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Sex ratios and 'missing women' among Asian minority and migrant populations in Aotearoa/New Zealand: a retrospective cohort analysis

Rachel Simon-Kumar ⬤ , Janine Paynter, Annie Chiang, Nimisha Chabba

School of Population Health, The University of Auckland, Auckland, New Zealand

Correspondence to
Dr Rachel Simon-Kumar;
r.simon-kumar@auckland.ac.nz

ABSTRACT

Objectives Recent research from the UK, USA, Australia and Canada point to male-favouring sex ratios at birth (SRB) among their Asian minority populations, attributed to son preference and sex-selective abortion within these cultural groups. The present study conducts a similar investigation of SRBs among New Zealand's Asian minority and migrant populations, who comprise 15% of the population.

Setting and participants The study focused on Asian populations of New Zealand and comparisons were made with NZ European, Māori, Pacific Island and Middle-Eastern, Latin American and African groups. Secondary data were obtained from the New Zealand historical census series between 1976 and 2013 and a retrospective birth cohort in New Zealand was created using the Stats NZ Integrated Data Infrastructure from 2003 to 2018.

Primary and secondary outcome measures The primary outcome measure was SRBs and sex ratios between the ages 0 and 5 by ethnicity. A logistic regression was conducted and adjusted for selected variables of interest including visa group, parity, maternal age and deprivation. Finally, associations between family size, ethnicity and family sex composition were examined in a subset of this cohort (families with two or three children).

Results There was no evidence of 'missing women' or gender bias as indicated by a deviation from the biological norm in New Zealand's Asian population. However, Indian and Chinese families were significantly more likely to have a third child if their first two children were female compared with two male children.

Conclusion The analyses did not reveal male-favouring sex ratios and any conclusive evidence of sex-selective abortion among Indian and Chinese populations. Based on these data, we conclude that in comparison to other western countries, New Zealand's Asian migrant populations present as an anomaly. The larger family sizes for Indian and Chinese populations where the first two children were girls suggested potentially 'soft' practices of son preference.

Strengths and limitations of this study

► This study uses whole of population data.
► Two independent data sets, the Longitudinal Census of New Zealand and Birth Register Cohort Series, were used for corroboration.
► The study uses administrative data which is not specifically collected for the purposes of this research that may affect the quality of the analysis.
► The use of proxies (such as visa status for length of residency) may affect the accuracy of the analysis.
► The study is limited by its exclusive use of live birth ratios and future research may include stillbirths and abortion data, should reliable data be available.

Landmark work conducted some four decades ago in India and China highlighted imbalances in M:F birth ratios above the normative 105:100, an artefact of deliberate sex selection resulting in excess prenatal female mortality estimated at millions.[2 4 5] Widely referred to as the 'missing women' phenomenon, skewed M:F ratios are unequivocally accepted as reflecting son preference and undervaluation of girls and women; as Sen[5] noted, they 'tell us, quietly, a terrible story of inequality and neglect' (p61).

Extensions to this scholarship more recently has focused on migrants of Asian heritage residing in 'western' societies. Burgeoning work in Canada,[6–14] the UK,[15–18] the USA,[19–24] Sweden,[25] Norway,[26] Australia[27] and Spain,[28] has documented male bias in sex ratios largely among their Indian, Chinese and Korean migrant communities. Overall, analyses of sex ratios in individual country contexts estimate anywhere from 2000 at a minimum to 4000 maximum missing women between the 1980s and 2000s.

Skewed M:F ratios among migrant Asian communities largely present among first-generation migrants, especially where the mother is overseas-born[8 10 13 15 27] although

BACKGROUND

Sex ratios at birth (SRB), calculated as males:females (M:F), are widely used as a measure of gender bias within a population.[1–3]

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recent research in Canada shows continuation of these trends among second-generation South Asian women.[6] Studies point to imbalances in M:F ratios at higher parities (>2) especially where the first two children are girls.[13 15 20 22–24 27 29 30] The practice is found among affluent, urban migrants, ruling out economic need as the exclusive driver of sex selection.[17 18] Instead, residual cultural norms are pivotal in the drive for male children; traditional gender practices around property inheritance, responsibilities of elder care, and continuity of the family name, which privilege men in most Asian societies, are largely followed even after generations of migration to the west.[9 19 31] Religion is implicated in son preference although the practices are neither uniform nor similar across communities. Sex selective abortions are more likely to be found among Sikh migrant communities,[12 16] whereas Abrahamic religions (such as, Christianity and Islam), given their strictures on abortion, are more likely to have larger families until they attain the family composition of their preference.[13 17] Although sex selective abortion is a predominant method, it is not the sole form of prenatal son preference. Other methods include larger family sizes and the application of the 'male preference stopping rule' or the practice of stopping pregnancies when the desired male child/children numbers have been achieved[21] and selective in-vitro fertilisation practices.[32]

There is a glaring lack of comparative analyses of SRBs in Aotearoa/New Zealand despite the significant increase in the Asian migrant populations in the last 30 years. New Zealand is a demographically multiethnic and 'superdiverse' society although its politically foundations are rooted in biculturalism and *Te Tiriti o Waitangi* (The Treaty of Waitangi) signed between the Crown and Māori in 1840. According to the 2018 Census, Asian ethnicities make up around 15.1% of the total New Zealand population, a growth of approximately 10% since the 1990s.[33 34] Asians (Chinese followed by Indians) are currently the largest ethnic minority population and comprise citizens, permanent residents, work-visa holders, refugees and international students. Scholarship on Asian women's lives highlights continuities in traditional gender norms.[35] In comparison to other ethnic groups, rates of induced abortion are higher among Asian women.[36 37] In 2019, amendments to the Abortion Legislation Bill decriminalised abortion relaxing the hitherto stringent conditions for termination (see http://legislation.govt.nz/bill/government/2019/0164/latest/LMS237550.html) although Section 20F specifically notes that, '[t]his parliament opposes the performance of abortions being sought solely because of a preference for the fetus to be of a particular sex', requiring a review to assess evidence of any abuse of the legislation within 5 years.[38]

This paper, an analysis of historical and current sex ratios within and among Asian migrant populations, aims to determine the influence, if any, of son favouring bias on SRBs, or in other forms as part of prenatal fertility and family size decision-making.

METHODS

Data sources

The Statistics New Zealand Integrated Data Infrastructure (IDI) is a secure database containing deidentified microdata on people and households, collected by government agencies and non-government organisations. Our study used the Census, Ministry of Health, Department of Internal Affairs (DIA) and Ministry of Business, Innovation and Employment (MBIE) datasets.

Historical census series: 1976–2013

Our first analysis aimed to describe the changes in ethnic sex ratios over time. This analysis used Census datasets from 1976, 1981, 1986, 1991, 1996, 2001, 2006 and 2013. At the time of analysis, Census 2018 was not yet available in the IDI. From these datasets, we extracted age, sex and ethnicity data. Age was defined as age on census day. Sex was recorded as a binary variable, man or woman. Ethnicity was coded according to the ethnic groups listed in the Health Information Standards Organisation's Ethnicity Data Protocols, the standard for collection, recording and outputting ethnicity in the health and disability sector in New Zealand.

Of note are ethnicities that were coded for, historically, that are no longer coded for in more recent census. These included classifications such as West Indies, Negro, Micronesia and conglomerate ethnicities such as 'Ceylonese/Singhalese/Sri Lankan', 'Syrian/Lebanese/Arab'. In the cases where there is no direct match for a historical code in the Protocols, the contemporary name of the region or name of the broad geographic area was imputed as the ethnicity code. Imputation was mostly required for Middle-Eastern, Latin American and African (MELAA) and Pacific ethnicities.

Given that the historical census series is a measure of the total New Zealand population, we summarised these data as the number of males born per 100 women. To represent the range of sex ratios that are likely to arise based on random variation (which is in turn dependent on the size of the sub-population of interest), we calculated 95% CIs based on binomial probability.

Birth register cohort

Our birth register cohort comprised all live births between 2003 and 2018, inclusive, recorded in the DIA Births dataset. The study period was determined by the data availability of the Ministry of Health Maternity dataset. Ethnicity for the mother was obtained by linking an encrypted unique identifier associated with the birth and data from the Ministry of Health Demographics dataset.

We chose a small number of covariates based on international literature. These were: (1) visa group, which is a proxy for generational status in New Zealand. It is assumed second and third generation migrants are likely to have resident status and those holding visas will be first generation/recent migrants. Visa status was derived from the MBIE Decisions data table; (2) parity, which was derived from the births dataset and includes a record of

the number of siblings a newborn has; (3) maternal age, which was estimated based on the birth year of the mother and birth year of the newborn; and (4) area level deprivation. Area level deprivation was derived using the latest notified address and linking this to an Index of Multiple Deprivation (IMD) decile.[39] The IMD measures deprivation of a data zone in terms of employment, income, crime, housing health, education and access to essential services, and ranking each area in New Zealand from most to least deprived. The data zone is a geographic scale that is designed to capture whole neighbourhoods while preserving socioeconomic homogeneity, making it a suitable proxy for socioeconomic position. Descriptive statistics for the New Zealand birth cohort 2003–2018 are presented as counts and percentages or means with SD and medians with IQR. Logistic regression was used to compare odds of a male child relative to a female child and adjust for other potentially influential factors. The European/Pākeha population was used as a reference population as per other studies on SRB.

Finally, the probability of having a third child within the 2003–2018 birth cohort was examined in the context of the sex of the first two children among families of 3 or more children using logistic regression. Analysis was conducted for the four permutations of female and male siblings (FF, FM, MF, MM).

Patient and public involvement
No patient involved.

RESULTS
Historical census series 1976–2013
The New Zealand population aged 0–5 years ranges from just over 300 000 up to 360 000 throughout the 8 censuses between 1976 and 2013 inclusive. The Indian, Chinese, Asian and MELAA population has grown steadily as a proportion of the total over these years. The Chinese population with about 1800 0–5 year olds in 1976 growing to 13 000 in 2013. The Indian population from 1400 0–5

year olds in 1976 to 13 400 in 2013. The number of men for every 100 women presented by ethnicity is shown in figure 1. The decreasing magnitude of the 95% CIs and declining variability of the male to female ratio for the Asian and MELAA populations reflects this steady growth. There is no evidence of excess female mortality, among the migrant population in New Zealand, in this robust data series.

Birth register cohort 2003–2018
There were around 877 101 births in New Zealand from 2003 to 2018 (table 1). Around 5% of these births were to mothers with a recent migrant and non-Pacific background. Parity is low with a median parity for the cohort of 1 and mean of 1.7 with relatively little variation among different ethnicities. There were no significant associations between ethnicity and odds of a male child with or without adjustment for visa group, parity, maternal age and deprivation.

When examining family sex composition and family size (table 2), there was a clear preference for mixed sex regardless of ethnicity with odds of having a third child significantly lower versus two males MF versus MM, OR 0.82 (95% CI 0.80 to 0.84) and FM versus MM, OR 0.83 (95% CI 0.81 to 0.84). However, there was a significant interaction between family sex composition and ethnicity and therefore different ethnic groups were modelled separately. Indian families, OR 1.51 (95% CI 1.35 to 1.69) and Chinese families OR 1.22 (95% CI 1.09 to −1.37) were significantly more likely to have a third child if the first two children were female (FF) compared with both male (MM). European families were marginally less likely to have a third child if the first two children were male, OR 0.95 (95% CI 0.93 to 0.98) and the significant preference for mixed sex compared with both males was maintained throughout the separate ethnic models.

Finally, the sex ratio for parity 3 children of families with two female first born was not significantly skewed for Indian (459 males/408 females, 52.9% (Wilson 95% CI
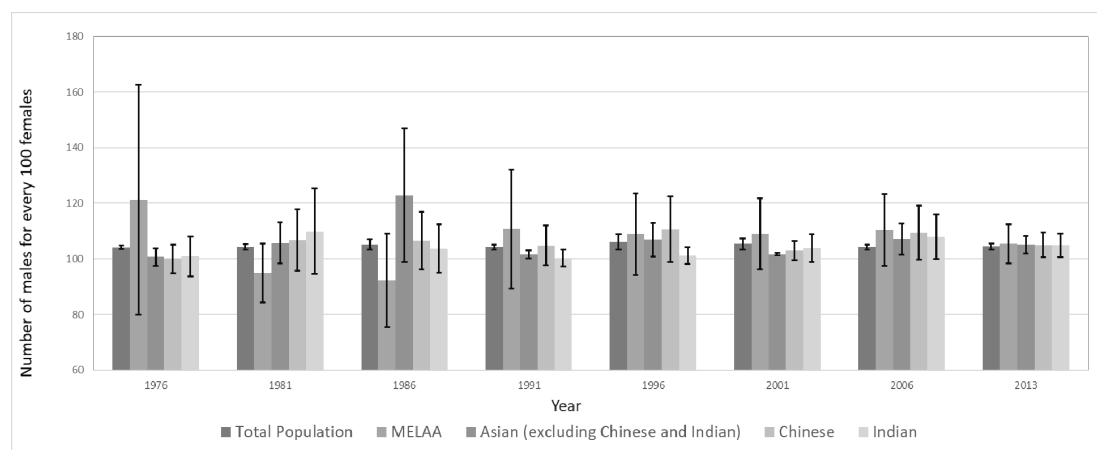

Figure 1 Number of males for every 100 women aged 0–5 years from NZ Census series from 1976 to 2013 with 95% CIs, expected sex ratios at 5 years of age remain around 105 men to 100 women for most countries and particularly developed countries due to reductions in infant mortality.[45] MELAA, Middle-Eastern, Latin American and African.

Table 1 Demographic and migration characteristics of the New Zealand birth cohort from 2003 to 2018*

	Sex				Visa group											All	
	Male		Female		Family		Other		Refugee		Work		Resident and Pacific					
Ethnicity	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)			N	(%)
African	2568	(50.3)	2541	(49.7)	885	(17.3)	402	(7.9)	594	(11.6)	510	(10.0)	2721	(53.3)			5109	(0.6)
Asian†	18990	(51.4)	17982	(48.6)	4695	(12.7)	912	(2.5)	1452	(3.9)	1482	(4.0)	28431	(76.9)			36972	(4.2)
Chinese	17925	(51.2)	17109	(48.8)	2244	(6.4)	879	(2.5)	96	(0.3)	1173	(3.3)	30642	(87.5)			35034	(4.0)
Indian	18639	(51.5)	17550	(48.5)	3609	(10.0)	927	(2.6)	117	(0.3)	1470	(4.1)	30066	(83.1)			36189	(4.1)
European	221538	(51.3)	210084	(48.7)	4905	(1.1)	1254	(0.3)	123	(0.0)	4128	(1.0)	421212	(97.6)			431622	(49.2)
Latin American	2202	(52.8)	1974	(47.3)	636	(15.2)	129	(3.1)	78	(1.9)	252	(6.0)	3081	(73.8)			4173	(0.5)
Middle Eastern	2805	(50.8)	2712	(49.1)	1068	(19.3)	330	(6.0)	903	(16.3)	150	(2.7)	3069	(55.6)			5523	(0.6)
NZ Māori	85788	(51.6)	80421	(48.4)	24	(0.0)	147	(0.1)	9	(0.0)	9	(0.0)	166023	(99.9)			166209	(18.9)
Pacific Island	38784	(51.4)	36714	(48.6)	3771	(5.0)	2838	(3.8)	99	(0.1)	396	(0.5)	68397	(90.6)			75498	(8.6)
Unknown	40881	(51.4)	38673	(48.6)	825	(1.0)	561	(0.7)	141	(0.2)	279	(0.4)	77748	(97.7)			79557	(9.1)
Other	615	(50.9)	600	(49.4)	78	(6.4)	15	(1.2)	18	(1.5)	51	(4.2)	1056	(86.9)			1215	(0.1)
All	450741	(51.4)	426360	(48.6)	22737	(2.6)	8385	(1.0)	3633	(0.4)	9900	(1.1)	832446	(94.9)			877101	(100.0)

	Parity					Maternal age					NZ Index of Multiple Deprivation (NZ IMD)				
Ethnicity	N	Mean	SD	Median	(IQR)	N	Mean	SD	Median	(IQR)	N	Mean	SD	Median	(IQR)
African	5109	2.0	1.0	2	(1–3)	5109	30.4	5.5	30	(27–34)	4908	6.6	2.6	7	(5–9)
Asian†	36972	1.7	0.8	1	(1–2)	36972	31.7	5.2	32	(28–35)	35643	5.9	2.7	6	(4–8)
Chinese	35034	1.5	0.7	1	(1–2)	35034	31.7	4.6	32	(29–35)	34224	5.0	2.7	5	(3–7)
Indian	36186	1.5	0.7	1	(1–2)	36186	30.0	4.5	30	(27–33)	35082	6.7	2.5	7	(5–9)
European	431622	1.7	0.8	1	(1–2)	431622	30.9	5.7	31	(27–35)	412986	5.2	2.7	5	(3–7)
Latin American	4173	1.5	0.7	1	(1–2)	4173	32.5	5.0	33	(30–36)	4032	5.1	2.7	5	(3–7)
Middle Eastern	5520	2.0	1.0	2	(1–3)	5520	29.9	5.6	30	(26–34)	5328	6.2	2.7	7	(4–9)
NZ Māori	166212	1.8	1.0	1	(1–2)	166212	26.8	6.3	26	(22–31)	157383	7.8	2.4	9	(7–10)
Pacific Island	75501	2.1	1.1	2	(1–3)	75501	28.4	6.3	28	(23–33)	73125	8.5	2.0	9	(8–10)
Other	1218	1.7	0.8	1	(1–2)	1218	32.5	6.6	33	(28–38)	1158	5.5	2.8	5	(3–8)
Unknown	79554	1.8	1.0	1	(1–2)	79554	30.0	6.4	30	(25–35)	75687	6.5	2.9	7	(4–9)
All	877101	1.7	0.9	1	(1–2)	877101	29.9	0.9	30	(25–34)	839553	6.2	0.9	7	(4–9)

*Counts are randomly rounded to base three to protect privacy as required by Stats NZ. This also means that the column totals will not reconcile.
†Excludes Indian and Chinese.

49.6% to 56.2%)) or Chinese (375 males/369 females, 50.4% (Wilson 95% CI 46.8% to 54.0%)) families.

DISCUSSION

Our study results point to marked differences in M:F ratios among New Zealand's Asian minority and migrant population groups relative to comparator countries like Canada, the USA and Australia. Varied measures of SRBs and child sex ratios in these countries consistently demonstrated a male surplus-female deficit in Indian and Chinese populations, resulting in significant missing women in the overall population. In contrast, SRB for New Zealand Indian and Chinese ethnic populations do not show similar male-favouring bias for the period

under study, in the multiple data sets, that is, Census and Birth Data. M:F deviations from the SRB norm of 105:100 norm were not outside of what would be expected due to random variation, or more recent estimations specifically for New Zealand at 1.058.[40] Most significantly, there was also no evidence of sex ratio skew at birth order >2/ higher parities as has been seen in several other contexts. Deprivation and migration (visa status) did not have a significant influence on the sex ratio either. In all these measures, Asian (Indian and Chinese) sex ratios are unremarkable and no different to the estimates for the reference group, that is, European/Pākeha.

The lack of evidence for excess female mortality allows us to conclude that if it occurs at all, prenatal sex-selective

Table 2 Percentages of families who have a third child amongst families with two or three children by ethnicity*

	African			Asian			Chinese		
	3rd child	(%)	Total	3rd child	(%)	Total	3rd child	(%)	Total
All	822	(34.8)	2364	4131	(25.4)	16254	2,400	(16.4)	14,646
First two siblings									
FF	228	(38.2)	597	1086	(27.9)	3891	744	(20.2)	3681
FM	186	(33.2)	561	882	(22.8)	3870	489	(13.9)	3507
MF	189	(33.5)	564	969	(23.8)	4074	516	(14.1)	3666
MM	219	(34.3)	639	1197	(27.1)	4422	651	(17.2)	3792
	European			**Indian**			**Latin American or Hispanic**		
	3rd child	(%)	Total	3rd child	(%)	Total	3rd child	(%)	Total
All	49500	(25.6)	193584	2535	(16.9)	15009	288	(18.1)	1593
First two siblings									
FF	12732	(27.2)	46743	867	(22.4)	3876	69	(19.5)	354
FM	10869	(23.4)	46458	504	(13.5)	3732	57	(15.3)	372
MF	10884	(23.1)	47079	549	(15.3)	3588	75	(17.4)	432
MM	15015	(28.2)	53301	612	(16.1)	3813	90	(20.5)	438
	Middle Eastern			**NZ Maori**			**Other**		
	3rd child	(%)	Total	3rd child	(%)	Total	3rd child	(%)	Total
All	828	(32.9)	2517	20259	(33.9)	59691	132	(24.3)	543
First two siblings									
FF	192	(32.7)	588	5106	(35.9)	14226	39	(27.7)	141
FM	219	(33.0)	663	4755	(33.0)	14421	33	(22.4)	147
MF	204	(34.0)	600	4704	(32.1)	14667	24	(22.9)	105
MM	210	(31.7)	663	5691	(34.7)	16377	36	(24.0)	150
	Pacific Island			**Unknown**					
	3rd child	(%)	Total	3rd child	(%)	Total			
All	11049	(39.1)	28224	5328	(30.2)	17646			
First two siblings									
FF	2703	(40.0)	6756	1404	(32.8)	4287			
FM	2625	(38.7)	6786	1182	(27.3)	4329			
MF	2718	(38.2)	7119	1200	(27.7)	4335			
MM	3006	(39.7)	7563	1542	(32.8)	4695			

*Counts are randomly rounded to base three to protect privacy as required by The Statistics New Zealand. This also means that the column totals will not reconcile.

termination is not a widespread practice among the Asian populations of New Zealand. The absence of bias in sex ratios may be attributed to a range of factors. Prominently, New Zealand, unlike neighbouring Australia, the USA or Canada, had stringent restrictions around pregnancy terminations, which may have been a deterrent to the procurement of sex-selective abortions. Also unlike in Canada and the USA, where the sex of the baby may be revealed during regular ultrasound screening during pregnancy, there are stricter stipulations around such disclosures in New Zealand. Although every interaction between practitioners and their clients cannot be monitored, the evidence does not seem to suggest significant breaches in disclosures. Furthermore, ultrasounds

confirming the sex of the baby are usually conducted around 18 weeks but by law abortions beyond 20 weeks are illegal. Arguably legislative restrictions are likely to affect domestic access to termination; however, there is also no evidence to suggest that Asian women travelled overseas to procure sex-selective abortions. Prohibitive costs associated with travel from New Zealand may constrain the return to home countries for this purpose but, conversely, there is no evidence to suggest that higher-income migrants have used this pathway.

More positively, acculturation of Asian migrant populations and alignment with the more liberal gender norms in the host country might have an influence on the reshaping of attitudes to the girl child and would be in

line with results noted elsewhere.[13 16] Broader social positioning as minority populations might have also impacted on the perception and valuation of children as assets and social capital, regardless of sex. Research has highlighted myriad ways in which 1.5 and second generation migrant children support families through bringing in secondary income, supporting parents through language and cultural interpretation,[41 42] and deepening roots in the community.[41] For many first-generation migrants, children also facilitate in the process of legalising their residency status. Until 2006, any child—regardless of sex—born in New Zealand was automatically accorded citizenship. Compared with other minority groups in New Zealand, such as Māori and Pacific Island communities, or overseas such as Punjabi Sikh community in Canada, the majority of New Zealand's Asian and ethnic community are relatively recent arrivals and in varied stages of settlement. Under these circumstances, the benefits of children, both boys and girls, may outweigh any perceived cultural disadvantages.

The lack of sex-selective abortion specifically does not dismiss son preference wholly. Indeed, what has emerged from the latter part of our analysis is that desire for male children continues to be germane among Indian and Chinese couples but is practiced as extended family sizes and planned sex composition. Male preference is manifest in 'soft' prenatal decision-making placing it in the ethical crossroads between gender bias and sex discrimination, on the one hand, or a matter of choice and family balancing, on the other.[16 32 43]

Study limitations
Methodologically, the strengths of the study include the use of whole of population data. However, these are administrative data not collected for the specific purposes of examining son preference and missing women. Therefore, there is likely to be imprecision in some of the measures, for example, visa group as a proxy for duration of family residency (generation number) in New Zealand. However, the analyses also reveal significant gaps in prenatal sex-specific data.

The analysis also used live birth sex ratios as the sole indicator of gender inequity in Asian and ethnic communities. Live birth sex ratios are open to critique and needs to be triangulated with other data sets to confirm existence of sex-selective fertility practices.[32] Further work could focus on *intervals* between births, sex of *stillbirths*, and further disaggregation by religion, income, and region. New Zealand also currently does not capture sex-specific abortion data, especially for abortions after 14 weeks when sex is known; this too would have been a source of additional data for triangulation. Similarly, there are also comparisons to be made against the inordinate perinatal stillbirths among the Indian population in New Zealand.[44] While as of now there is no suggestion that this gender-related, a sex-differentiated analysis would further enhance our understanding of the physiological

and social implications of gender and culture during pregnancy.

Finally, the data presented here are a snapshot of time whereas the migrant community in New Zealand is continually in transition. In the years to come, we are likely to have a growing proportion of migrant populations who have been born in New Zealand or have come to the country as children, and who make up the next generation of reproductive age women. There is also a rise in inter-racial/interethnic marriages, all of which are likely to inform a new generation of gender norms in many of these communities.

CONCLUSION
Our study, an exploration of M:F sex ratio imbalances in Asian immigrant populations in New Zealand, failed to reveal any skewness towards male children, or present any evidence of potential sex-selective abortion. The data, however, demonstrated extended family sizes particularly where the first two children were female.

Based on these findings, the study draws the following conclusions. The first is to underscore the 'New Zealand anomaly' in Asian ethnicity sex ratios disputing sex-selection and missing women as a widespread phenomenon in the country. Second, we conclude that gender bias and son preference are prevalent through softer cultural practices that are not captured in sex ratio imbalances. These study findings come at an apposite moment in New Zealand's legal history. The Abortion Legislation Bill in 2020 was enacted in the face of some concerns that any relaxations of the law may evoke sex selective abortion. Our results, which highlight an absence of this practice, provide a baseline for future reviews to assess the impact, if any, of the decriminalisation reforms. Instead, we argue that there should be scrutiny on the more subtle forms of son preference in the prenatal stages including family balancing or the less explored in-vitro fertilisation practices. Equally, son preference can also be demonstrated after birth, for example, in the opportunities available to girl children. These are areas for further research.

Most importantly, these findings suggest that culture is continually being adapted to local conditions, be it fertility regulatory frameworks or migration histories. While education programmes in the community around daughter valuation may be beneficial, son preference and its effects are likely to be ameliorated through creating social systems—for example, in education, employment, community structures, leadership and politics—that are equitable to girls and women of colour and present the best possibilities for elimination of son preference as a cultural practice.

conducted background literature review and assisted in final preparation of the manuscript. RS-K is the author of the Introduction, Discussion and Conclusion section, and JP with assistance from AC authored the Methodology and Results Section. All authors approved the final manuscript. RS-K and JP are the guarantors for the study. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

ORCID iD
Rachel Simon-Kumar http://orcid.org/0000-0002-4866-5226

REFERENCES

1 United Nations,, Department of Economic and Social Affairs,, Population Division. *Sex differentials in childhood mortality. United Nations*, 2011.
2 Bongaarts J, Guilmoto CZ. How many more missing women? excess female mortality and prenatal sex selection, 1970-2050. *Popul Dev Rev* 2015;41:241–69.
3 Ritchie H, Roser M. Gender ratio. our world data, 2019. Available: https://ourworldindata.org/gender-ratio [Accessed 4 Mar 2021].
4 Gupta MD. Explaining Asia's "Missing Women": A New Look at the Data. *Popul Dev Rev* 2005;31:529–35.
5 Sen A. More than 100 million women are missing. *N Y Rev Books* 1990;37:61–6.
6 Wanigaratne S, Uppal P, Bhangoo M, et al. Sex ratios at birth among second-generation mothers of South Asian ethnicity in Ontario, Canada: a retrospective population-based cohort study. *J Epidemiol Community Health* 2018;72:1044–51.
7 Vogel L. Sex selection migrates to Canada. *CMAJ* 2012;184:E163–4.
8 Urquia ML, Ray JG, Wanigaratne S, et al. Variations in male-female infant ratios among births to Canadian- and Indian-born mothers, 1990-2011: a population-based register study. *CMAJ Open* 2016;4:E116–23.
9 Srinivasan S. Transnationally relocated? sex selection among Punjabis in Canada. *Canadian Journal of Development Studies / Revue canadienne d'études du développement* 2018;39:408–25.
10 Ray JG, Henry DA, Urquia ML. Sex ratios among Canadian liveborn infants of mothers from different countries. *CMAJ* 2012;184:E492–6.
11 Postulart S, Srinivasan S. Daughter discrimination and son preference in Canada. *Can J Dev Stud Rev Can Détudes Dév* 2018;39:443–59.
12 Brar A, Wanigaratne S, Pulver A, et al. Sex ratios at birth among Indian immigrant subgroups according to time spent in Canada. *J Obstet Gynaecol Can* 2017;39:459–64.
13 Almond D, Edlund L, Milligan K. Son preference and the persistence of culture: evidence from South and East Asian immigrants to Canada. *Popul Dev Rev* 2013;39:75–95.
14 Joseph KS, Lee L, Williams K. Sex ratios among births in British Columbia, 2000-2013. *J Obstet Gynaecol Can* 2016;38:919–25.
15 Dubuc S, Coleman D. An increase in the sex ratio of births to India-born mothers in England and Wales: evidence for sex-selective abortion. *Popul Dev Rev* 2007;33:383–400.
16 Dyal M. Sex selection and sex-selective abortion: lessons to be learnt from a comparison between the United Kingdom and the North Indian state of Punjab. *Med Law Int* 2013;13:101–34.
17 Adamou A, Drakos C, Iyer S. Missing women in the United Kingdom. *IZA J Migration* 2013;2:1–19.
18 Gill A, Mitra-Kahn T. Explaining daughter devaluation and the issue of missing women in South Asia and the UK. *Current Sociology* 2009;57:684–703.
19 Puri S, Adams V, Ivey S, et al. "There is such a thing as too many daughters, but not too many sons": A qualitative study of son preference and fetal sex selection among Indian immigrants in the United States. *Soc Sci Med* 2011;72:1169–76.
20 Howell EM, Zhang H, Poston DL. Son preference of immigrants to the United States: data from U.S. birth certificates, 2004-2013. *J Immigr Minor Health* 2018;20:711–6.
21 Grech V. Evidence of socio-economic stress and female foeticide in racial disparities in the gender ratio at birth in the United States (1995-2014). *Early Hum Dev* 2017;106-107:63–5.
22 Almond D, Sun Y. Son-biased sex ratios in 2010 US census and 2011-2013 US natality data. *Soc Sci Med* 2017;176:21–4.
23 Almond D, Edlund L. Son-biased sex ratios in the 2000 United States census. *Proc Natl Acad Sci U S A* 2008;105:5681–2.
24 Abrevaya J. Are there missing girls in the United States? Evidence from birth data. *Am Econ J Appl Econ* 2009;1:1–34.
25 Mussino E, Miranda V, Ma L. Changes in sex ratio at birth among immigrant groups in Sweden. *Genus* 2018;74:13.
26 Tønnessen M, Aalandslid V, Skjerpen T. Changing trend? sex ratios of children born to Indian immigrants in Norway revisited. *BMC Pregnancy Childbirth* 2013;13:170.
27 Edvardsson K, Axmon A, Powell R, et al. Male-biased sex ratios in Australian migrant populations: a population-based study of 1 191 250 births 1999-2015. *Int J Epidemiol* 2018;47:2025–37.
28 González L. Sex selection and health at birth among Indian immigrants. *Econ Hum Biol* 2018;29:64–75.
29 Castelló A, Urquia M, Rodríguez-Arenas María Ángeles, et al. Missing girls among deliveries from Indian and Chinese mothers in Spain 2007-2015. *Eur J Epidemiol* 2019;34:699–709.
30 Singh N, Pripp AH, Brekke T, et al. Different sex ratios of children born to Indian and Pakistani immigrants in Norway. *BMC Pregnancy Childbirth* 2010;10:40.
31 Unnithan M, Dubuc S. Re-visioning evidence: reflections on the recent controversy around gender selective abortion in the UK. *Glob Public Health* 2018;13:742–53.
32 Purewal N, Eklund L. 'Gendercide', abortion policy, and the disciplining of prenatal sex-selection in neoliberal Europe. *Glob Public Health* 2018;13:724–41.
33 Stats NZ. Asian ethnic group. STAT. N. Z. Available: https://www.stats.govt.nz/tools/2018-census-ethnic-group-summaries/asian [Accessed 4 Mar 2021].
34 Stats NZ. Estimated resident population (Erp), National population by ethnic group, age, and sex, 30 June 1996, 2001, 2006, 2013, and 2018. n.d. Available: http://nzdotstat.stats.govt.nz/wbos/Index.aspx [Accessed 4 Mar 2021].
35 Rahmanipour S, Kumar S, Simon-Kumar R. Underreporting sexual violence among 'ethnic'[1] migrant women: perspectives from Aotearoa/New Zealand. *Cult Health Sex* 2019;21:837–52.
36 Simon-Kumar R. The 'problem' of Asian women's sexuality: public discourses in Aotearoa/New Zealand. *Cult Health Sex* 2009;11:1–16.
37 Rose SB, Wei Z, Cooper AJ, et al. Peri-abortion contraceptive choices of migrant Chinese women: a retrospective review of medical records. *PLoS One* 2012;7:e40103.
38 Abortion legislation bill. 2019. (164-3)..
39 Exeter DJ, Zhao J, Crengle S, et al. The New Zealand indices of multiple deprivation (IMD): a new suite of indicators for social

and health research in Aotearoa, New Zealand. *PLoS One* 2017;12:e0181260.

40 Chao F, Gerland P, Cook AR, *et al*. Systematic assessment of the sex ratio at birth for all countries and estimation of national imbalances and regional reference levels. *Proc Natl Acad Sci U S A* 2019;116:9303–11.

41 Bartley A, Spoonley P. Intergenerational Transnationalism: 1.5 Generation Asian Migrants in New Zealand [1]. *Int Migr* 2008;46:63–84.

42 Roh SY, Chang IY. Exploring the Role of Family and School as Spaces for 1.5 Generation South Korean's Adjustment and Identity Negotiation in New Zealand: A Qualitative Study. *Int J Environ Res Public Health* 2020;17:4408.

43 Macklin R. The ethics of sex selection and family balancing. *Semin Reprod Med* 2010;28:315–21.

44 McCowan LME, George-Haddad M, Stacey T, *et al*. Fetal growth restriction and other risk factors for stillbirth in a New Zealand setting. *Aust N Z J Obstet Gynaecol* 2007;47:450–6.

45 United Nations,, Department of Economic and Social Affairs,, Population Division. World population prospects 2019, online edition. rev. 1, 2019. Available: https://population.un.org/wpp/Download/Standard/Population/