Diets within planetary boundaries: What can be achieved through dietary change alone?

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Problem

- Single environmental aspect considered
- Contrived dietary comparisons
- Dietary recommendations that are not nutritionally complete
- Footprints based on agricultural production only

Yet the evidence underpinning many widely touted recommendations about what to grow and eat is remarkably sparse and generally biased.

Putting all foods on the same table: Achieving sustainable food systems requires full accounting

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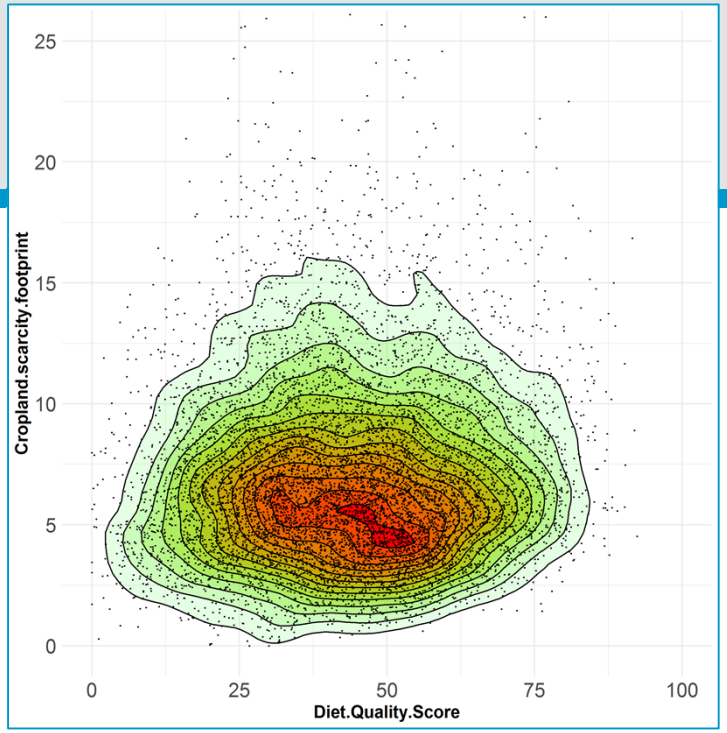
The reality of diets in Australia

- Highly varied
- Weak correlations between environmental footprints at the level of individual diets
- Individual foods score highly on some footprints and very low on others, and vice versa
- Little or no correlation between diet quality and environmental footprint



This suggests it will be a challenge to achieve multiple objectives concurrently

Footprint data for 9,341 individual Australian adult diets

- Climate footprint: https://www.mdpi.com/2072-6643/13/4/1122
- Water-scarcity footprint: https://doi.org/10.1017/S1368980021000483
- Cropland-scarcity footprint: https://www.mdpi.com/2072-6643/12/5/1212

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Weighting model based on “distance-to-target” to downscaled planetary boundaries

Footprint	Current value	Target	Reduction	Weight
Climate	3.4 kg CO2 e/person/day	0	100%	0.585
Water scarcity	433 L-e/person/day	217 L-e/person/day*	50.1%	0.294
Cropland	7.1 m2.yr-e/person/day	5.6 m2.yr-e/person/day	20.7%	0.121

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Other weighting models were developed for sensitivity analysis

Footprint	Base	ALT1	ALT2	ALT3
Climate	0.585	0.513	0.828	0.333
Water scarcity	0.294	0.401	0.000	0.333
Cropland	0.121	0.086	0.172	0.333

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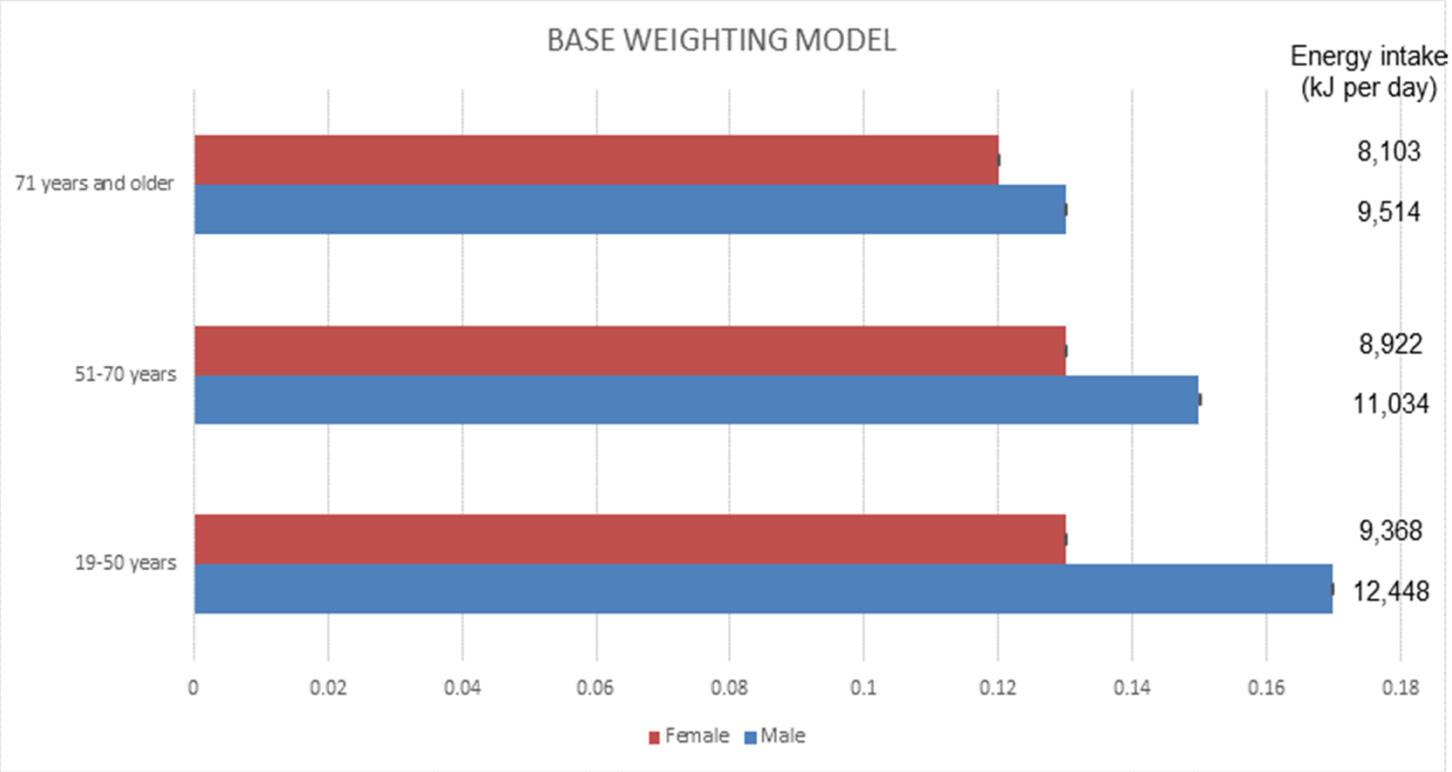
Applying the EI score to 9,341 adult diets
Average all adults 0.143



Total energy intake explained almost half the variation in EI score

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Food	Male	Female	Total
Fruit	6.5	8.2	7.4
Vegetables	5.2	6.7	6.0
Bread and cereal foods	10.1	9.6	9.9
Fresh meats and alternatives	20.5	18.6	19.5
Red meat	*9.1*	*7.8*	*8.5*
Poultry	*5.7*	*5.3*	*5.5*
Vegetarian alternatives	*2.1*	*2.2*	*2.2*
Fish and seafood	*2.0*	*2.3*	*2.1*
Pork	*1.5*	*1.1*	*1.3*
Other livestock products, such as organ meats	*<0.01*	*<0.01*	*<0.01*
Dairy foods and alternatives	11.7	12.3	12.0
Discretionary foods	31.8	26.0	28.9
Burgers, pizza, tacos, processed meats	*10.9*	*8.2*	*9.6*
Beer, wine, and other alcohol	*7.0*	*4.8*	*5.9*
Sugar sweetened beverages	*3.6*	*2.8*	*3.2*
Pastries and pies	*2.4*	*2.0*	*2.2*
Diary-based desserts, cream and butter	*2.3*	*2.0*	*2.1*
Biscuits, cakes, and waffles	*1.7*	*2.0*	*1.8*
Muesli bars, confectionary, chocolate	*1.6*	*1.9*	*1.8*
Fried potato and extruded snacks	*1.2*	*1.0*	*1.1*
…Other discretionary	*1.0*	*1.3*	*1.2*
Healthy fats and oils	0.5	0.6	0.6
Other miscellaneous foods and beverages	13.7	17.9	15.8

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Food	Current diet		Recommended diet based on current food choices	
	Servings	EI score	Servings	EI score
Fruit	1.38	0.010	2.0	0.014
Vegetables	2.47	0.007	5.5	0.017
Bread and cereal foods	4.57	0.014	6.0	0.019
Fresh meats and alternatives	2.32	0.035	2.8	0.042
Fish and seafood	*0.22*	*0.003*	*0.27*	*0.003*
Red meat	*0.66*	*0.019*	*0.79*	*0.023*
Poultry	*0.74*	*0.008*	*0.90*	*0.010*
Pork	*0.18*	*0.002*	*0.22*	*0.002*
Vegetarian alternatives	*0.51*	*0.003*	*0.61*	*0.003*
Dairy foods and alternatives	1.46	0.017	2.5	0.029
Discretionary foods	7.42	0.044	2.8	0.017
Other		0.021		0.021
Total		**0.148**		**0.158**

6.6% higher

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Food	Current diet		Recommended diet based on current food choices		Recommended diet based on HQLI food choices	
	Servings	EI score	Servings	EI score	Servings	EI score
Fruit	1.38	0.010	2.0	0.014	2.0	0.011
Vegetables	2.47	0.007	5.5	0.017	5.5	0.014
Bread and cereal foods	4.57	0.014	6.0	0.019	6.0	0.015
Fresh meats and alternatives	2.32	0.035	2.8	0.042	2.8	0.022
Fish and seafood	*0.22*	*0.003*	*0.27*	*0.003*	*0.31*	*0.003*
Red meat	*0.66*	*0.019*	*0.79*	*0.023*	*0.50*	*0.001*
Poultry	*0.74*	*0.008*	*0.90*	*0.010*	*0.98*	*0.011*
Pork	*0.18*	*0.002*	*0.22*	*0.002*	*0.22*	*0.002*
Vegetarian alternatives	*0.51*	*0.003*	*0.61*	*0.003*	*0.79*	*0.004*
Dairy foods and alternatives	1.46	0.017	2.5	0.029	2.5	0.028
Discretionary foods	7.42	0.044	2.8	0.017	2.8	0.014
Other		0.021		0.021		0.020
Total		**0.148**		**0.158**		**0.125**

6.6% higher

15.9% lower

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Key messages

1. Difficult to achieve multiple objectives simultaneously
2. Recommended diet with better food choices (best quadrant), had about 15% lower environmental impact
3. No planetary boundary goals were met
4. Serious trade-offs!!
   - 35% progress toward the climate goal
   - 28% progress towards the cropland goal
   - Water footprint goal about 26% in wrong direction
5. Larger reductions in climate footprint resulted in greater trade-offs with water

The opportunities to improve environmental impacts through dietary change are exaggerated

The greater emphasis should be on food production

Article now published:
https://www.sciencedirect.com/science/article/pii/S2352550921002098

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