Systematic Review of Ethnic Differences in Pre-Operative Micronutrient Deficiencies in Bariatric Patients

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Introduction

- Bariatric surgery -> nutritional deficiencies
- B12, folate, iron deficiencies -> anaemia
- Vitamin D deficiency
  - Impair calcium, phosphate and bone metabolism
  - -> decreased bone mineral density
  - -> osteoporosis, osteopenia, increased risk of fracture
- Important to correct deficiencies to prevent worsening deficiency postoperatively

Introduction

- High prevalence of micronutrient deficiencies in bariatric patients pre operatively
- British Obesity and Metabolic Surgery Society
  - Recommend pre op testing of Hb, ferritin, folate, vitamin B12, vitamin D

Introduction

- Ethnic differences in micronutrient deficiency in the general population
- May be a need to risk profile bariatric patients by ethnicity

Aims

- To review the literature to determine if, in patients presenting for bariatric surgery, patients of different ethnicities have different micronutrient deficiencies preoperatively

Methods

- Systematic review - PRISMA guidelines
- Inclusion criteria
  - Assessment of micronutrient levels or prevalence of deficiency in preoperative bariatric patients
  - Age > 16
  - Ethnicity data
  - Cut offs for definition of deficiency

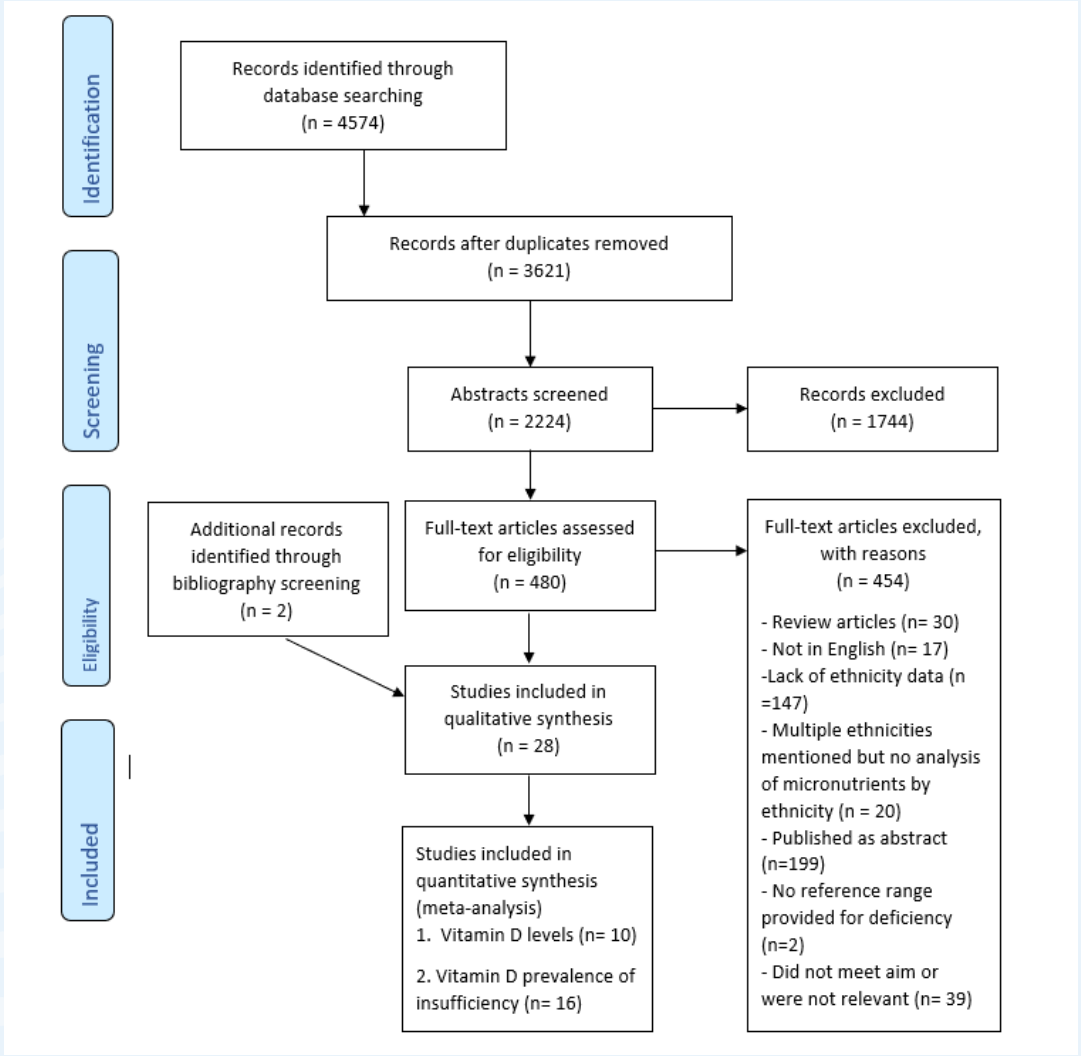
Methods

- 2 independent reviewers
- Electronic searches
  - Medline, Embase, Cochrane Library, Pubmed
- Search strategy: keywords and MeSH terms
  - “micronutrients”
  - “bariatric surgery”
  - “preoperative”

Methods

- Statistical analyses
  - Meta analyses - vitamin D
    - random effects model
- Quality Assessment
  - Newcastle-Ottawa Scale
- Heterogeneity testing
  - I squared statistic

Results – literature search



Results – overview of studies

- 7 articles – multi ethnic population
- 21 articles – single ethnic group
- 9 articles – single micronutrient
- 19 articles – multiple micronutrients
- 14 cross sectional studies, 14 cohort studies, 1 case control

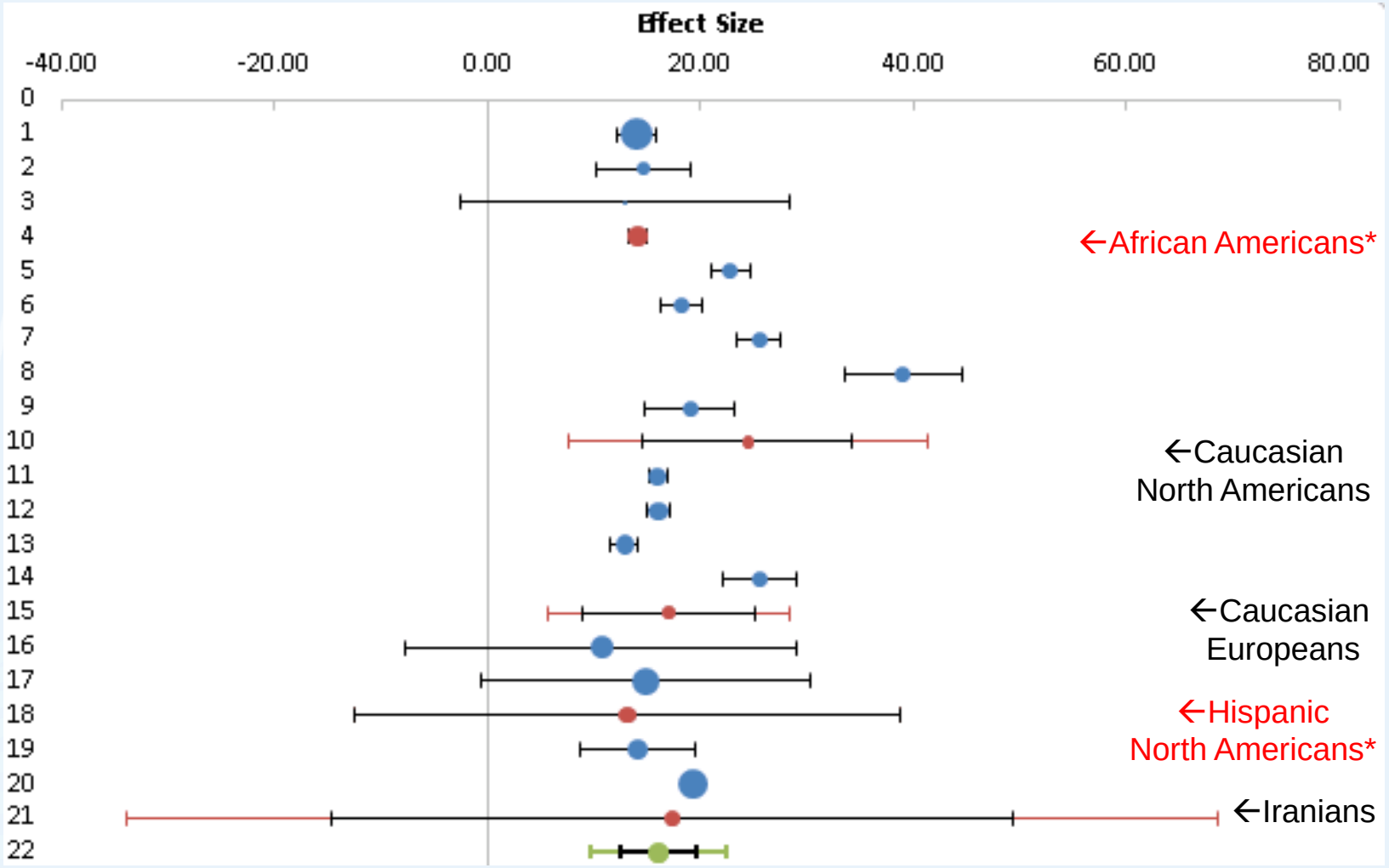
Results

- Ethnicity breakdown
  - 3977 Caucasian Europeans **(12 studies)**
  - 2224 Iranians (3 studies)
  - 1522 North American Caucasians **(7 studies)**
  - 664 Chinese from China (3 studies)
  - 282 Chinese from Singapore (2 studies)
  - 252 South American Caucasians (1 study)
  - 37 South American Non Caucasians (1 study)
  - 202 Malays from Singapore (2 studies)
  - 187 African Americans (4 studies)
  - 168 Indians from Singapore (2 studies)
  - 103 Chilean South Americans (1 study)
  - 19 North American Hispanics (3 studies)
  - 2 North American Asians (1 study)
  - 1 Native American (1 study)

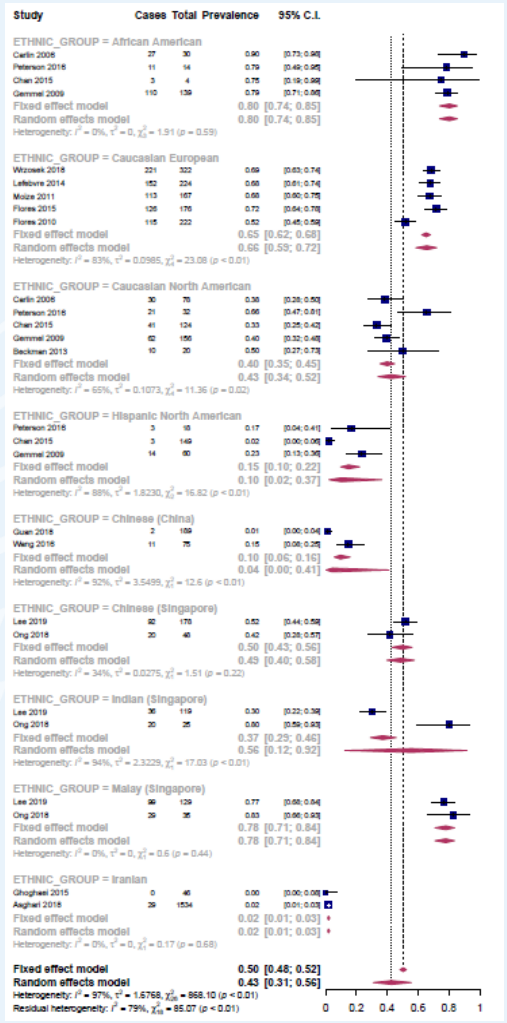
Meta-analysis of mean levels of vitamin D (ng/mL) across ethnic groups

Study name / Subgroup name	Mean	95% Confidence Interval		Weight	Q	pQ	I2	T2	T	PI LL	PI UL
1. Carlin 2006 [20]	14.000	12.139	15.861	0.815							
2. Peterson 2016 [21]	14.600	10.106	19.094	0.156							
3. Chan 2015 [22]	12.900	-2.535	28.335	0.029							
4. African American	**14.062**	**13.164**	**14.960**	**0.343**	**0.129**	**0.938**	**0.000**	**0.000**	**0.000**	**13.164**	**14.960**
5. Carlin 2006 [20]	22.800	20.988	24.612	0.214							
6. Peterson 2016 [21]	18.200	16.181	20.219	0.213							
7. Chan 2015 [22]	25.500	23.461	27.539	0.212							
8. Grethen 2011 [31]	39.000	33.488	44.512	0.169							
9. Beckman 2013 [32]	19.000	14.814	23.186	0.190							
10. Caucasian North American	**24.415**	**14.532**	**34.298**	**0.112**	**66.779**	**0.000**	**0.940**	**24.354**	**4.935**	**7.521**	**41.309**
11. Wrzosek 2018 [23]	16.000	15.174	16.826	0.273							
12. Flores 2015 study 1 [28]	16.030	15.023	17.037	0.270							
13. Flores 2015 study 2 [28]	12.820	11.595	14.045	0.265							
14. Guglielmi 2018 [46]	25.600	22.126	29.074	0.192							
15. Caucasian European	**17.012**	**8.921**	**25.104**	**0.168**	**56.187**	**0.000**	**0.947**	**6.477**	**2.545**	**5.564**	**28.461**
16. Peterson 2016 [21]	10.700	-7.672	29.072	0.413							
17. Chan 2015 [22]	14.800	-0.603	30.203	0.587							
18. Hispanic North American	**13.108**	**-12.541**	**38.756**	**0.207**	**0.541**	**0.462**	**0.000**	**0.000**	**0.000**	**-12.541**	**38.756**
19. Ghoghaei 2015 [26]	14.100	8.642	19.558	0.372							
20. Asghari 2018 [27]	19.300	18.653	19.947	0.628							
21. Iranian	**17.365**	**-14.573**	**49.303**	**0.170**	**3.792**	**0.052**	**0.736**	**9.954**	**3.155**	**-33.891**	**68.620**
22. Combined effect size	16.083	12.476	19.691		310.448	0.000	0.952	13.602	3.688	9.698	22.469

Results – vitamin D mean meta analysis

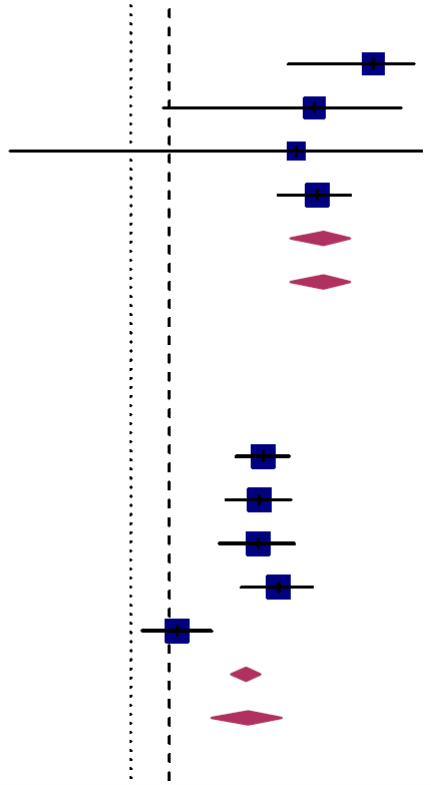


Vitamin D prevalence of insufficiency meta analysis

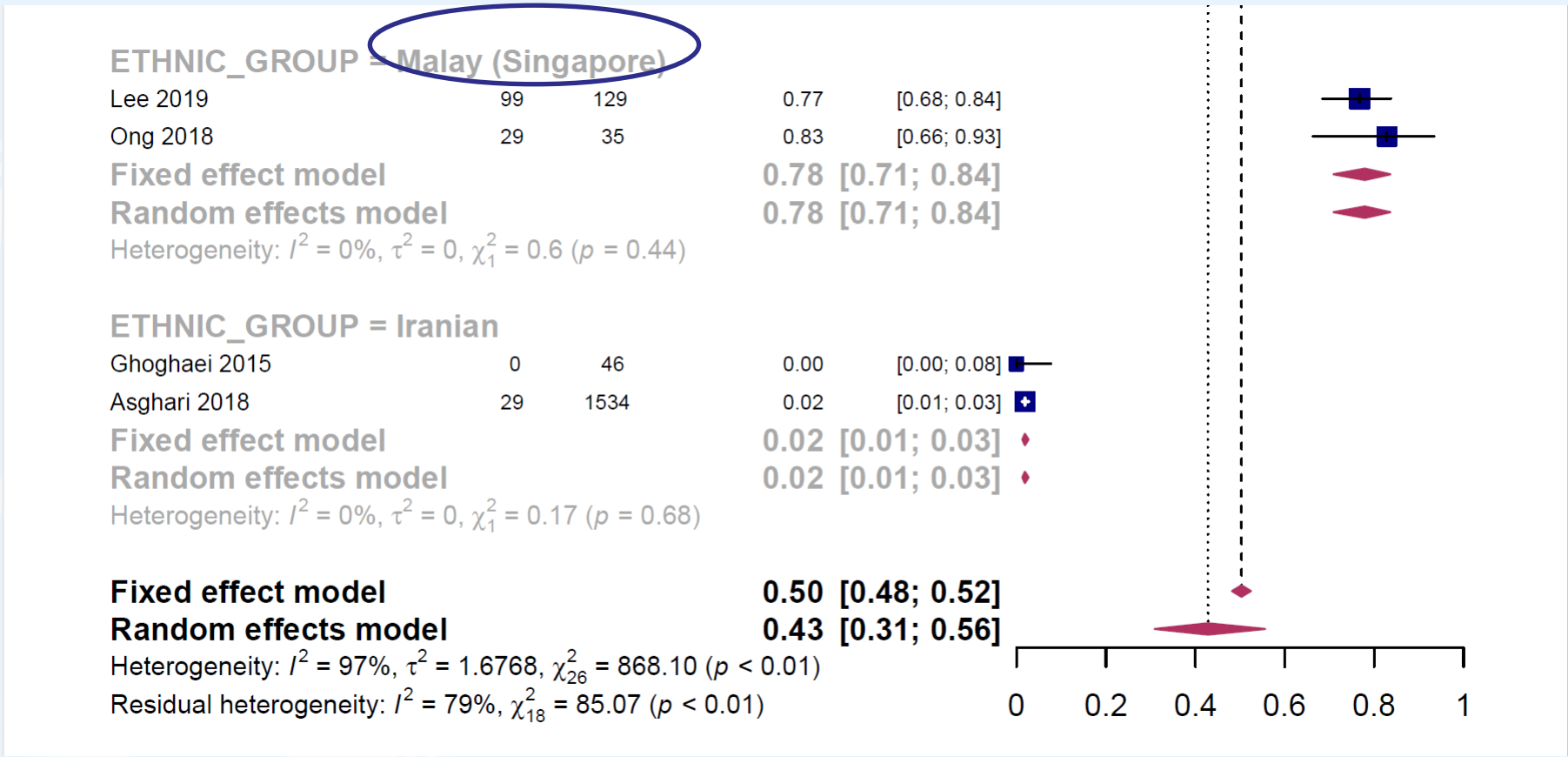


Vitamin D prevalence of insufficiency meta analysis

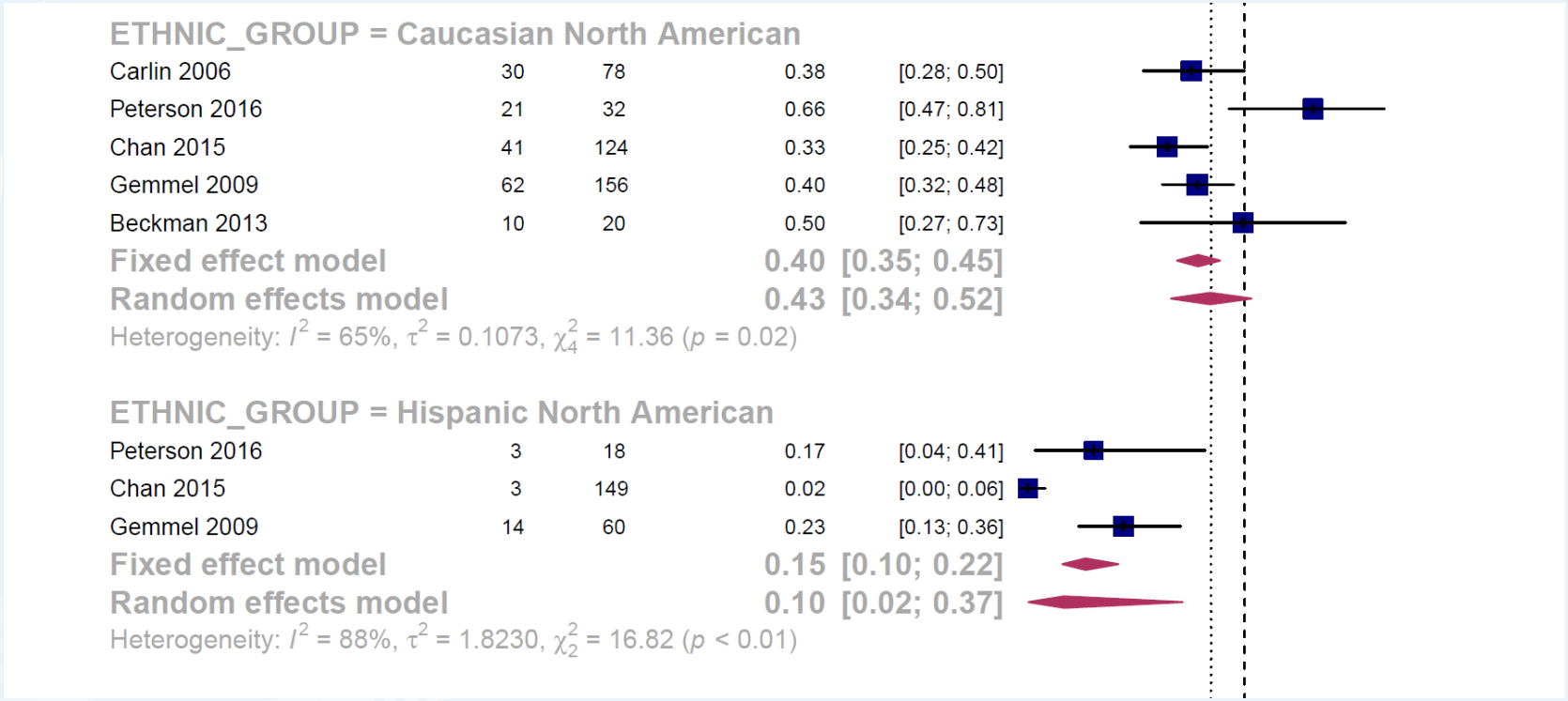
Study	Cases	Total	Prevalence	95% C.I.
ETHNIC_GROUP = African American				
Carlin 2006	27	30	0.90	[0.73; 0.98]
Peterson 2016	11	14	0.79	[0.49; 0.95]
Chan 2015	3	4	0.75	[0.19; 0.99]
Gemmel 2009	110	139	0.79	[0.71; 0.86]
Fixed effect model			**0.80**	**[0.74; 0.85]**
Random effects model			**0.80**	**[0.74; 0.85]**
Heterogeneity: I^2 = 0%, τ^2 = 0, χ^2_3 = 1.91 (p = 0.59)				
ETHNIC_GROUP = Caucasian European				
Wrzosek 2018	221	322	0.69	[0.63; 0.74]
Lefebvre 2014	152	224	0.68	[0.61; 0.74]
Moize 2011	113	167	0.68	[0.60; 0.75]
Flores 2015	126	176	0.72	[0.64; 0.78]
Flores 2010	115	222	0.52	[0.45; 0.59]
Fixed effect model			**0.65**	**[0.62; 0.68]**
Random effects model			**0.66**	**[0.59; 0.72]**
Heterogeneity: I^2 = 83%, τ^2 = 0.0985, χ^2_4 = 23.08 (p < 0.01)				



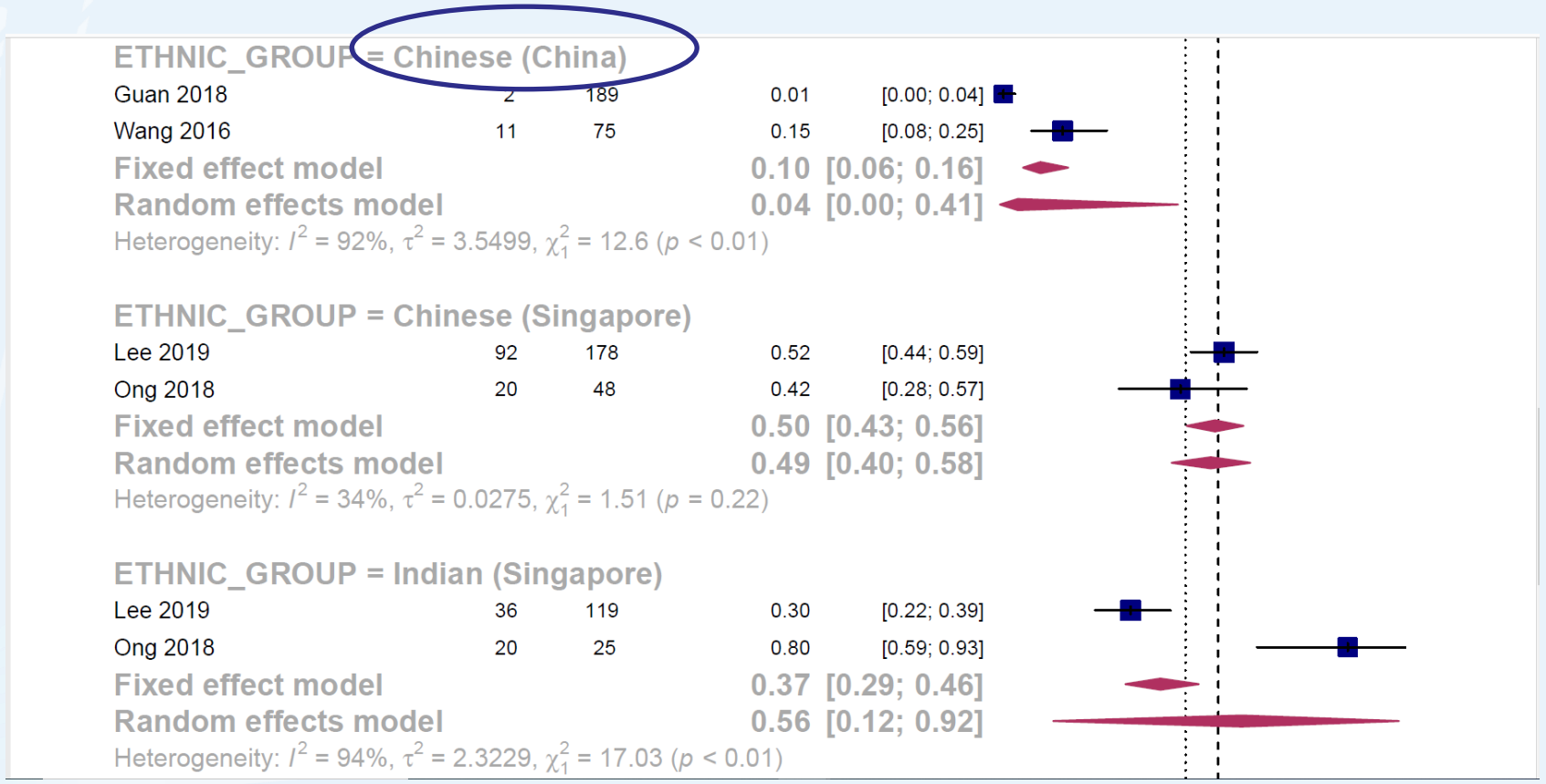
Vitamin D prevalence of insufficiency meta analysis



Vitamin D prevalence of insufficiency meta analysis



Vitamin D prevalence of insufficiency meta analysis



Other micronutrients

- Small number of studies
- Differences in cut offs used to define deficiency

Discussion – limitations

- Poor quality studies
- Heterogeneity of studies
- Factors impacting vitamin D
  - Latitude, temporal zones, skin colour, seasonal variation, sun exposure, supplementation

Discussion - implications

- Highest prevalence of vitamin D deficiency in African Americans
- Consider empiric treatment
  - Cost of testing
- High index of suspicion for vitamin D deficiency in patients with darker skin

Conclusions

- Vitamin D is the most commonly assessed micronutrient in pre op bariatric patients
- African Americans have a high burden of vitamin D insufficiency
- Most articles studied a Caucasian population
- Need for further assessment in bariatric patients from ethnic minority groups + multi-ethnic populations

Questions