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Influence of Nutritional Requirement on Fish, Meat and Poultry Consumption

Bissih Fred[1*]

[1]School of Life Science, Huzhou University, 759 Erhuan Road (E), Huzhou 313000, PR China

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***Corresponding Author:**
Bissih Fred

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Conflicts of Interest
There are no conflicts to declare.

ABSTRACT

Due to a growth in the consumption of mixed meals, it is becoming increasingly necessary to collect more exact quantitative data on specific food components. The purpose of this article is to evaluate the consumption of meat, chicken, and fish before and after the disaggregation of mixed meals, as well as the contribution of meat, poultry, and fish to energy and nutritional intakes in a representative sample of individuals.

Following the disaggregation of mixed meals, reduced estimates of red meat (9 percent), chicken (25 percent), and fish (18 percent) intakes were obtained, while greater estimates of processed meat intakes were obtained (17 percent). After disaggregation, meat/poultry/fish contributed approximately 25% of total energy intake, 49% of protein intake, 29% saturated fat intake, 26% iron intake, and 38% zinc intake, which was significantly higher than their contributions reflected in survey data containing a variety of different dishes. Children consumed 118 g of meat/poultry/fish per day, while adults consumed 162 g per day, with chicken and beef accounting for the majority of the calories consumed by both groups.

These findings give a thorough picture of meat, poultry, and fish consumption in Australia, and also highlight the need for more population studies to disaggregate reported dietary information in order to produce a more exact estimate of consumption in future years.

Keywords: NUTRITIONAL REQUIREMENT, FISH, MEAT, POULTRY, HUMAN CONSUMPTION

Introduction

Animal protein relevance

Adequate consumption of protein is essential for health and growth. Protein of animal origin is often of superior quality due to the pattern of amino acid and good digestion for humans [1]. It can improve the quality of plant proteins when mixed, but is typically poor in low-income areas, particularly among young children, the elderly and pregnant and nursing women that are increasing in demand and in whom high-quality protein encourages (bone) development and maintenance [2]. Although excessive consumption of protein has been related with increasing risk of diabetes mellitus, milk and seafood are rich sources of amino acids and taurine that benefit the metabolism of glucose and blood pressure. However, high intakes of protein rich animal foods are associated with adverse health effects and increased risk of non-communicable diseases related partly to other food

components such as saturated fatty acids and carcinogenic potentials in processed meat as well as to atherogenic methionin metabolite homocysteine [3]. However, animal proteins are particularly necessary in moderation for the health care of vulnerable people.

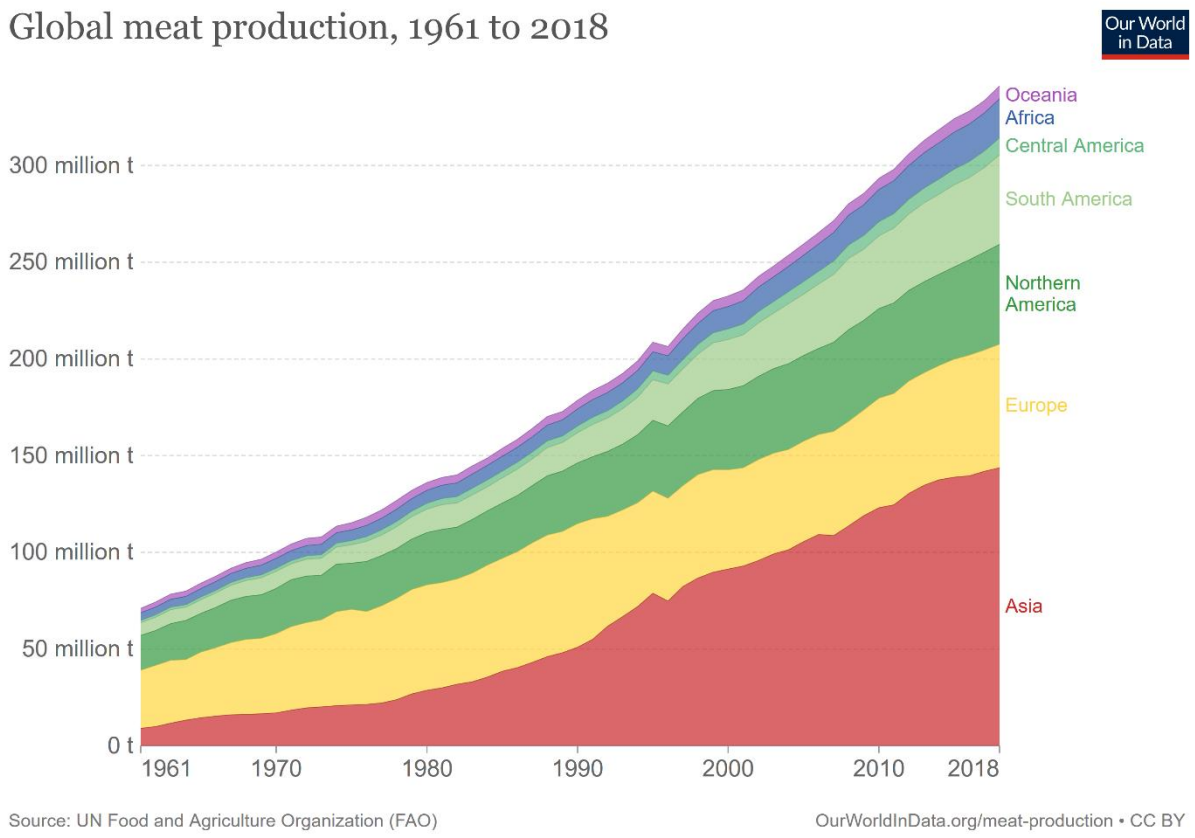
Global consumption trends of animal protein

Over the past 50 years, global meat production has risen significantly — since 1961 overall output has more than tripled. The graphic displays regionally measured worldwide meat output in tonnes[4].

Asia is the greatest producer of meat regionally and accounts for around 40%-45% of total meat output. In recent decades, this geographical distribution has altered substantially. Europe and North America were the leading meat producers in 1961, at 42% and 25%, respectively. Asia produced only 12 percent in 1961. By 2013, Europe and North America had respectively decreased to 19 and 15 percent [5].

This loss in production share occurred in absolute terms despite a major rise in production: throughout this period, Europe's meat production has about doubled, whereas North American output has grown 2,5 times. In Asia, however, output gains have been staggering: since 1961 the production of meat has grown 15 times.

Absolute gains in production in other regions have also been considerable, with production more than five times during this period in all regions (with the exception of the Caribbean which nearly quadrupled).



What nutritional values

As an ordinary consumer, you are generally confused about the nutritional worth of your animal proteins – for

example, fish are healthier than red meat. The problem can be difficult since all animal proteins have advantages and disadvantages, research might provide contradicting results, and studies can surprise us. For instance, research shows that eating white flesh chicken alone is as hazardous for you as consuming beef (6).

Still, a hierarchy of nutritional value is generally accepted when it comes to animal proteins and modest dietary adjustments may have more consequences than you realize. In a study of the Danish population, researchers concluded that Danes might earn more than 7,000 years of healthy life per year by eating the appropriate proportion of fish (12 oz per week), while substituting red and processed meat [7].

"It is crucial to emphasize that no single-size diet or meat is better per se," said Janese Laster, a District nutrition specialist. So it's crucial? "There are variances in farming techniques, therefore each individual is at various dangers and advantages from meat in the United States." In view of this, some inferences may be drawn, starting with the positive, on various types of animal protein [8].

Nutritional values does influences human consumption choices of animal protein

Enhanced dietary protein may promote cardiovascular health by helping to reduce weight loss/maintainment, improve the lipid profile, and reduce blood pressure (1–3). How to cautiously interpret research showing the health advantages of dietary protein, because increased intake of protein-rich meals generally reflect other dietary changes such as energy, nutrients, and foods, because food protein is obtained from many different foods. Increasing protein-rich meals, for example, might affect the consumption of foods (e.g., saturated fat and refined carbs) and foods (e.g. fruits, vegetables and whole grains), based on which protein sources and what they replace are increased and increased [9]. The consequences of an increased protein consumption are thus impacted by the specific protein source of the diet and the consequent replacements for macronutrients and micronutrients (and bioactives). Evidence for total protein consumption must thus take into account the source of protein that components of the diet it replaces and the nutrients and bioactives which accompany protein in the food matrix [10].

The history of dietary advice shows how different nutrients, bioactive products and foods impact health. Carbohydrates shall be categorized as refined or com-plex, and fats shall be defined as SFAs, trans-FAs, MUFAs and distinct PUFAs. Dietary proteins are also categorized according to their plant or animal origin. Current dietary standards say that the RDA of adults is 0.8 g of protein/kg body weight. The permissible range of 10–35% of total protein calories enables more freedom of meal planning according to specific needs and preferences (4, 5). An RDA for each essential amino acid is also available to supply a variety of various proteins for meals. However, no recommendations are made about protein consumption by a specific protein source and resultant substitutes for macronutrients and micronutrients (including bioactives). Evidence of total protein consumption must thus take into consideration the source of protein, which dietary components are being replaced and the nutrients and bioactives in the dietary array of the protein [11].

The evolution of dietary instructions reflects our expanding understanding of the health effects of different nutrients, bioactives and foods. Carbohydrates are categorized as refined or com present in plexes and fats are

categorised as SFAs, trans fats, MUFAs and various PUFAs. Diät proteins are also categorized according to their plant or animal origin [12]. Current Dietary Guidelines indicate that adult RDA is 0.8 g protein/kg body weight; however, the recommended 10–35 percent macronutrient distribution range for total protein calories provides for more freedom in meal planning depending on individual needs and preferences (4, 5). An RDA for each essential amino acid is also available to supply a variety of various proteins for meals. There are no recommendations, though.

Materials & methods

Subjects and dietary data collection

The 2020–21 National Nutrition and Physical Activity Survey (NNPAS) was conducted between May 2020 and June 2021 by the Australian Statistics Office (ABS). Ethics approval of the survey was obtained in 20202 by the Department of Health and Ageing Departmental Ethics Committee of the Government [16].

The NNPAS study provides information on food and nutrients from 24-hour reminiscences and on chosen national dietary habits. The NNPAS sample has been distributed across a 12-month enumeration period to take into consideration probable seasonal impacts on health and dietary parameters. The survey included a sample of about 9500 individual homes. The ABS[16] provides further details on the scope and methodology of the study. A total of 12,153 individuals were questioned face-to-face with 24-hour reminder data for the collection of food consumption. The retrieval technique followed the 5-step Automatic Multi-pass method, which navigates the interviewer through the retrieval process, asks standardized questions and provides answers for various meals and beverages[17]. The surveyors utilize an example photo and measurement food model booklet to help respondents describe the amount of food and beverages consumed[16]. A second 24-hour reminder was obtained from a sub-sample but for this secondary analysis only data from the initial reminder were utilized, with weighted findings reflecting the population [16].

The initial release of nutrition data in the NNPAS survey reported data on food and nutrition intakes on the basis of the Australia and New Zealand (FSANZ) food categorization system[16]. The approach classifies food as main, sub-important, minor and sub-minor food categories with a hierarchical level. The main food groups for meat and poultry were "meat, poultry and game products and dishes," as well as for fish and meats and meat products and dishes, which contained individually registered meat/pultry and fish products, and meats/poultry/fish products and dishes in which meat/poultry/fish were a key component of the dish [9]. For dishes in which meat/poultry/fish were a small component (e.g., pie, lasagne or pizza where grain/cereal were the most significant weighing components of the recipe), meat/poultry/fish consumption was not taken, and in these dishes the weight and nutrients of meat/ poultry/fish were considered as other food groups (e.g. 'cereal products'). Total meat/pultry/fish intake included all recorded items and mixed foods where the main ingredients of meat/ poultry/fish (but other ingredients of the mixed meal includes and excludes meat/pultry/fish from meals where the ingredients of meat/pultry/fish were a minor ingredient).

Table 1. Categorisation of meat/poultry/fish

Category	Type	Common examples
Red meat	Beef	Beef, veal, all cuts/mince
	Lamb	Lamb, mutton, all cuts/mince
	Pork	Pork, all cuts/mince
	Kangaroo	Kangaroo, all cuts/mince
	Game meat	Goat, rabbit, all cuts
Poultry	Chicken	Chicken, all cuts/mince
	Other	Duck, turkey, quail, all cuts/mince
Organ/offal meat	Offal/organ	Liver, kidney, heart
Fish/seafood	Finfish	Fish fillets, whole fish, fish pieces
	Seafood	Prawns, oysters, mussels, crabs
	Canned fish	Canned tuna, canned, salmon, sardines
	Fish/seafood products	Smoked salmon, fish cake, seafood sticks
Processed meat	Sausage^	Beef/pork/chicken sausage, BBQ sausage
	Ham	All ham types
	Bacon	All bacon types
	Salami	Salami, cabanossi
	Luncheon meat	Corned beef, devon, smoked turkey
	Other	Frankfurters, spam, beef jerky

^ Sausage applies to traditional Australian sausages described in the Food Standards Code Standard 2.2.1 as 'Sausage is meat that is minced or comminuted meat or a combination thereof which may be combined with other foods encased or formed into discrete units but does not include meat formed or joined into the semblance of meat'.

Table 2. Mean per-capita intake of meat/poultry/fish (g) by socio-economic category after disaggregation of mixed dishes

	Socio-economic category - SEIFA quintiles				
Male	**1st**	**2nd**	**3rd**	**4th**	**5th**
Red meat	**69.6**	**66.1**	**72.8**	**70.3**	**64.8**
Beef	49.5	47.2	54.0	47.0	43.2
Lamb	10.2	10.5	10.4	13.4	13.6
Pork	9.3	8.1	8.2	9.1	7.5
Kangaroo	0.3	0.0	0.2	0.8	0.5
Game meat	0.3	0.3	0.1	0.0	0.1
Poultry	**49.6**	**56.0**	**50.8**	**53.0**	**53.7**
Fish/seafood^	**19.9**	**21.2**	**19.7**	**21.0**	**25.3**
Fish^	12.5	12.5	11.2	12.1	13.2
Seafood^	2.6	3.3	2.6	3.8	5.1
Canned fish^	4.8	5.4	5.9	5.1	7.0
Organ/offal meat	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**
Processed meat	**39.3**	**32.4**	**37.0**	**32.6**	**33.7**
Total meat/poultry/fish	**178.4**	**175.7**	**180.4**	**177.0**	**177.6**
Female	**1st**	**2nd**	**3rd**	**4th**	**5th**
Red meat	44.6	52.4	46.7	47.1	44.0

Beef	30.9	37.5	33.5	32.1	31.0
Lamb	6.7	8.5	6.5	8.7	8.3
Pork	6.6	5.9	6.0	6.2	4.7
Kangaroo	0.0	0.5	0.6	0.0	0.1
Game meat	0.2	0.0	0.1	0.1	0.0
Poultry	**41.3**	**36.8**	**42.7**	**39.5**	**41.8**
Fish/seafood^	**16.8**	**18.5**	**20.5**	**18.2**	**21.5**
Fish^	9.1	9.9	9.8	8.5	10.9
Seafood	3.4	3.2	4.0	3.5	3.5
Canned fish^	4.3	5.4	6.7	6.2	7.1
Organ/offal meat	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**
Processed meat	**22.9**	**20.9**	**22.9**	**26.0**	**20.5**
Total Meat/poultry/fish	**125.6**	**128.7**	**132.9**	**130.7**	**127.9**

^P-value <0.05 for different across SEIFA category from Analysis of Variance

Table 3. Daily energy and key nutrient intakes from meat/poultry/fish consumption – comparison before and after disaggregation of mixed dishes

	Before disaggregation[+]	After disaggregation [§]	Difference (%)
Red meat			
Energy (Kj)	586	931	-37.0*
Protein (g)	13.2	18.0	-26.7*
Total fat (g)	5.8	13.8	-58.0*
Monounsaturated fat (g)	2.6	6.9	-27.7*
Polyunsaturated fat (g)	0.6	3.3	-10.9*
Saturated fat (g)	2.0	3.6	-44.4*
Long-chain omega 3 fatty acids (mg)	36.1	41.1	-12.2*
Iron (mg)	1.1	1.5	-26.7*
Zinc (mg)	2.2	2.7	-18.5*
Poultry			
Energy (Kj)	457	584	-21.7*
Protein (g)	11.6	13.4	-13.4*
Total fat (g)	5.4	10.1	-46.5*
Monounsaturated fat (g)	2.5	4.7	-46.8*
Polyunsaturated fat (g)	0.9	3.6	-69.2*
Saturated fat (g)	1.6	1.8	-11.1*
Long-chain omega 3 fatty acids (mg)	11.0	12.8	-14.1*
Iron (mg)	0.4	0.5	-20.0*
Zinc (mg)	0.6	0.7	-14.3*
Fish/seafood			
Energy (Kj)	197	228	-13.7*
Protein (g)	5.2	5.0	4.0
Total fat (g)	2.4	3.9	-38.5*
Monounsaturated fat (g)	1.0	2.1	-52.3*
Polyunsaturated fat (g)	0.7	1.2	-41.7*
Saturated fat (g)	0.5	0.6	-16.7*
Long-chain omega 3 fatty acids (mg)	138.6	131.5	5.4
Iron (mg)	0.2	0.2	0.0
Zinc (mg)	0.3	0.3	0.0
Processed meat			
Energy (Kj)	205	370	-44.7*

Protein (g)	5.0	6.0	-16.7*
Total fat (g)	3.4	5.6	-39.3*
Monounsaturated fat (g)	1.5	2.9	-48.3*
Polyunsaturated fat (g)	0.2	0.5	-60*
Saturated fat (g)	1.4	2.2	-36.4*
Long-chain omega 3 fatty acids (mg)	11.4	14.1	-19.1*
Iron (mg)	0.3	0.5	-40.0*
Zinc (mg)	0.5	0.6	-16.7*
Total meat/poultry/fish			
Energy (Kj)	1445	2114	-31.6*
Protein (g)	35.0	42.4	-17.5*
Total fat (g)	17.0	33.4	-49.1*
Monounsaturated fat (g)	7.6	16.6	-54.2*
Polyunsaturated fat (g)	2.4	8.6	-72.1*
Saturated fat (g)	5.5	8.2	-32.9*
Long-chain omega 3 fatty acids (mg)	197.1	199.5	-1.2
Iron (mg)	2.0	2.7	-25.9*
Zinc (mg)	3.6	4.3	-16.3*

* P-value < 0.05 from independent t-test

[+]Values refer to the mass of all individually recorded items, and the total mass of mixed dishes where meat/poultry/fish was a major component but excludes mass from dishes where meat/poultry/fish was a minor component

[§]Values refer to the mass of the meat/poultry/fish components from all individually recorded items and from mixed dishes where meat/poultry/fish was a major or minor component

Data and statistical analysis

Total meat consumption was estimated before (using the survey categorization) disaggregation and per capita intake was compared by paired sample t-tests. Descriptive statistics were used to report the proportions of total and specific categories of meat, poultry and fishery, per capita (average intake among all respondents) and per consumer (average intake among consumers alone). Intake per capita was provided as medium and standard deviation (SD) as gram/day. Median intake, 25th and 75th percentiles per customer have been recorded. Where suitable to evaluate correlations between meat intake and gender, age, and socioeconomic groups, the testing of chi-square, ANOVA or non-parametric (Kruskal-Wallis) was conducted.

Analysis on meat/poultry/fish consumption has been presented in terms of gender, the age group as defined by NNPAS and the socio-economical categories (based on the Social and economic Disadvantage Index for Areas (SEIFA) where the first SEIFA quintile represents the most disadvantageous areas)[9]. Statistical analysis was conducted using Windows 22.0 program SPSS (SPSS Inc., Chicago, IL, USA). A P value of <0.05 was statistically significant for all tests.

Result and discussion

Meat/poultry/fish disaggregation effect from meat products and mixed meals

Table 1 compares the mean daily intakes of consumption of meat/poultry/fish according to an estimate of

utilizing the study classifications when all mixed dishes are broken down by ingredients and shows a difference of 11.0% in overall consumption. The intakes of meat/poultry/fish were lower after disintegration than those reported in the wider categories of the survey. Daily intakes of red meats were 9.1% lower, chicken 25.3% lower and fish/seafood 17.6% lower, compared to 17.4% higher intakes of processed meat using the disaggregated approach.

	Before disaggregation mean (SD)[a]	**After disaggregation mean (SD)[b]**	**Difference (%)**
Red meat	62.2 (90.4)	57.0 (88.4)	9.1*
Beef, cut or mince	18.7 (77.3)	17.8 (58.0)	
Mixed dishes where beef is the major component	22.0 (78.0)	10.2 (43.5)	
Mixed dishes where beef is the minor component[c]	-	12.0 (32.0)	
Lamb, cut or mince	7.2 (37.0)	7.2 (37.0)	
Mixed dishes where lamb is the major component	4.9 (20.3)	1.8 (18.0)	
Mixed dishes where lamb is the minor component[c]	-	0.6 (8.2)	
Pork, cut or mince	6.0 (30.1)	5.1 (31.1)	
Mixed dishes where pork is the major component	2.6 (24.7)	1.1 (13.2)	
Mixed dishes where pork is the minor component[c]	-	0.8 (7.0)	
Kangaroo, cut or mince	0.2 (21.2)	0.2 (15.0)	
Game meat, cut or mince	0.1 (14.1)	0.1 (6.9)	
Poultry	57.9 (96.0)	46.2 (86.7)	25.3*
Chicken, cut or mince	24.3 (86.7)	22.7 (69.5)	
Other poultry, cut or mince	1.3 (12.3)	1.1 (18.1)	
Mixed dishes where poultry is the major component	32.3 (45.1)	16.2 (53.7)	
Mixed dishes where poultry is the minor component[c]	-	6.2 (7.3)	
Fish/seafood	26.0 (62.2)	22.1 (60.5)	17.6*
Finfish	6.5 (36.7)	6.5 (36.7)	
Crustacea and molluscs	1.3 (17.8)	1.3 (17.8)	
Packed fish and seafood	4.8 (23.7)	4.6 (23.7)	
Fish and seafood products	7.7 (32.3)	5.5 (32.3)	
Mixed dishes with fish or seafood as the major component	5.3 (18.6)	2.0 (18.6)	
Mixed dishes with fish or seafood as the minor component[c]	-	1.8 (19.5)	
Processed meat	21.9 (87.5)	26.5 (58.0)	−17.4*
Sausages, frankfurts and saveloy	10.2 (45.7)	10.2 (45.7)	
Bacon	2.8 (23.0)	2.8 (23.0)	

	Before disaggregation mean (SD)[a]	After disaggregation mean (SD)[b]	Difference (%)
Ham	3.4 (19.9)	3.4 (19.9)	
Fermented, comminuted meats	1.2 (11.5)	1.2 (11.5)	
Processed delicatessen meat	3.1 (23.0)	3.1 (23.0)	
Mixed dishes where processed meat is the major component	0.5 (5.9)	0.3 (5.9)	
Mixed dishes where processed meat is the minor component[c]	-	4.8 (11.0)	
Total meat/poultry/fish	168.2 (189.4)	152.0 (128.9)	11.0*

1. *P-value <0.05 from independent t-test

Classification results disaggregated: proportion consumed

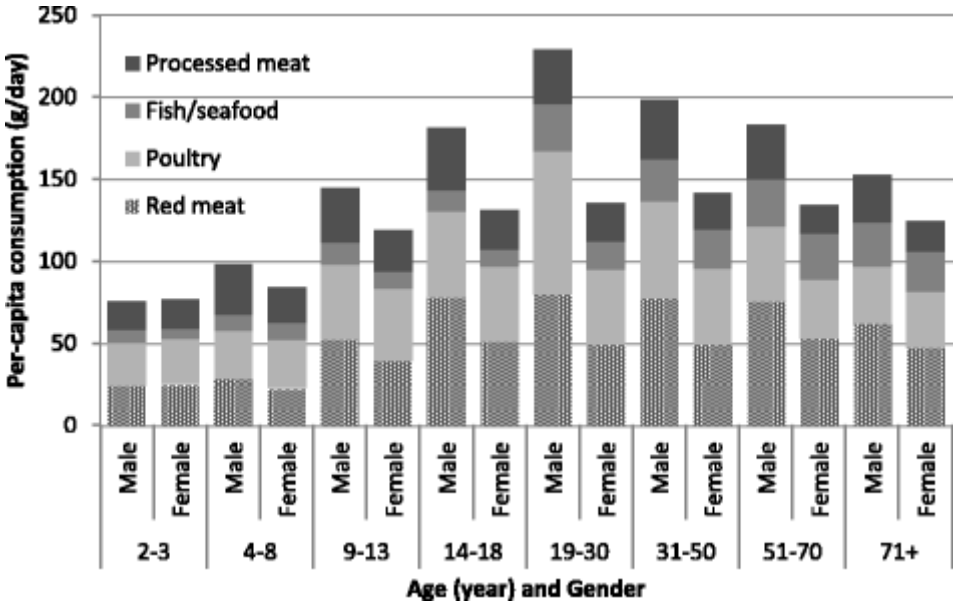
Approximately 92.6 percent of men and 90.1 percent of women reported consuming meat/poultry/fish on the studied day following disaggregating all meat items and mixed meals (Table 2) and statistically significant gender gender difference (P < 0.01). The proportion of consumption of meat/poultry/fish was 90.4% for children and 91.5% for adults. 48.6 percent of participants had red meat with beef being the most commonly reported kind (males 41.8 percent , females 34.7 percent). 37.7% of participants eat poultry mostly as chicken (males 36.8 percent , females 36.9 percent). Fish/water food was ingested by 21.4% of the individuals (finfish 9.7%, seafood 5.4%, tinned fish 7.8%, and seafood products 1.6%). 37.8% of individuals ingested processed meat with greater frequencies reported by males as well as females (41.4% versus 34.6%, P<0.01). Ham (males 19.4 percent, ladies 16.8 percent), bacon (males 15.3 percent, females 12.4 percent) and sausage were the most often reported types of processed meats used (males 8.5 percent , females 5.8 percent).

Proportion (%)	Total	Total male	Total female	Children			Adults		
				Total	Male	Female	Total	Male	Female
Red meat	48.6	52.4	45.2^	46.0	47.4	44.6^	49.4	54.1	45.4^
Beef	38.0	41.8	34.7^	38.3	39.9	36.6^	38.0	42.4	34.2^
Lamb	8.1	8.6	7.6^	6.1	6.6	5.6	8.7	9.3	8.2^
Pork	7.5	8.0	7.0	5.6	5.4	5.9	8.0	8.9	7.3^
Kangaroo	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.3
Game meat	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.2	0.1
Poultry	37.7	37.7	37.7	38.4	37.5	39.4	37.5	37.8	37.2^
Chicken	36.8	36.8	36.9	38.0	37.1	38.9	36.5	36.6	36.4
Other	1.3	1.4	1.1	0.7	0.6	0.9	1.4	1.6	1.2
Organ/offal meat	0.1	0.2	0.1	0.1	0.1	0.0	0.1	0.2	0.1
Fish/seafood	21.4	20.3	22.4^	14.3	13.7	14.9	23.5	22.5	24.4^
Finfish	9.7	10.0	9.4	7.1	6.9	7.3	10.4	11.0	10.0
Seafood	5.4	5.1	5.7	3.1	3.0	3.2	6.1	5.8	6.3
Canned fish	7.8	7.1	8.5^	4.6	4.2	5.0	8.8	8.0	9.5^
Fish/seafood products	1.6	1.4	1.7	0.7	0.5	0.9	1.8	1.6	2.0

Proportion (%)	Total	Total male	Total female	Children			Adults		
				Total	Male	Female	Total	Male	Female
Processed meat	37.8	41.4	34.6^	42.9	44.7	41.1^	36.2	40.4	32.8^
Sausage	7.1	8.5	5.8^	9.0	9.9	8.2^	6.5	8.1	5.1^
Ham	18.0	19.4	16.8^	21.1	22.1	20.0^	17.1	18.6	15.9^
Bacon	13.8	15.3	12.4^	14.3	15.4	13.1^	13.6	15.3	12.2^
Salami	5.7	6.7	4.8^	6.3	7.3	5.2^	5.5	6.4	4.6^
Luncheon meat	3.7	4.2	3.4	4.0	4.1	3.9	3.7	4.3	3.3
Other	1.9	2.2	1.5	3.3	4.3	2.2^	1.4	1.5	1.3
Total meat/poultry/fish	91.3	92.6	90.1^	90.4	90.8	90.0^	91.5	93.2	90.1^

1. ^ *P*-value <0.05 for gender difference from Chi-square test

The meat/poultry/fish type with the highest per-capita intake was chicken (males 50.8 g/day, females 39.2 g/day), followed by beef (males 48.0 g/day, females 33.0 g/day), finfish (males 12.3 g/day, females 9.7 g/day), sausage (males 13.4 g/day, females 7.4 g/day), and lamb (males 11.7 g/day, females 7.7 g/day) (Table 3). The lowest intake per-capita was game meats and organ meats (<1.0 g/day). The mean per-capita intake of all meat/poultry/fish types was greater for males than females ($P < 0.01$), except canned fish and fish/seafood products. Adult males aged between 19 and 30 years were the highest consumers of meat/poultry/fish, and males aged 14–70 years were the highest red meat consumers (Fig. 1).



According to the statistics, over 90% reported consuming meat/poultry/fish the day before the interview, with red meat (e.g. beef, lamb, pork) eaten by about half, with two-fifths consuming poultry and processed meat, and one-fifth of the population eating fish and shellfish. Each capita data showed a total consumption of meat/oxidation/fish of 152 g per day (118 g for children and 162 g for adults). The biggest contribution type was red meat (beef, lamb and pork) (38%), followed by poultery (30%), processed meat (17%) and fish/seafood

(15 percent). Beef was the most popular form of meat in the red meat category, followed by lamb and swine while kangaroo and game meat were consumed in modest quantities. In the poultry category, chicken was the primary meat type and only less than 2 percent of other meats such as duck, turkey and quail. Finfish and tinned fish were the greatest contributors in the category of fish/seafood. The intake of organ and offal meat was minimal. In the category of processed meat, sausage followed by ham and bacon contributed the most to the consumption per capita. Overall, chicken was the most favored form of meat for children and adults of all ages.

Because of methodological variations the comparison of intakes per capita to other surveys is difficult. As has been done in this research, earlier analyzes of Australian national surveys on nutrition do not disaggregate all meat components from mixed foods [2, 28]. Our data may be compared with data from the United Kingdom (UK) and the U.S. (US). In the United Kingdom, an average daily meal/poultry/fish intake of 144–173 g was reported in men and 100–117 g was reported in women aged 36-64 years[12] contrasted to our findings, which were 193 g for adult men and 136 g for adult women. Higher intakes were reported in the US for adults in 2004 at 255–281 g per day[29].

Red meat intake was calculated at 75 g and 62 g per day, respectively, for adults men and females. If these average intakes are typical of daily intakes, a total weekly intake of red meat may be calculated at 525 g for men and 430 g for women. The Red Meat Consumption Recommendation for Australian adults is established at 455 g/week, based on both fulfilling nutritional needs and limiting the use of excessive meats due to elevated risks for colon cancer (>700 g red meat cooked/weekly)[7]. Although the present intakes are around the recommended consumption of women and considerably higher for males, the percentage of excess red meat intakes consumed consistently cannot be estimated properly from one or two days' records [30, 31].

References

1. Baghurst K. Red meat consumption in Australia: intakes, contributions to nutrient intake and associated dietary patterns. Eur J Cancer Prev. 1999;8(3):185–91.
2. Bowen J, Baird D, Syrette J, Noakes M, Baghurst K. Consumption of beef/veal/lamb in Australian children: Intake, nutrient contribution and comparison with other meat, poultry and fish categories. Nutr Diet. 2012;69:1–16.
3. Hayley A, Zinkiewicz L, Hardiman K. Values, attitudes, and frequency of meat consumption. Predicting meat-reduced diet in Australians. Appetite. 2015;84:98–106.
4. Williams P, Droulez V. Australian red meat consumption - implications of changes over 20 years on nutrient composition. Food Aust. 2010;62(3):87–94.
5. Wong L, Selvanathan E A, Selvanathan S, Changing Pattern of Meat Consumption in Australia. In: Griffith Business School Reports. Griffith University. 2013. https://www.murdoch.edu.au/School-of-Business-

andGovernance/_document/Australian-Conference-of-Economists/Changingpattern-of-meat-consumption-in-Australia.pdf. Accessed 24 Apr 2017.

6. National Health and Medical Research Council. Australian Guide to Healthy Eating. Canberra: National Health and Medical Research Council; 2013.

7. National Health and Medical Research Council: Eat for health - Educator guide. In. Canberra: National health and Medical Research Council; 2013. 8. National Health and Medical Research Council. A modelling system to inform the revision of the Australian Guide to Healthy Eating. In. Council NHaMR, editor. Canberra: Commonwealth of Australia; 2011.

9. Australian Bureau of Statistics. Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011–12. In: 2011–12 National Nutrition and Physical Activity Survey. Canberra: Australian Bureau of Statistics; 2014.

10. Sui Z, Raubenheimer D, Cunningham J, Rangan A. Changes in Meat/Poultry/ Fish Consumption in Australia: From 1995 to 2011-2012. Nutrients. 2016; 8(12):753.

11. Food Standards Australia New Zealand. Australian Food, Supplement and Nutrient Database (AUSNUT). Canberra: Food Standards Australia New Zealand; 2014

12. Pot GK, Prynne CJ, Almoosawi S, Kuh D, Stephen AA. Trends in food consumption over 30 years: evidence from a British birth cohort. Eur J Clin Nutr. 2014;69(7):817–23. 13. National Health and Medical Research Council. Australian Dietary Guidelines. In: Eat for health. Canberra: National health and Medical Research Council; 2013. 14. Daniel CR, Cross AJ, Koebnick C, Sinha R. Trends in meat consumption in the USA. Public Health Nutr. 2011;14(4):575–83. 15. Henchion M, McCarthy M, Resconi VC, Troy D. Meat consumption: trends and quality matters. Meat Sci. 2014;98(3):561–8. 16. Australian Bureau of Statistics. Australian Health Survey: User's Guide, 2011–13. Canberra: Australian Government Publishing Service, Australian Bureau of Statistics; 2013. 17. Moshfegh AJ, Rhodes DG, Baer DJ, Murayi T, Clemens JC, Rumpler WV, et al. The US Department of Agriculture Automated Multiple-Pass Method reduces bias in the collection of energy intakes. Am J Clin Nutr. 2008;88(2):324–32.

18. Food Standards Australia and New Zealand (FSANZ). Australian Food Supplement and Nutrient Database: Food Recipe File. http://www. foodstandards.gov.au/science/monitoringnutrients/ausnut/ausnutdatafiles/ Pages/foodrecipe.aspx. Accessed 24 Apr 2017. 19. Food Standards Australia and New Zealand (FSANZ). Development of additional nutrient profiles for foods and beverages consumed in the NNPAS. http://www.foodstandards.gov.au/science/monitoringnutrients/ ausnut/foodnutrient/Pages/developnutrientprofiles.aspx. Accessed 24 Apr 2017.

20. Cosgrove M, Flynn A, Kiely M. Impact of disaggregation of composite foods on estimates of intakes of meat and meat products in Irish adults. Public Health Nutr. 2005;8(3):327–37.

21. Prynne CJ, Wagemakers JJ, Stephen AM, Wadsworth ME. Meat consumption after disaggregation of meat dishes in a cohort of British adults in 1989 and 1999 in relation to diet quality. Eur J Clin Nutr. 2009;63(5):660–6. 22. Food and Argriculture Organisation of the United States (FAO). Food composition study guide. http://www.fao.org/infoods/infoods/training/ study-guide-presentations/en/. Accessed 24 Apr 2017.

23. Engeset D, Braaten T, Teucher B, Kuhn T, Bueno-de-Mesquita HB, Leenders M, et al. Fish consumption and mortality in the European Prospective Investigation into Cancer and Nutrition cohort. Eur J Epidemiol. 2015;30(1):57–70.

24. World Health Organization (WHO). Q&A on the carcinogenicity of the consumption of red meat and processed meat. http://www.who.int/ features/qa/cancer-red-meat/en/. Accessed

24 Apr 2017.

25. Fitt E, Mak TN, Stephen AM, Prynne C, Roberts C, Swan G, et al. Disaggregating composite food codes in the UK National Diet and Nutrition Survey food composition databank. Eur J Clin Nutr. 2010;64(Suppl 3):S32–6.

26. Cosgrove M, Flynn A, Kiely M. Consumption of red meat, white meat and processed meat in Irish adults in relation to dietary quality. Br J Nutr. 2005;93(6):933–42.

27. Faber M, Wenhold FA, Macintyre UE, Wentzel-Viljoen E, Steyn NP, Oldewage-Theron WH. Presentation and interpretation of food intake data: factors affecting comparability across studies. Nutrition. 2013;29(11–12):1286–92.

28. Australian Bureau of Statistics. National Nutrition Survey: Foods Eaten Australia 1995. Canberra: Australian Bureau of Statistics; 1999.

29. Wang Y, Beydoun MA, Caballero B, Gary TL, Lawrence R. Trends and correlates in meat consumption patterns in the US adult population. Public Health Nutr. 2010;13(9):1333–45.

30. Souverein OW, Dekkers AL, Geelen A, Haubrock J, de Vries JH, Ocke MC, et al. Boeing H, van 't Veer P, Consortium E: Comparing four methods to estimate usual intake distributions. Eur J Clin Nutr. 2011;65(Suppl 1):S92–101.

31. Tooze JA, Midthune D, Dodd KW, Freedman LS, Krebs-Smith SM, Subar AF, et al. A new statistical method for estimating the usual intake of episodically consumed foods with application to their distribution. J Am Diet Assoc. 2006;106(10):1575–87.

32. Meyer BJ, Kolanu N, Griffiths DA, Grounds B, Howe PRC, Kreis IA. Food groups and fatty acids associated with self-reported depression: An analysis from the Australian National Nutrition and Health Surveys. Nutrition. 2013;29(7–8):1042–7. 33. Rahmawaty S, Charlton K, Lyons-Wall P, Meyer BJ. Dietary Intake and Food Sources of EPA, DPA and DHA in Australian Children. Lipids. 2013;48(9):869–77. 34. Nolan-Clark DJ, Neale EP, Charlton KE. Processed pork is the most frequently consumed type of pork in a survey of Australian children. Nutr Res. 2013;33(11):913–21.