Changes in the Well-being of Native Americans Born in the Northwest, 1830-1900[1]

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Introduction

In this paper we consider the physical well-being of Native Americans living along and near the northwest coast of North America in the nineteenth century. Systematic evidence extracted from anthropological, prison and military sources suggests that physical well-being improved for Indians born in the middle decades of the nineteenth century. This is somewhat unexpected given the simultaneous decline of indigenous population. We identify potential hypotheses that might explain the phenomenon of stable or improving health amid population decline.

Europeans and the peoples of the northwest coast of North America

British and Spanish ships reached Vancouver Island during the 1770s, and the first Europeans travelling overland reached the Pacific in 1793 (Alexander MacKenzie) and 1806 (Lewis and Clark). European disease may have been introduced even earlier by native coastal traders coming north from Spanish California or south from Russia. Nevertheless, the first record of smallpox on the northwest coast of North America dates from the 1770s. Particularly virulent epidemics swept through the region in 1781-1782, 1802-1802 and 1824-1825. Large numbers of people died. The circulation of syphilis, tuberculosis and measles further damaged Indian health. Another round of powerful epidemics during the 1830s and 1840s likely accelerated indigenous population decline as the region was integrated more closely into the North American disease pool.[2]

Of course, other influences were also at work. A Hudson's Bay Company (HBC) post established in 1843 was the first permanent British settlement on Vancouver Island. The new settlement created considerable demand for Indian labour and facilitated the arrival of a growing number of Whites.[3] A gold discovery in 1858 on the mainland hastened the influx of newcomers; large

[1] We appreciate support from the Social Sciences and Humanities Research Council of Canada, excellent research assistance from Maddox Hunt and colleagues in the Historical Data Research Unit at the University of Guelph and comments from participants at the *Canadian Network for Economic History Conference*, Sepember 27-29 2019.

[2] Robert Boyd, *The coming of the spirit of pestilence: Introduced infectious disease and the population decline among Northwest Coast Indians, 1774-1874* (Vancouver and Seattle: UBC Press and University of Washington Press, 1999); Boyd, "Smallpox in the Pacific Northwest: The Early Epidemics," *BC Studies* 101 (1994): 5-40; Grant Keddie, *Songhees Pictorial: A History of the Songhees People as seen by Outsiders, 1790* (Victoria: Royal BC Museum, 2003).

[3]Robin Fisher, *Conflict and contact: Indian-European relations in British Columbia, 1774-1890* (Vancouver: UBC Press, 1977); John Lutz, *Makúk A new history of aboriginal-white relations*

numbers of gold-seekers people arrived between 1858 and 1863.[4] Intermittent armed conflict between Indian and Whites, and between Indian groups using European firearms took a significant toll.[5]

The broad outlines of this story are well known in spite of uncertainty about the size of First Nations population before the arrival of Europeans and hence in the extent of population decline. Population estimates for the late eighteenth century range from 100,000 to 400,000. A century later most observers estimate the indigenous population of British Colombia to be 25,000 to 30,000.[6] The decline of native population continued at least until the 1890s although it varied by clan or group and is not known with certainty.[7] Thus, the evidence examined in this paper, the stature of Native Americans born from the 1840s to the 1890s, describes indigenous peoples that were declining in numbers and, perhaps more importantly, already having experienced two generations of colonization, socio-economic disruption and demographic decline before evidence becomes available.[8]

There is no reason to be optimistic about the physical well-being of British Columbia's Indian population in a period of demographic decline, warfare, epidemic and endemic disease and loss of control over some of the natural resources on which indigenous communities depended. And yet, the arrival of Europeans also brought new work and trading opportunities, new foodstuffs and increasingly valuable understandings of medicine and public health. In advance of the evidence there is no way of knowing the net consequences of colonization for the health of Indians who managed to survive the arrival of Europeans.

(Vancouver: UBC Press, 2008); Jean Barman, *The West beyond the West: A history of British Columbia* (Toronto: University of Toronto Press, 2007 3rd edition).

[4] Whites, many moving north from San Francisco, were most visible in this process although Indians, Chinese and other ethnicities participated as well.

[5] Barry Gough, *Gunboat frontier: British maritime authority and Northwest coast Indians, 1846-1890* (Vancouver: UBC Press, 1984); John Douglas Belshw, *Becoming British Columbia: A Population History* (Vancouver: UBC Press, 2009), 29-30 and 83-85.

[6] Robert Galois and Cole Harris argue for an upward adjustment of the 1881 census report in their "Recalibrating Society: The population geography of British Columbia in 1881", *The Canadian Geographer* 38 no 1 (1994): 37-53. Further support for upward adjustment is found in the size of indigenous population reported in the 1901 census, which adopted a more inclusive definition of Indian.

[7] John Douglas Belshaw, "The West we have lost: British Columbia's demographic past and an agenda for population history", *The Western Historical Quarterly* 29 (1998): 25-47 and Belshaw, *Becoming British Columbia,* chapter three.

[8] Roberta L. Hall and Peter L. Macnair, "Multivariate analysis of anthropometric data and classifications of British Columbia natives", *American Journal of Physical Anthropology* 37 (1972): 401-409; Roberta L. Hall, "A Legacy for the Pacific Northwest: Franz Boas's Surveys of Native People in the Late19th Century", *The Pacific Northwest Quarterly* 97 (2006): 59-68; Boyd, *The coming of the spirit of pestilence.*

The Boas evidence of physical well-being

Any consideration of physical well-being in British Columbia before the twentieth century is hampered by a dearth of systematic evidence about births, marriages, deaths and health more generally.[9] Consequently, we turn to measures of physical stature and the logic of "net nutrition", which interprets adult stature for large numbers of people as a reflection of their early-life physical well-being.[10] Evidence of stature is available from three sources – prison, anthropological survey and military - each of which describes a different subset of the indigenous population.

The anthropologist Frans Boas took particular interest in Native North Americans and the systematic measurement of their physical characteristics.[11] These data survive and have been reanalyzed by successive generations of researchers.[12] The evidence is most extensive for Indians living along the coasts of Washington state and British Columbia.[13] We return to Boas' data for the northwest coast Native Americans and add two additional sources – Indians recorded in the admission registers of British Columbia prisons 1864-1920 and those who enlisted in the Canadian Expeditionary Force 1914-1918. Within each of these sources we examine adult

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[9] The tendency for Indians to be ignored or minimized in historical sources generated by Whites and the new settler state is discussed in Lutz, *Makúk A new history*, chapter three.

[10] Phyllis Eveleth and J.M. Tanner, *Worldwide Variation in Human Growth* (Cambridge: Cambridge University Press, 1976); Roderick Floud, Robert Fogel, Bernard Harris and Sok Chul Hong*, The Changing Body: Health, Nutrition, and Human Development in the Western World since 1700* (Cambridge: Cambridge University Press, 2011); Richard H. Steckel. "Biological Measures of the Standard of Living", *Journal of Economic Perspectives* 22 (2008): 129–52.

[11] Roberta Hall, "A Legacy for the Pacific Northwest; Richard L. Jantz, "Frans Boas and Native American biological variability", *Human Biology* 67 (1995): 345-353; Richard L. Jantz, "The anthropometric legacy of Franz Boas", *Economics and Human Biology* 1 (2003): 277-284.

[12] Hall and Macnair, "Multivariate analysis of anthropometric data"; Richard L. Jantz, "Variation among North Amerindians: Analysis of Boas' anthropometric data", *Human Biology* 64 (1992): 435-461; Richard H. Steckel & J.M. Prince. "Tallest in the World: Native Americans of the Great Plains in the Nineteenth Century", *American Economic Review* 91 (2001): 287-294; Kristin A. Kirkpatrick, *Archival anthropometry: an analysis of the anthropometric data of native american children gathered by Franz Boas, 1888-1902*, MA thesis, Oregon State University 2001; Richard H. Steckel, "Inequality amidst Nutritional Abundance: Native Americans on the Great Plains", *Journal of Economic History* 70 (2010): 265-86; Donna Feir, Rob Gillezeau and Maggie Jones, "The slaughter of the bison and reversal of fortunes on the Great Plains", *Federal Reserve Bank of Minnesota Working Paper* Jan 2019.

[13] Boas personally collected data in in the region during 1890, 1894 and 1897. Eight assistants made ten additional research trips during the 1890s. See his "Physical Characteristics of the Tribes of the Northwest Coast", *Report of British Association for the Advancement of Science* 61 (1891): 424–449; "Physical Characteristics of the Tribes of the North Pacific Coast", *Report of British Association for the Advancement of Science* 65 (1895): 524–551; "Summary of the Work of the Committee in British Columbia", *Report of the British Association for the Advancement of Science* 68 (1898): 667–688. We are grateful to Richard Jantz for his digitization of the information and making it available.

stature as an indicator of childhood standard of living for cohorts born between the 1830s and 1890s.

The British Columbia evidence collected during the Boas interviews of the 1890s are summarized in Table One. Average height for individuals aged 21-50 yrs is reported by gender and birth decade. Adult stature for both women and men born during the middle decades of the nineteenth century was increasing. This restatement of the evidence confirms a pattern first identified by Hall and Macnair using different methodology.[14] Nevertheless, the differences from decade to decade were not significantly different from zero on a difference of means test except for the comparison of men from the 1840s to the 1850s and again from the 1850s to 1860s (both significant at the 1% threshold).

Thus, the Boas evidence indicates that the stature of northwest coast Indian men increased from the 1840s to the 1860s to an extent that was statistically and, given the values, substantively significant.[15] An *increase* of adult stature reflecting improvements in childhood health is unexpected if disease compromised personal health sufficiently to cause a decline of population. Admittedly, we do not know the relative contributions of elevated mortality and disrupted fertility to the decline.[16] The latter would not necessarily damage child health. Hall speculates that, among other factors, the introduction of molasses, wheat flour and especially the potato improved nutrition through an increased availability of calories and mitigation of seasonal shortages.[17] The decline of population, by itself, has ambiguous implications for food availability. Realizing the advantages of an increase in per capita natural resources may have been difficult if, as seems likely, the labour available for food acquisition also declined.

Moreover, the enormity of population decline creates the potential for a substantial survival bias. Change over time must be inferred from a comparison of different birth cohorts among those surviving into the 1890s. A 'survival of the healthiest' effect could mitigate or offset the negative impact of disease and dislocation in the Boas data.[18] There are other complications. The Northwest coast Indians are the best documented of all peoples visited by Boas, and yet sample size in Table

[14] Hall and Macnair, "Multivariate analysis of anthropometric data"; Hall, "A Legacy for the Pacific Northwest".

[15] The growing male-female differential is discussed by Roberta L. Hall, "Sexual Dimorphism for Size in Seven Nineteenth-Century Northwest Coast Populations", *Human Biology* 50 (1978): 159-71 and Hall, "A Legacy for the Pacific Northwest".

[16] One of the few acknowledgements of disrupted fertility is Keddie, *Songhees Pictorial*, p34.

[17] Hall, "A Legacy for the Pacific Northwest". Admittedly, inexpensive alcohol brought by Europeans clearly damaged Indigenous health.

[18] Carlos Bozzoli, Angus Deaton and Climent Quintana-Domeque. Adult Height and Childhood Disease", *Demography* 49 (2009): 647-669; Paul Frijters, Timothy J. Hatton, Richard Martin, and Michael Shields. "Childhood economic conditions and length of life: Evidence from the UK Boyd Orr cohort, 1937–2005", *Journal of Health Economics* 29 (2010): 39-47; Timothy J. Hatton, "Infant mortality and the health of survivors: Britain, 1910–50", *Economic History Review* 64 (2011): 951–972.

One is small. Moreover, most people were interviewed at reserves, reservations or residential schools implying a useful but not comprehensive selection of the Indian population.[19] We conclude that, while the Boas data are exceptionally valuable, it is useful to consider other sources.

Evidence from prison admissions

Additional evidence comes from prison admission registers which document the incarceration of large numbers of Indians. The British Columbia's first prison or gaol was erected in 1864. Admission and cell registers survive for the Victoria Gaol from 1864 to 1914, New Westminster Gaol 1875-1914, Nanaimo Gaol 1911-1914 and Saanich Prison Farm 1914-1917.[20] These institutions served Vancouver Island and communities along or near the coast of mainland British Columbia, a region in which a majority of Indians and an even larger proportion of Whites lived.[21] Digitization of the records of individual prisoners allows us to describe the frequency with which Indians were incarcerated and the distribution of personal characteristics and offending patterns.

In total, 33,297 records describe 28,201 distinct people. Indians account for roughly one-third of all assignments to the Victoria Gaol during the late 1860s (Figure One). We identify indigenous prisoners with information recorded about the physical appearance and social identity of each prisoner. Where detailed description is lacking the name of an individual occasionally helps to identify ethnicity. 88% of the Canadian indigenous records are identified by reference to a particular Indian group or the insertion of "Indian", "Half Breed" etc as a modifier to name. Another 7% convey indigeneity by an explicit reference in one of the other fields (eg nationality, religion etc). 4% are identified through their name and 1% can be seen to be indigenous through another record for the same person. Undoubtedly we miss some Indians, particularly those of mixed ancestry, because of limited detail in the registers and because at least some people would have tried to conceal their Indigenous ancestry.

An example illustrates the problem. On Christmas Day 1879 Allan, Charlie and Archie MacLean along with Alexander Hare entered the New Westminster Gaol to await trial for murder.[22] Nothing in their register entries identifies these men as being part-indigenous, even though the McLeans

[19] The representativeness of the Boas samples is considered by Hall and Macnair, "Multivariate analysis of anthropometric data"; John H. Moore and Janis E. Campbell, Blood quantum and ethnic intermarriage in the Boas data set", *Human Biology* 67 (1995): 499-516; Hall, "A Legacy for the Pacific Northwest"; and inmportantly, Melinda Miller, "Selection and height data: Evidence from the 1892 sample of the Cherokee Nation", *Explorations in Economic History* 61 (2016): 119-123.

[20] British Columbia Archives, GR-308/7-13 *Victoria Gaol Description Book 1864-1914*; GR-309/1-2 *New Westminster Gaol Description Book* 1875-1914; GR-310/4 *Nanaimo Gaol Description Book* 1911-1914; GR-306/10 *Saanich Prison Farm* 1914-1917.

[21] The records of most jails and lock-ups in the interior are missing (for example, the gaols at Nelson and Kamloops and small lock-ups attached to police stations at Lytton and Yale). Of course, some prisoners in the missing institutions passed through either the Victoria or New Westminster gaol. A few records surviving from Quesnel (British Columbia Archives GR-0042 *Quesnel Gaol* 1915-1919 are included.

[22] British Columbia Archives, GR-309/1 *New Westminster Gaol Description Book* 1879 pp43-43.

were members of a well-known mixed ancestry family and lived with Indian relatives and friends much of the time.[23] Possibly these men were so well known that the registrar did not consider it necessary to make a note of their ethnicity. The broader problem is that in an era that depreciated indigenous identity, many individuals either concealed or at least did not volunteer this information.[24] It is precisely in this context that the explicit ascription of indigenous identity to so many prisoners is revealing.

The prison data describe a different component of the Indian population than the Boas interviewees. Some prisoners lived on reserves but it is likely many did not, since they lived alongside Whites sufficiently closely to have offended provincial or Canadian law. The method of data acquisition also differs between the sources. The prisoners were measured on entry to gaol as young adults, year after year, over five decades. There is no need to infer cohorts from those who lived long enough to be interviewed in the 1890s. The prisoners in our sample only needed to survive until the age of 21 or so (and to have sufficient interaction with Whites to be arrested).[25] Change over time is inferred from a cross-cohort comparison of 21 year olds with 21 year olds rather than a comparison of 21 year olds with 41 year olds who happened to be interviewed together.

We report in Table Two adult stature estimates for the prisoners in the same manner as Table One.[26] Sample size is still small although larger than that of the Boas data. Male stature in the two sources is similar for men born in the 1860s, the only group for which 200+ observations are available in each source. There is no reason to expect the sources to yield similar height, given the different selections from within the Indian population, measurement differences and the smallish samples. Remarkably, the prison data replicate for both men and women the Boas pattern of a significant increase of stature from the 1840s to the 1850s. The prison data reveal another wave of increasing stature (for men only) from the 1860s to the 1870s. Both changes are significant on a difference of means test. For other birth decade transitions we cannot rejection the hypothesis of

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[23] Hamar Foster, "The Kamloops Outlaws and Commissions of Assize in Nineteenth-Century British Columbia", pp 308-364 in G. Blaine Baker et al, *Essays in the history of Canadian law* (Osgoode Society and University of Toronto Press 1981)..

[24] The challenge of ethnic identification in Canadian sources is explored, *inter alia*, by Michelle Hamilton, "'Anyone Not on the List Might as Well Be Dead': Aboriginal Peoples and the Censuses of Canada, 1851-1916." *Journal of Canadian Historical Association* 18, (2007): 57–79 and Michelle Hamilton and Kris Inwood, "The Aboriginal Population and the 1891 Census of Canada", in Per Axelsson and Peter Skold eds., *Indigenous Peoples and Demography. The Complex Relation Between Identity and Statistics* (New York: Bergahn, 2011): 95-116.

[25] Most offenses were minor; over half of them involved alcohol consumption or sales (illegal under Canada's Indian Act).

[26] Mean height is reported by birth decade and gender for men aged 21-50. Values that are statistically significantly different from the previous decade are asterisked. In this table we use the records for all Indigenous except those who give a birthplace outside of British Columbia (ie excepting row 4 in Table 3). For the European-descended we use only those who report a B.C. birthplace (the first three rows in Table 3).

no change.[27] The broad picture is that Indian stature increased over the period, corresponding roughly to a comparison of grandparents with their grandchildren, by a substantial 1.7 inches for men and a smaller margin for women.

During the same span settlers and other locally born Europeans experienced no significant change in stature. At the beginning of the period the European-descended were much taller than Indigenous men reflecting, no doubt, superior access to nutrition and some level of protection from infectious disease. There was still a difference between ethnicities for men born in the 1880s, but it was much reduced by the rise in stature of Indigenous population.

This pattern of rising Indigenous stature with interruptions in the 1840s and 1860s is an summary aggregation for a great variety of distinct peoples with diverse cultural and economic practices.[28] The evidence does not allow us to focus on individual groups, however it has been possible to distinguish groups living substantially on the coast from those who were based inland and those who were of mixed ancestry (*half-breed* in the language of the time) versus others not known to be children of mixed unions. Food sources and disease exposure for inland groups may have differed sufficiently to permit greater realization of potential stature. At least some children of mixed unions likely had access to a more diverse set of practices and resources again with implications for the realization of potential stature.

The number of records with locational or location-related ethnic identification is reported in Table Three. The detail and granularity of reporting is not consistent, but 70% of the useful records point to either a coastal or inland location. In Table Four we examine this subset of the records by birth decade. As expected, the inland people were slightly taller, and there was a tendency for that group to become more numerous (15% of the total in the 1870s against less than 10% earlier). However, the differences between inland and coastal are small and, more importantly, both groups experienced the same pattern of increase. We conclude that the growing proportion of inland peoples, by itself, cannot account for increasing Indigenous staure at the level of the colony/province.

Another potential recomposition that could increase average stature is a growing share of prisoners with mixed parentage (typically a White male and Indigenous Female). Identification of mixed ethnic ancestry is hampered by under-reporting. There were social advantages to passing as White and some advantages to presenting as Indian, but no advantages for self-identifying as a *Half-breed*. In Table Five we report numbers and average stature for records that point to mixed ancestry and those with no such evidence. Identifiable mixed parentage increased from 7% of records in the 1840s and 1850s to 8% in the 1860s and 14% in 1870s. The mixed ancestry group was substantially taller in all birth cohorts until the 1870s. This should not be surprising. The Boas data for British Columbia, most of which were collected at inland locations, show the same pattern of

[27] The transitions 1940s to 1850s and 1860s to 1870s are significant at a 1% confidence level, and the others do not even approach significance at a 10% level of confidence.

[28] Wilson Duff, *The Indian History of British Columbia* (Victoria: Royal British Columbia Museum, 1997).

greater stature among those not claiming 'pure' Indian ancestry and a much diminished gap for the 1870s birth cohort (Table Six).

Although mixed ancestry Indians were taller, and their share among prisoners was increasing, it is not the only or most important source of increasing Indigenous stature. Even among prisoners with no visible sign of mixed status the 1870s birth cohort was substantially taller than the earlier-born. A growing presence of children of mixed unions may have contributed to an increase, but by itself it cannot explain the substantial increase of the 1870s (unless there was an unreported increase in mixed ancestry during that decade). We conclude that the evidence of rising Indigenous stature was not a misleading artifact of shifting heterogeneity in the imprisoned population.

Evidence from First World War enlistment records

Our final source is the medical examination of British Columbia Natives who enlisted in the Canadian Expeditonary Force (CEF) during the First World War (WWI).[29] The cursory medical examination administered on enlistment, and the rigours of basic training, exclude from this source men who were clearly unfit. There was a nominal requirement for minimum height, however in this enlistment it appears to have been enforced little if at all. Consequently these records describe men who were reasonably fit but otherwise physically unremarkable.

The CEF did not record indigenous identity systematically although the information is found in some files. We identify Indian soldiers by two methods. A team of undergraduates students read through the entire 1901 Canadian census enumeration in order to identify every young male of indigenous or part-indigenous ancestry and search for him in the list of CEF soldiers.[30] Slightly more than 2400 indigenous men can be identified uniquely and with confidence in both the 1901 census and in the CEF personnel records. Of these men, 172 were born in British Columbia.[31] We augment these records with another 75 records for British Columbia men who are not in the first database but have been identified publicly by descendents and other researchers as being of indigenous ancestry and serving in the CEF.[32] Thus, the first part of the sample represents men born into families who self-identified as indigenous in 1901, when the men were still very young. The second part of the sample includes soldiers identified as indigenous typically by a family

[29] Library and Archives Canada. Record Group 150, acc. 1992–93/166, 'Personnel Files'.

[30] Allegra Fryxell, Kris Inwood and Aaron Van Tassel. "Aboriginal and Mixed-Race Men in the Canadian Expeditionary Force 1914-1918", pp 254-273 in P. Baskerville and K. Inwood, eds., *Lives in Transition: Longitudinal Research from Historical Sources* (McGill-Queens University Press 2015). Criteria for declaring a census-military match are reported in Appendix Table 12.6. The 1901 enumeration was the most comprehensive Canadian census (although still inconsistent) in its identification of indigenous ethnicity especially for those of mixed ancestry.

[31] We use the birthplace reported in the census for those who have been linked between sources. For the second group of soldiers, who are not yet linked to the census, we use birthplace reported at enlistment.

[32] Aboriginal Veterans Tribute Honour List, http://www.vcn.bc.ca/~jeffrey1/LtoZ.htm. Accessed Sept 20 2019.

member alive today (presumably using private family history evidence). Many of the soldiers themselves did *not* identify as indigenous at the time of enlistment.[33]

As with the Boas sample, birth cohorts in the CEF evidence must be extracted from age at enlistment. Thus, any selection effect that differs by age has the potential to distort a comparison across cohorts. After excluding records with incomplete information and for men who enlisted before the age of 21, we report mean stature for 166 indigenous soldiers in Table Six. The men in this group were born later than most of the prisoners and Boas interviewees. Not surprisingly, the soldiers were slightly taller than prisoners and Boas interviewees.

Stature among the Indian soldiers declined modestly from those born in the 1870s and 1880s to those born in the 1890s, although a difference of means test does not reject the hypothesis that the two groups were drawn from populations of equal stature. The small size of the two birth cohorts, of course, limits the value of any significance test. Nevertheless, there is no sign of a resumption of stature increases experienced earlier in the century. Non-indigenous WWI soldiers born in British Columbia experienced a comparably modest (and not statistically significant) decline in stature.[34] The White soldiers reported in Table Six were slightly taller than their Indigenous colleagues.

Do we have a story?

We are still in the early stages of making sense of the patterns suggested by our sources. If the patterns reported above survive further investigation, what story would we tell about the evolution of physical well-being within the net nutrition paradigm? The story has to be one of increasing stature and, by implication, improvements in childhood standard of living during the mid-nineteenth century. Both Boas and prison data suggest that the physical well-being of B.C. Indians improved between those born in the 1840s and those born in the 1850s. The Boas data suggests a further increase into the 1860s, while prison evidence indicates an increase into the 1870s. Thus, the northwest coast Indians join the Plains Indians as a group that maintained a large stature even as population was declining.[35] And they join the Māori in New Zealand prisons whose stature increased, at least for a time, amid the experience of population decline.[36]

[33] The personnel files for some of these soldiers does indicate indigenous ancestry, although the reference where available frequently is oblique.

[34] The files of White soldiers were selected as part of a sample of all WWI personnel whose surnames begin with the letter 'B'; see John Cranfield and Kris Inwood, "The Great Transformation: A Long-Run Perspective on Physical Well-Being in Canada", *Economics and Human Biology* 5 (2007): 204-228.

[35] Steckel and Prince, "Tallest in the World"; Steckel, "Inequality amidst Nutritional Abundance".

[36] Kris Inwood, Les Oxley and Evan Roberts, "The long arm of colonialism: the decline and rise of Māori stature", unpublished paper presented to the *Canadian Network for Economic History Conference*, Sepember 27-29 2019.

How do we explain the seeming paradox on the northwest coast? A simple survival bias cannot explain improvements in child health during population decline unless we were able to hypothesize an *increasingly* selective survival bias. That seems unlikely. Population decline in response to fertility reduction rather than heightened mortality, by itself, cannot explain rising stature although a shift from mortality- to fertility-driven population decline might have been influential. Unfortunately, little evidence of indigenous fertility, even anecdotally, appears to be available for the nineteenth century.

The mechanism originally hypothesized by Roberta Hall remains a likely candidate to explain the apparent improvement in indigenous child health during the early years of European colonization. There is evidence for the use of introduced foods (eg the potato), transportation improvement that would mitigate local shortages and an increased demand for Indian labour from the HBC and white settlement more generally. Nevertheless, there are unresolved issues even with this mechanism. If the European influence was favourable, why did Indian stature cease to increase after the 1870s? Clearly other factors were at work. Additional influences are suggested as well by a simple moving average of adult male prison stature from the 1840s to the 1870s. These data, reported in Figure 2, show significant declines in the mid-1840s and later 1850s/early 1860s.[37]

The first setback is contemporaneous with the introduction of a permanent HBC post in 1843 and the beginning of permanent White settlement in the region. We might hypothesize that disruptions accompanying the first resident European presence undermined Indian health, but that this negative impact gave way to opportunities in the 1850s for Indians to improve their health. On this view, enhanced trade with the HBC and other interactions with White society brought changes that, on balance, were beneficial. This process was severely disrupted again c1860 by dramatic gold discoveries in 1858 and 1862, which drew tens of thousands of aggressive prospectors to southern British Columbia.[38] Frontier violence, land loss and a severe smallpox epidemic undoubtedly damaged the health of Indian children born during these years. Again in the later 1860s, however, indigenous health managed to recover as the prospectors left and Indians again were able to advantage of opportunities offered by the increasingly well-organized White community.

On balance, the narrative being considered here conveys an unexpectedly positive portrait of early European influences on Indigenous health, or at any rate the health of survivors, admittedly with periodic trauma and reversals. If there is an alternative to this perspective, it might be found in the experience of earlier generations. We know nothing about generations born before 1840 who likely experienced the greatest losses to European disease. The impact of disease epidemics in this period cannot be assessed with precision, but every indication suggests it was highly severe. It is possible that the overwhelming impact of earlier epidemics caused a decline in indigenous stature, which was reinforced by the introduction of permanent European settlement in the 1840s. On this view, the upward trend in subsequent decades would reflect a long-delayed recovery from the initial catastrophe. Unfortunately, at the present time, we do not yet have evidence to assess this hypothesis.

[37] The moving average is useful because of small sample size in any one year.

[38] Fisher, *Conflict and contact*; Lutz, *Makúk A new history*; Barman, *The West beyond the West.*

Table 1: Adult stature in B.C. as measured by Frans Boas and his associates

	Women		Men	
	n	mean stature	n	mean stature
born 1840s	45	60.7	101	64.0
born 1850s	108	61.0	180	65.0*
born 1860s	152	61.0	252	65.9*
born 1870s	38	61.2	55	66.2

Source: see text. 'Adults' have reported ages 21-50.
* denotes significantly different from the previous decade

Table 2: Stature of BC-born adults as measured by prison records

	Indigenous women		Indigenous men		European-descended men	
	n	mean stature	n	mean stature	n	mean stature
born 1830s	57	62.9	229	65.4		
born 1840s	217	63.3	1039	65.5	51	67.5
born 1850s	300	64.1*	1475	66.0*	70	67.4
born 1860s	91	63.8	506	65.8	178	67.1
born 1870s			142	66.7*	186	67.5
born 1880s			89	67.1	144	67.1

Source: British Columbia Archives, GR-308/7-13 *Victoria Gaol Description Book 1864-1914*; GR-309/1-2 *New Westminster Gaol Description Book* 1875-1914; GR-310/4 *Nanaimo Gaol Description Book* 1911-1914; GR-306/10 *Saanich Prison Farm* 1914-1917. Cells with fewer than 30 observations are suppressed. 'Adults' have reported ages 21-50. Locally-born men are considered to be European-descended if there is no reference to Indigenous, African, Chinese or other non-local ancestry.
* denotes significantly different from the previous decade

Table 3: Distribution of birthplace for adult male prisoners

	Number of records	
	Indians	Whites
Coastal British Columbia	2239	85
Inland British Columbia	206	10
British Columbia not specified	491	586
Canada other than B.C.	7	495
Canada not specified	40	1604
No birthplace mentioned	543	0

Source: as in Table 2. Whites here are the 'European-descended' in Table 2. Coastal locations including all of Vancouver Island is recognized for people identified (with variation) as Ahousett, Albernie, Barclay Bay, Beaches Bay, Bella Bella, Bella Coola, Burard Inlet, Canichen, Cape Mudge, Clalam, Clayquot, Coal Harbour, Coquitlam, Cowitchan, Esquimault, Fort Rupert, Fort Simpson, Hydah, Kaitsey, Kitamat, Langley, Mosquiam, Nanimo, New Werstminster, Nisqually, Nitinak, Nootka, Queen Charlotte, Saanich, San Juan, Sitka, Skidagate, Songhees, Sooke, Squamish, Stickeen, Tchyupsiaw, Victoria, Watcom and others. Inland groups and locations are considered to be Carrier, Cheam, Chilliwack, Comox, Flathead, Fort Douglas, Fort Hope, Fort Yale, Fraser River, Harrison River, Hazelton, Lilooet, Lytton, Naas River, Nicola, Skeena, Sumas, Thompson and variations.

Table 4: Adult stature for Indians born in coastal and inland locations

	Coastal		Inland	
	n	mean stature	n	mean stature
born 1840s	746	65.4	55	65.5
born 1850s	986	65.9	121	66.1
born 1860s	280	65.5	10	65.8
born 1870s	41	66.7	7	66.2

Source: Table 3 and text

Table 5: Adult stature for Indian prisoners with and without evidence of mixed ancestry

	Mixed ancestry		No evidence of mixed ancestry	
	n	mean stature	n	mean stature
born 1840s	71	66.5	968	65.4
born 1850s	96	66.7	1379	65.9
born 1860s	41	66.6	465	65.8
born 1870s	20	66.5	122	66.8

Source: Table 3 and text

Table 6: Adult stature for Boas interviewees with and without evidence of mixed ancestry

	Mixed ancestry		No evidence of mixed ancestry	
FEMALE	n	mean stature	n	mean stature
born 1840s			45	60.7
born 1850s	4	64.9	105	60.8
born 1860s	12	62.5	140	60.9
born 1870s	3	62.6	35	61.2
MALE				
born 1840s	1	65.3	100	64.0
born 1850s	108	68.0	178	64.9
born 1860s	18	68.0	234	65.7
born 1870s	6	66.8	49	66.1

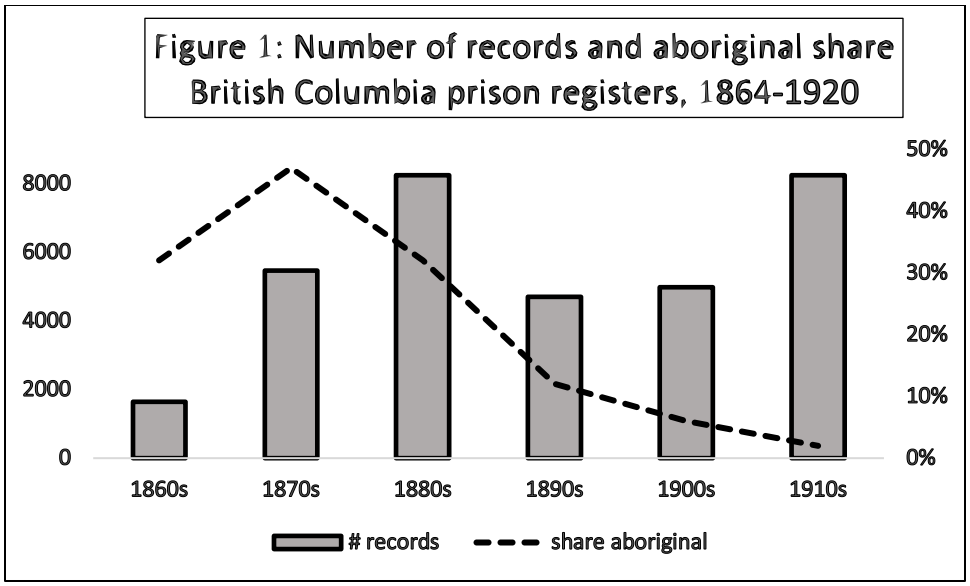
Source: see Table 1 and text

Table 7: Adult stature as reported in First World War medical examinations

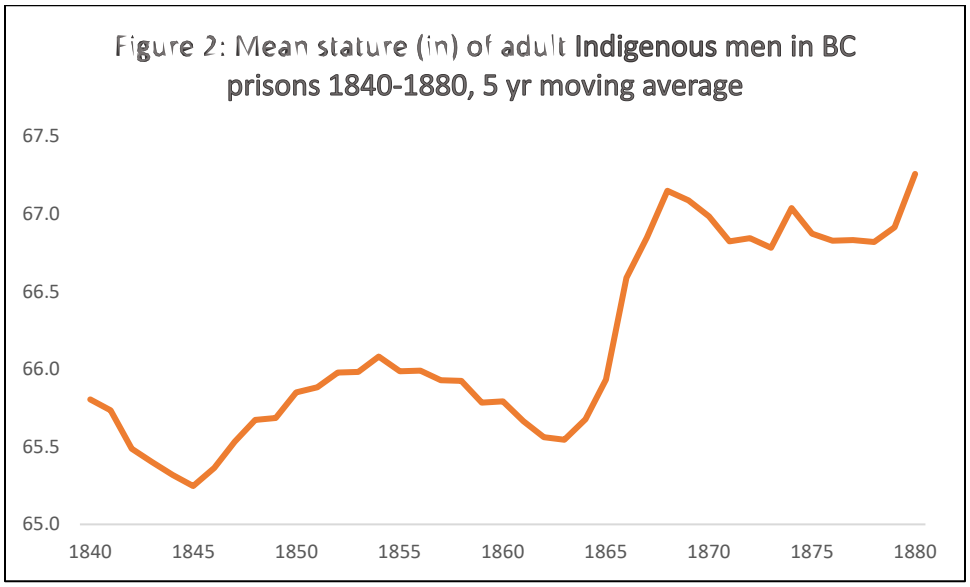
	Indian		Whites	
	n	mean stature	n	mean stature
born 1872-1890	88	67.9	82	68.2
born 1890s	78	67.7	143	68.0

Source: Library and Archives Canada. Record Group 150, acc. 1992–93/166, 'Personnel Files'. See text for the Indian sample. For the sample of Whites see John Cranfield and Kris Inwood, "The Great Transformation: A Long-Run Perspective on Physical Well-Being in Canada", *Economics and Human Biology* 5 (2007): 204-228.

* denotes significantly different from the previous decade



Sources: See Table 2



Sources: see text