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# **Dietary intakes and food sources of omega-6 and omega-3 polyunsaturated fatty acids in pregnant women living in New Zealand**

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# Abstract

**Background/Aims:** Adequate intakes of omega-6 (n-6) and omega-3 (n-3) polyunsaturated fatty acids (PUFAs) are required for fetal growth, brain development and to support a healthy pregnancy. This study aimed to investigate dietary intakes and food sources of n-6 and n-3 PUFAs in a cohort of New Zealand (NZ) pregnant women.

**Method:** Pregnant women (n=596) in their third trimester of pregnancy from throughout NZ completed an online validated FFQ to assess PUFA intakes over the past three months. Individual and combined intakes of the main PUFAs (linoleic acid, LA; alpha linolenic acid, ALA; arachidonic acid, AA; eicosapentaenoic acid, EPA; docosahexaenoic acid, DHA) were compared with dietary recommendations using frequency summary statistics.

**Results:** Estimated median [25<sup>th</sup>, 75<sup>th</sup> percentile] intakes were: 11,580 [8,840, 15,760]mg/d LA (recommended 10,000mg/d), 1,300 [790, 2,120]mg/d ALA (recommended 1,000mg/d), 90 [60, 110]mg/d AA (upper limit 800mg/d), 180 [90, 460]mg/d total n-3 LC-PUFA (EPA plus DHA) (recommended 500mg/d), 60 [30, 190]mg/d EPA (recommended 220mg/d, and 110 [50, 250]mg/d DHA (recommended 200mg/d), with 30.9% of participants consuming more than 200mg/d DHA. Participants taking PUFA supplements (19.6%) had median intakes of 370 [210, 530]mg/d DHA, with 79.5% meeting DHA recommendations. Participants taking PUFA supplements were 16.5 times more likely to meet recommendations for DHA compared to participants not taking supplements. For participants not taking PUFA supplements (80.4%), DHA intakes were 90 [50, 160]mg/d and only 19% met the recommendations. Across all women fish and seafood were the main contributors of DHA (84.8%) and EPA (82.1%) intakes, yet only 9.5% and 12.2% of women consumed canned fish or fresh/frozen fish respectively at least twice per week. Over half of participants reported intakes of poultry (63.1%) and beef (60.8%) at least twice per week. Red meats and poultry

(36.8%) alongside eggs (23.3%) were important sources of AA intakes. Fats and oils largely contributed to LA (43.2%) and ALA (55.7%) intakes.

**Conclusion:** The majority of pregnant women did not meet the recommended intakes for DHA, which may be in part due to low fish/seafood intakes. Women taking PUFA supplements were more likely to meet these recommendations. These findings highlight the need for nutrition advice on the benefits of consuming n-3 LC-PUFA rich foods such as fish/seafood during pregnancy.

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## **Abbreviations**

AA - Arachidonic Acid

AFFSA - French Food Safety Agency

AI - Adequate Intake

ALA - Alpha-Linolenic Acid

AMDR - Acceptable Macronutrient Distribution Range

Aust-PUFA FFQ - Australian Polyunsaturated Fatty Acids Food Frequency Questionnaire

CNS - Central Nervous System

DHA - Docosahexaenoic Acid

DHQ - Diet History Questionnaire

DPA - Docosapentaenoic Acid

EFA - Essential Fatty Acid

EPA - Eicosapentaenoic Acid

FABMpm - Membrane Fatty Acid Binding Proteins

FABPs - Fatty Acid Binding Proteins

FADS - Fatty Acid Desaturase

FAO & WHO - Food and Agriculture Organization of the United Nations and World Health Organization

FAT - Fatty Acid Transport Proteins

FFA - Free Fatty Acids

FFQ - Food Frequency Questionnaire

FR - Food Record

GDM - Gestational Diabetes Mellitus

GH - Gestational Hypertension

HBP - High Blood Pressure

HDL - High-Density Lipoprotein

IQ - Intelligence Quotient

ISSFAL - International Society for the Study of Fatty Acids and Lipids

IUGR - Intrauterine Growth Restriction

LA - Linoleic Acid

LC-PUFA - Long Chain Polyunsaturated Fatty Acid

LDL - Low-Density Lipoprotein.

LXR - Liver X Receptor

n-3 - Omega-3

n-6 - Omega-6

NHMRC - National Health and Medical Research Council

NNS NZ – New Zealand National Nutrition Survey

NRV - Nutrient Reference Values

NOAEL – No Observed Adverse Effect Level

NZ – New Zealand

NZ-PUFA FFQ - New Zealand Polyunsaturated Fatty Acids Food Frequency Questionnaire

PE - Preeclampsia

PERILIP - Perinatal Lipid Intake Working Group

PND - Postnatal Depression

PPARs - Peroxisome Proliferator-Activated Receptors

PTWI - Provisional Tolerable Weekly Intakes

PUFA - Polyunsaturated Fatty Acids

RCT - Randomised Control Trial

RDI - Recommended Dietary Intake

SDT - Suggested Dietary Target

SGA - Small for Gestational Age

SREBP - Sterol Regulatory Element-Binding Protein

TAGs - Triacylglycerols

UL - Upper Level of Intake

VLDL - Very Low-Density Lipoprotein