

Inequities in pre-pregnancy folic acid use in Central and South Auckland: secondary analysis from a postpartum contraception survey

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ABSTRACT

Introduction. In Aotearoa New Zealand (NZ), there is inequity in rates of neural tube defects (NTDs). Among Maaori, NTD occur in 4.58/10 000 live births, and for Pacific peoples, it is 4.09/10 000 live births; this is compared to 2.81/10 000 live births for non-Maaori, non-Pacific peoples.

Aim. To describe self-reported pre-pregnancy folic acid supplementation and to determine the association between pregnancy intendedness, ethnicity, parity, maternal age, care provider and pre-pregnancy folic acid supplementation. **Methods.** Secondary analysis of postpartum survey data collected at Te Whatu Ora Te Toka Tumai and Counties Manukau birthing facilities in 2020 was conducted. Descriptive analyses explored pregnancy intendedness and self-reported folic acid use by demographic variables. Multivariable logistic regression explored independent associations between demographic variables and folic acid use among intended pregnancies. **Results.** In total, 398 participants completed the survey. The response rate was (140/149) 94% at Counties Manukau and (258/315) 82% at Te Toka Tumai. Pre-pregnancy supplementation was reported by 182 of 398 participants (46%). Use was higher among those who intended their pregnancy (151/262, 58%) compared to those who were 'pregnancy ambivalent' (9/33, 27%) or did not intend to become pregnant (22/103, 21%). Factors independently associated with supplementation among intended pregnancies included: 'Other ethnicity' (European, Middle Eastern, Latin American, African) compared to Maaori (aOR 5.3 (95% CI 1.3, 21.8)), age ≥30 years compared to <30 years (aOR 2.1 (1.0, 4.1)), and private obstetrician compared to midwifery care (aOR 4.2 (1.6, 10.9)). **Discussion.** Low rates of pre-pregnancy folic acid supplementation exist in Auckland with significant ethnic disparity. Mandatory fortification of non-organic wheat is important, but supplementation is still recommended to maximally reduce risk.

Keywords: congenital anomaly, equity, folate, folic acid, fortification, neural tube defects, pre-pregnancy supplementation, prevention.

Introduction

Neural tube defects (NTDs) occur when the neural tube does not fully close early in foetal development, resulting in incomplete formation of the spine, membranes (spina bifida), or cerebrum and cerebellum (anencephaly). They are among the most common severe birth defects. The rate of NTDs in Aotearoa New Zealand (NZ) is 10.3 per 10 000 pregnancies.¹

Rates of NTD by ethnicity are only available as a proportion of live births. Rates are significantly higher for Maaori (4.58 per 10 000 live births) compared to European/other women (2.81 per 10 000 live births), and higher, though not statistically significantly, for Pacific peoples (4.09 per 10 000 live births) compared to European/other women.¹

Folate is an essential vitamin. Supplementation with folic acid, the synthetic form of folate, reduces the risk of NTDs, cardiac, and oral cleft defects. The neural tube closes on day 28 after fertilisation and adequate folate levels pre-pregnancy are essential to reduce the risk

WHAT GAP THIS FILLS

What is already known: Pre-pregnancy folic acid supplementation reduces neural tube defects. Neural tube defect rates vary by ethnicity in Aotearoa New Zealand.

What this study adds: In a diverse sample of birthing people across two large hospitals in Auckland, self reported pre-pregnancy folic acid supplementation was found to be low. We observed significant differences in pre-pregnancy supplementation by age, ethnic grouping, and pregnancy care provider.

of malformation.^{2–5} Manatuu Hauora recommends the use of 800 microgram folic acid daily, for 4 weeks pre-pregnancy until 12 weeks' gestation. For pregnancies where additional risk factors are present (eg a personal or family history of NTD, previous child with a NTD, diabetes, use of medications that affect folate metabolism), a 5 mg daily dose is recommended.⁶

A population-based survey showed only 16% of NZ women of child-bearing age had blood folate levels above the World Health Organization (WHO) recommended level for minimal risk of NTDs.¹ In addition, with almost half of pregnancies unplanned,⁷ the NZ government moved to mandate fortification of non-organic wheat flour sold for bread making, from 2023, replacing the existing legislation of voluntary fortification.⁸ Mandatory fortification of wheat is safe, with no absolute increase in risk of prostate, breast, or colorectal cancer, and no evidence suggesting increased rates of twin pregnancy (after controlling for assisted reproductive technology).¹ In other countries, mandatory fortification has been associated with reduced rates of NTD.⁹ Mandatory fortification in New Zealand is predicted to result in 14–20 fewer NTD among live births annually.¹

Despite fortification, it is expected that a large proportion of people will continue to have folate levels below WHO recommendations.¹ Supplementation 1 month pre-pregnancy and for the first trimester *is still recommended* to reduce the risk of NTD.¹⁰ It is critical that we prioritise this message to groups at greatest risk of having babies with NTD, including those where pre-pregnancy supplementation is already low. However, despite the observed inequities in NTD rates by ethnicity, there are little published data describing folic acid supplementation, or supplementation by ethnicity and other demographic variables in NZ. A 2012 post partum survey found rates of supplementation at 54% for planned pregnancies and less than two-thirds of women were aware that folic acid supplements reduced the risk of birth defects. In this study for women with planned pregnancy, Maaori Pacific and Asian women were less likely to receive information before conception than New Zealand European women.¹¹

The aim of the present study was to describe the proportion of recently postpartum people who reported using folic acid pre-conception, and to determine whether factors such as ethnicity, parity, maternal age, pregnancy intendedness,

location of birth and type of pregnancy care provider are associated with folic acid supplementation. We also aimed to explore independent associations between ethnicity, parity, maternal age, location of birth, pregnancy care provider and folic acid supplementation among women whose pregnancies were intended.

Methods

We conducted secondary analysis of cross-sectional survey data collected at Te Whatu Ora Te Toka Tumai (Auckland) and Counties Manukau birthing facilities (two tertiary and four primary birthing units) in 2020, birthing approximately 14 000 women per year combined, as part of an anonymous postnatal contraception survey. Full details of the survey and methodology are published elsewhere.^{7,12} In brief, study investigators approached eligible patients between day 1 and 7 postpartum during their inpatient stay, irrespective of mode of delivery, explained the study and invited them to participate. Patients were excluded if they were discharged home within 6 h, required a translator, delivered a baby <23 weeks' gestation or experienced a perinatal loss. At Counties Manukau, all women were approached in a 2-week period. Te Toka Tumai recruitment was continued for some ethnic groups until a cohort was achieved with adequate numbers for analysis by ethnicity.

Basic demographic data were collected including parity, maternal ethnicity (self-defined using the standard NZ Census question, and prioritised according to NZ protocols¹³), location at given birth, and type of maternity care received (community or self-employed midwifery, private obstetrician and hospital-based midwifery care). Relevant to this study, the survey included questions described in the London Measure of Unplanned Pregnancy (LMUP).¹² This measure includes six questions, one of which asks 'Before you became pregnant, did you do anything to improve your health in preparation for pregnancy?'. The responses for this question include 'took folic acid'. There is also an option, 'took some other action, please describe___' for which some women described pre-pregnancy (multi)vitamin preparations known to contain folic acid. Response to the specific option, and free text describing these additional preparations, were taken to represent pre-pregnancy folic acid supplementation in this study.

The study was approved by the New Zealand Health and Disability Ethics Committee (HDEC) as an amendment to the original contraception survey application, and locality approval at Te Whatu Ora Te Toka Tumai and Counties Manukau facilities was also obtained.

Statistical analysis

Continuous variables have been presented in tables in categories, and all statistical comparisons in univariable

analyses were undertaken with chi-squared tests. The multi-variable logistic regression model to predict folic acid supplementation pre-pregnancy included women whose pregnancies were intended, defined based on the responses 'strongly agree' or 'agree' to the statement, 'I intended to be pregnant with this baby'. Folic acid supplementation was also reported among those who were ambivalent ('slightly agree' and 'slightly disagree') and those who 'disagreed' and 'strongly disagreed' with the statement. Variables (locality, ethnicity, parity, maternal age, and pregnancy caregiver) were included in the logistic regression model for *a priori* reasons and no variables were excluded from the full model. Statistical significance was defined as $P < 0.05$. Statistical analysis was undertaken using STATA17 (Statacorp, College Station, Texas, USA).

Results

In total, 140 people were surveyed at Te Whatu Ora Counties Manukau and 258 at Te Whatu Ora Te Toka Tumai facilities in 2020. Overall, 398 participants completed the survey. Of those eligible and approached, the response rate was (140/149) 94% at Te Whatu Ora Counties Manukau and (258/315) 82% at Te Whatu Ora Te Toka Tumai.

Maternal ethnicity, parity, age, pregnancy care provider, and pregnancy intendedness of the women in the study differed by unit, but were similar to the characteristics of all women birthing at Te Whatu Ora Te Toka Tumai and Counties localities in 2020 (Table 1).

Overall, 182 of 398 (46%) of those surveyed reported taking folic acid supplementation pre-pregnancy. Rates differed by locality, ethnicity, parity, maternal age, and type of pregnancy care (Table 2). Of participants who intended to be pregnant, 58% reported taking pre-pregnancy folic acid compared to 21% who did not, and 27% who reported ambivalence (slightly agree or slightly disagree to the statement 'I intended to be pregnant with this baby') (Table 2).

Twenty-five percent of Maaori participants reported folic acid supplementation (Tables 1, 2) compared to 22% of Pacific, 46% of Indian, 58% of Asian, and 64% of participants of other (including European) ethnicities (Table 2). Those having their first baby were more likely to take supplementation than those having their fourth or later babies (Table 2).

Pregnancy intention varied by locality, ethnicity, maternal age, and type of pregnancy care (Table 3). Locality of birth, parity, maternal age, and type of pregnancy care also varied by ethnicity (Table 4). The multivariable analyses conducted using the data obtained from the 262 participants whose pregnancies were reported as intended are given in Table 5. The associations seen between locality, ethnicity, parity, age, and pregnancy caregiver and folic acid supplementation were attenuated once adjusted for each other.

Supplementation was more likely only for the 'Other' ethnic grouping (including European, Middle Eastern, Latin American, and African) compared to Maaori (aOR 5.3 (95% CI 1.3, 21.8)), older age (≥ 30 years compared to < 30 years) (aOR 2.1 (1.0, 4.1)), and private obstetrician (aOR 4.2 (1.6, 10.9)) compared to Community (self-employed) midwifery care. After adjusting for other factors, there was no difference in supplementation observed by locality of birth.

Discussion

This study demonstrates suboptimal pre-pregnancy folic acid supplementation in those intending to become pregnant (58% supplementation rate), as well as those not planning their pregnancy (21% supplementation rate). Among those who reported having a planned pregnancy, European and MELAA ethnicities, older maternal age, and private obstetrician care independently predicted folic acid use.

Pregnancy intention was the most significant predictor of folic acid supplementation in this study. We speculate that facilitating reproductive autonomy, including information about and access to contraception, could optimise pre-pregnancy folic acid supplementation.

However, we note that more than one-third of those with a planned pregnancy were not supplementing with folic acid. Additional approaches (to fortification) will be required to optimise folate levels before or at the earliest opportunity in pregnancy. This presumably requires greater public health awareness and education.¹

In a 2010 telephone survey of women of child bearing age commissioned by the New Zealand Food Safety Authority, more than half (57%) of respondents rated their knowledge of folate/folic acid as a '0', '1' or '2' (out of 10), with 23% rating their knowledge as '0 – don't know anything about it at all'.¹⁴ Tools like pre-pregnancy checklists that include folic acid supplementation (and other health promotion behaviours) to use at the time of contraception discussions (and especially when removing LARCs) might help aid clinician-prompted conversations.

The significantly higher folic acid supplementation reported among European participants might contribute to the lower NTD rates observed for European compared to Maaori in NZ. This is concerning. The New Zealand Health System has an obligation to Maaori under The Treaty of Waitangi with a responsibility to actively protect wellbeing and work in partnership with Maaori to achieve health equity.¹⁵ Our study shows that these obligations are not being met. European, Middle Eastern, Latin American, and African women had significantly greater access to folate supplementation compared with Maaori, after adjusting for other variables, which is consistent with the findings of previous research.¹⁶ More work needs to be done to dismantle the barriers to equitable supplementation, including the

Table 1. Demographic and clinical characteristics of surveyed populations, based on locality in Aotearoa New Zealand 2020.

	Counties Manukau 2020						Te Toka Tumai 2020				Aotearoa NZ	
	Study births N = 398		Study births N = 140		All births ^A N = 7392		Study births N = 258		All births ^A N = 6212		All births 2020 ^B N = 58 693	
	n	%	n	%	n	%	n	%	n	%	n	%
Ethnicity (prioritised)												
Māori	48	12.1	20	14.3	1486	20.1	28	10.9	454	7.3	15313	26.2
Pacific people	88	22.1	47	33.6	2547	34.5	41	15.9	726	11.7	6097	10.4
Indian	70	17.6	38	27.1	1243	16.8	32	12.4	705	11.3	4751	8.1
Other Asian	57	14.3	5	3.6	591	8	52	20.2	1597	25.7	6636	11.4
European/MELAA	135	33.9	30	21.4	1496	20.2	105	40.7	2712	43.7	25871	44.3
Missing/Other					29	0.4					25	0.04
Parity												
Primiparous	206	51.8	69	49.3	2870	38.8	137	53.1	2981	48	23439	40.1
Second or third baby	159	39.9	52	37.1	3239	43.8	107	41.5	2800	45.1	27126	46.4
Fourth or later baby	33	8.3	19	13.6	1229	16.6	14	5.4	431	6.9	6241	10.7
Missing					54	0.7					1657	2.8
Age at baby's birth (years)												
<25	44	11.1	26	18.6	1801	24.4	18	7.0	483	7.8	10317	17.7
25–29	98	24.6	46	32.9	2294	31	52	20.2	1203	19.4	15883	27.2
30–34	146	36.7	42	30.0	2105	28.5	104	40.3	2495	40.2	19835	33.9
≥35	108	27.1	26	18.6	1192	16.1	82	31.8	2031	32.7	12658	21.7
Missing	2	0.5	0	0.0		0	2	0.8				
Pregnancy care												
Self-employed midwife	192	48.2	106	75.7	6174	83.5	86	33.3	2769	44.6	52390	89.6
Private obstetrician	71	17.8	0	0.0	0	0	71	27.5	1799	29	2292	3.9
GP											82	0.1
LMC type not reported											51	0.1
Unbooked	3	0.8	2	1.4			1	0.4	36	0.6		
Hospital midwife or doctor	132	33.2	32	22.9	1218	16.5	100	38.8	1601	25.8	2125	3.6
Unknown (DHB or no LMC)											1753	3.0

DHB, District Health Board; GP, general practitioner; LMC, Lead Maternity Carer; MELAA, Middle Eastern, Latin American, and African.

^AHospital data obtained from hospital-based maternity databases.^BNational data are obtained from <https://tewhatauora.shinyapps.io/report-on-maternity-web-tool/>.

Table 2. Folic acid supplementation by demographic and pregnancy factors.

		Total		Folic acid supplementation <i>n</i> = 398		<i>P</i>
		<i>n</i>	%	<i>n</i>	%	
Total births		398		182	45.7	
Locality of birthing facility	Counties Manukau	140	35.2	34	24.3	<0.001
	Te Toka Tumai	258	64.8	148	57.4	
Ethnicity	Māori	48	12.1	12	25.0	<0.001
	Pacific people	88	22.1	19	21.6	
	Indian	70	17.6	32	45.7	
	Other Asian	57	14.3	33	57.9	
	Other (European/MELAA)	135	33.9	86	63.7	
Parity	Primiparous	206	51.8	108	52.4	0.001
	Second or third baby	159	39.9	68	42.8	
	Fourth or later baby	33	8.3	6	18.2	
Age at birth (years)	<25	44	11.1	14	31.8	0.001
	25–29	98	24.6	32	32.7	
	30–34	146	36.7	80	54.8	
	≥35	108	27.1	55	50.9	
	Missing	2	0.5	1	50.0	
Pregnancy care	Self-employed midwife	192	48.2	69	35.9	<0.001
	Hospital midwife or doctor	132	33.2	60	45.5	
	Private obstetrician	71	17.8	52	73.2	
	Unbooked	3	0.8	1	33.3	
'I intended to be pregnant with this baby'	Strongly agree/agree	262	65.8	151	57.6	<0.001
	Slightly agree/slightly disagree	33	8.3	9	27.3	
	Disagree/strongly disagree	103	25.9	22	21.4	

MELAA, Middle Eastern, Latin American, and African.

wider determinants of health such as health literacy, access, cultural safety, colonialism, political context and systemic racism.¹⁷ Importantly, ongoing monitoring of policies and interventions must occur to ensure the New Zealand Health System is addressing the current ethnic disparities in folic acid levels, supplementation and consequently rates of NTD. It is expected that mandatory fortification will narrow the inequity in NTD rates in NZ, as it has in the Australian population.⁹

Other findings of this study were that those who had intended pregnancies and were older, and/or under care of a private obstetrician, were two- and four- fold more likely compared to younger people and people under community midwifery care to have reported folic acid supplementation after adjusting for other factors. Age is a recognised predictor of 'medication adherence'¹⁸ and this study aligns with previous studies reporting maternal age as a factor for increased knowledge about folic acid, its relevance to pregnancy¹⁴ and predicting folic acid supplementation.¹⁹

Care by a private obstetrician likely reflects socio-economic advantage, a factor we were unable to adjust for in this study.²⁰ Private obstetricians are chosen by a small proportion (3.92%) of New Zealand women, with 89.6% choosing a midwife as their Lead Maternity Carer and 0.14% a general practitioner in 2020.²¹

This study was performed at two large and diverse metro Auckland maternity facilities and achieved a very high response rate. Participants were approximately representative of birthing parents in those sites. Anonymous survey methodology is likely superior to pharmacy data as folic acid is prescribed as well as purchased over the counter as part of a pregnancy multivitamin, and prescription does not measure compliance. This survey could be repeated over time to determine whether there is a change in adjuvant uptake of supplements after the implementation of compulsory wheat flour fortification. Given the high levels of folate

Table 3. Demographic and clinical characteristics of surveyed populations by pregnancy intendedness.

		Total <i>n</i> = 398		Pregnancy intended ^A		<i>P</i>
		<i>n</i>	%	<i>n</i>	%	
Locality of birthing facility	Counties Manukau	140	35.2	81	57.9	0.01
	Te Toka Tumai	258	64.8	181	70.2	
Ethnicity	Māori	48	12.1	12	25.0	<0.001
	Pacific people	88	22.1	50	56.8	
	Indian	70	17.6	55	78.6	
	Other Asian	57	14.3	39	68.4	
	Other (European/MELAA)	135	33.9	106	78.5	
Parity	Primiparous	206	51.8	155	75.2	<0.001
	Second or third baby	159	39.9	96	60.4	
	Fourth or later baby	33	8.3	11	33.3	
Age at baby's birth (years)	<25	44	11.1	13	29.5	<0.001
	25–29	98	24.6	64	65.3	
	30–34	146	36.7	112	76.7	
	≥35	108	27.1	73	67.6	
	Missing	2	0.5	0	0.0	
Pregnancy care	LMC midwife	192	48.2	119	62.0	0.01
	Hospital midwife or doctor	132	33.2	84	63.6	
	Private obstetrician	71	17.8	58	81.7	
	Unbooked	3	0.8	1	33.3	
Folic acid supplementation	Yes	182	45.7	151	83.0	<0.001
	No	216	54.3	111	51.4	

MELAA, Middle Eastern, Latin American, and African; LMC, Lead Maternity Carer.

^A'I was planning to be pregnant with this baby' = strongly agree or agree compared to slightly agree, slightly disagree, disagree, strongly disagree.

recommended to prevent NTDs, it will be important to evaluate the effect of the new policy on serum levels.

There are limitations. Data relied on self-reporting by participants. Also, data on exact periods of use were not collected. Despite being an anonymous survey, respondents might have forgotten or felt inclined to report what they should have done rather than what they did. There was no assessment of whether the appropriate dose was taken based on risk factors. The survey also excluded a low number of people because they required a translator or because they went home directly after birthing. The survey collected information from the two sites during different periods, and at one site the collection was purposive for some ethnicity groups, and these methodologic differences might have led to some bias in the findings.

This survey was undertaken in two localities in the ethnically diverse areas of central and south Auckland. The rates of both private obstetrician care and DHB- led care are higher in these hospital regions (Table 1) than in

Aotearoa as a whole, and the results might therefore not be generalisable to the rest of the country.

Although national fortification of wheat is important, we believe that folic acid supplements should be freely available, and that appropriate, targeted education needs to be planned to raise awareness of the need for supplementation pre-pregnancy. Support, including funding for clinicians to undertake opportunistic pre-pregnancy counselling, is also important. We propose a future prospective study of folate blood levels in the early weeks of pregnancy to determine the success of flour fortification. This might be possible in a general practice environment, as women often access a general practitioner for pregnancy testing/confirmation, and LMC care might be delayed until beyond the window of opportunity.²²

Mixed methods research exploring awareness of, attitudes towards, and acceptability of folic acid supplementation within communities would help to understand reasons for, and address, inequity in use.

Table 4. Demographic and clinical characteristics of surveyed populations by maternal prioritised ethnicity.

		Maaori N = 48		Pacific N = 88		Indian N = 70		Other Asian N = 57		Other ^A N = 135		P
		n	%	n	%	n	%	n	%	n	%	
Locality of birthing facility	Counties Manukau	20	41.7	47	53.4	38	54.3	5	8.8	30	22.2	<0.001
	Te Toka Tumai	28	58.3	41	46.6	32	45.7	52	91.2	105	77.8	
Parity	Primiparous	20	41.7	27	30.7	48	68.6	33	57.9	78	57.8	<0.001
	Second or third baby	22	45.8	39	44.3	22	31.4	23	40.4	53	39.3	
	Fourth or later baby	6	12.5	22	25.0	0	0.0	1	1.8	4	3.0	
Age at baby's birth (years)	<25	19	39.6	19	21.6	3	4.3	0	0.0	3	2.2	<0.001
	25–29	8	16.7	27	30.7	23	32.9	12	21.1	28	20.7	
	30–34	7	14.6	19	21.6	33	47.1	26	45.6	61	45.2	
	≥35	13	27.1	23	26.1	11	15.7	18	31.6	43	31.9	
	Missing	1	2.1	0	0.0	0	0.0	1	1.8	0	0.0	
Pregnancy care	Self-employed midwife	27	56.3	45	51.1	39	55.7	21	36.8	60	44.4	<0.001
	Hospital midwife or doctor	16	33.3	40	45.5	27	38.6	19	33.3	30	22.2	
	Private obstetrician	5	10.4	1	1.1	4	5.7	17	29.8	44	32.6	
	Unbooked	0	0.0	2	2.3	0	0.0	0	0.0	1	0.7	

^AOther includes European, Middle Eastern, Latin American, and African.**Table 5.** Unadjusted and adjusted odds ratios for pre-pregnancy folic acid supplementation by locality of birth, prioritised maternal ethnicity, parity, age, and pregnancy caregiver among women who intended to be pregnant.

		Folic acid supplementation pre-pregnancy			Unadjusted			Adjusted		
		N	n	%	OR	95% CI	P	OR	95% CI	P
Locality of birthing facility	Counties Manukau	81	29	35.8	1			1		
	Te Toka Tumai	181	122	67.4	3.7	2.1–6.4	<0.001	1.5	0.8–3.1	0.2
Maternal ethnicity	Maaori	12	4	33.3	1			1		
	Pacific	50	11	22.0	0.6	0.1–2.2	0.4	0.8	0.2–3.6	0.8
	Asian	94	55	58.5	2.8	0.8–10.0	0.1	2.7	0.7–11.0	0.2
	Other (European/MELAA)	106	81	76.4	6.5	1.8–23.3	0.004	5.3	1.3–21.8	0.02
Parity	Primiparous	155	97	62.6	1			1		
	Second or third baby	96	50	52.1	0.6	0.4–1.1	0.1	0.6	0.3–1.2	0.1
	Fourth or later baby	11	4	36.4	0.3	0.1–1.2	0.1	0.6	0.1–3.1	0.6
Age (years)	<30	77	30	39.0	1			1		
	≥30	185	121	65.4	3	1.7–5.1	<0.001	2.1	1.0–4.1	0.04
Pregnancy care	Self-employed midwife	119	52	43.7	1			1		
	Hospital midwife or doctor or unbooked	85	49	57.6	1.8	1.0–3.1	0.05	1.8	0.9–3.5	0.09
	Private obstetrician	58	50	86.2	8.1	3.5–18.5	<0.001	4.2	1.6–10.9	0.003

CI, confidence interval; MELAA, Middle Eastern, Latin American, and African; OR, odds ratio.

Conclusion

Auckland has low rates of pre-pregnancy folic acid supplementation, even among those with intended pregnancy. There is significant ethnic disparity in supplementation, which might contribute to the disproportionate neural tube defect rate in Māori whānau.¹⁰ Fortification is a promising step forward. However, the strategy might not succeed if concurrent efforts do not continue to support women with reproductive autonomy and disseminate knowledge about the continued importance of supplementation pre-pregnancy to maximally reduce the risk for future tamariki (children).

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Data availability. The data that support this study are available in the article.

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