0.1% growth per annum, extrapolated an estimate for 1905. New Guinea: Backwards extrapolation from 1920 based on assumption of 0.1% growth per annum. For 1930 a nominal figure is taken.

28 ‘Opgaaf der bevolking der Moluksche eilanden 1840’, NA, MvK 1 inv. no. 3089.