

Diet quality and the factors that influence nutrient intake in teenage girls

Laura Weston

December 2014

Abstract Prior work has found that teenage girls are less likely to meet recommended food and nutrient intakes than other age and sex groups. For example, only 8% of girls in this age group meet the '5-a-day' recommendation for fruit and vegetable consumption; and substantial proportions of teenage girls have intakes below the lower reference nutrient intake for vitamins and minerals. To date work on child and adolescent diet has typically focused on particular aspects of diet such as iron intake with little exploration of the factors that are associated with overall diet quality. This paper seeks to identify factors, both positive and negative, that affect the diet quality of teenage girls aged 11-18 years, using data from the National Diet and Nutrition Survey (NDND). Firstly a diet quality index (DQI) is developed - this is a composite measure of diet quality which provides a summary measure of participants' overall diets, based on UK dietary recommendations for this age/sex group. A high overall DQI score indicates a good diet and a low DQI score indicates a poorer diet. We then go on to examine influences on good and poor diets - for instance assessing the importance of household composition, household income, presence of long-term illness, mother's employment, physical activity level (if this is available), cigarette and alcohol use, and whether they eat school dinners.

Speaker Laura Weston, National Diet and Nutrition Survey Researcher, NatGen Social Research

Notes ICLS hosted a policy seminar on Sleep & Health at UCL on 2 December 2014. The seminar was chaired by Richard Bartholomew, (former), Chief Research Officer, Children, Young People and Families Directorate, Department for Education and the presentations co-ordinated by Professor Yvonne Kelly, Associate Director ICLS. Transcripts from this event, including this paper, have been made available via the ICLS Occasional Paper Series. This series allows all (those who were or were not able to attend) to read an account of the presentation. Other papers in the series include:

OP15.1 Why are early adolescents from poor families at increased risk of overweight and obesity? Amanda Sacker, Professor of Lifecourse Studies at UCL and Director of ICLS.

OP 15.2 Who are the 11 year old drinkers? Yvonne Kelly, Professor of Epidemiology and ICLS Associate Director.

OP15.4 Stress resilience and inflammation in adolescence predict poor mental and physical health in middle-aged men. Scott Montgomery, Professor of Clinical Epidemiology, ICLS, Örebro University Hospital and Karolinska Institute, Sweden



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Diet quality and the factors that influence nutrient intake in teenage girls

Laura Weston, December 2014

SLIDE 1

I'm Laura Weston and I'm a researcher at NatCen Social Research and I work on the National Diet and Nutrition Survey which is a rolling programme and a cross-sectional survey so it's ongoing but it's not longitudinal, we have a cross sample every year. And I did some secondary analysis with the help of some academics at MRCH&R on the diet quality of adolescent girls and the factors that influence their diet at an early age.



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Diet quality of adolescent girls

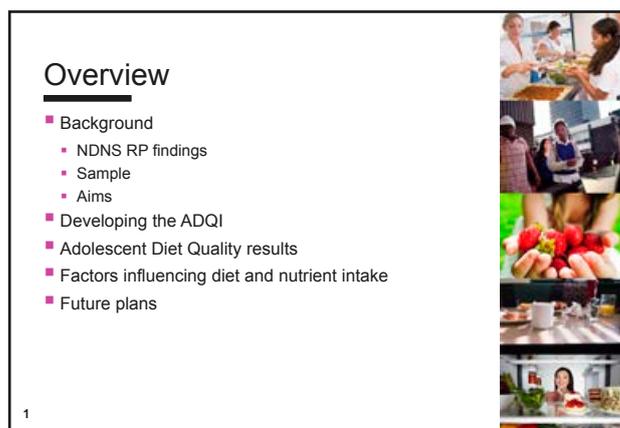
Factors influencing nutrient intake in teenage girls in the NDNS RP

Tuesday, 13 January 2015

The slide features a pink background with the NatCen logo and title. On the right side, there is a vertical strip of five small images: a woman preparing food, a woman sitting at a table, a close-up of fresh vegetables, a kitchen counter with various items, and a woman in a kitchen.

SLIDE 2

We had two main research questions and they were firstly to see whether parents drinking and friends drinking were influential in terms of drinking among eleven year olds, and secondly to try and look at these elements of what's going on in the family e.g. family relationships and parental supervision on the one hand, and knowledge and attitudes of the eleven year olds towards alcohol, their expectancies towards alcohol e.g. whether they have positive expectations or negative expectations and their awareness of harm due to drinking. We wanted to look at those factors in relation to the likelihood



Overview

- Background
 - NDNS RP findings
 - Sample
 - Aims
- Developing the ADQI
- Adolescent Diet Quality results
- Factors influencing diet and nutrient intake
- Future plans

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The slide features a white background with the title 'Overview' and a bulleted list of topics. On the right side, there is a vertical strip of five small images, identical to the ones on Slide 1.

of eleven year olds drinking as well as factoring all these things into a multivariable analysis.

SLIDE 3

Background

1.

SLIDE 4

So we know from the National Diet and Nutrition Survey - the last report has just been archived last July for years one to four - we know that teenage girls have pretty much the poorest diet in the whole sample which Yvonne mentioned earlier rated from one and a half years to the very old. And it's a UK-wide sample and some of the examples do highlight where girls fall particularly short is their fruit and vegetable intake which is particularly low. So only 7% of the sample, of girls between eleven and eighteen reached the target of five a day compared to 10% with the boys which isn't great but they're doing better than girls. And a great proportion of girls don't achieve the lower recommended nutrition intake for lots of vitamins and minerals but particularly low for magnesium and iron. And usually we report the RNI, so the Recommended Nutritional Intake, on the National Diet and Nutrition Survey but for

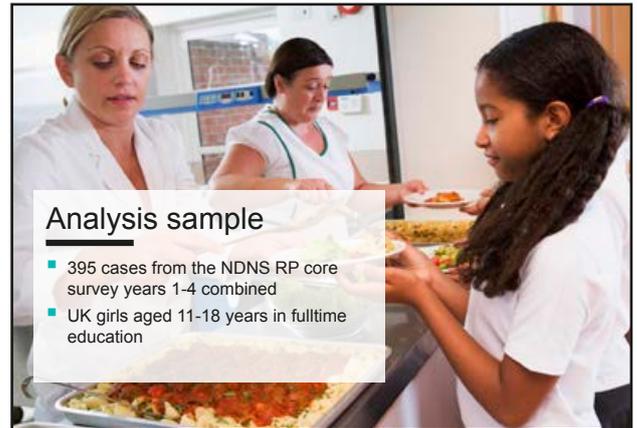
NDNS RP findings

- Teenage girls have the poorest diets
- E.g. only 7% met the 5-a-day recommendation for fruit & vegetables (compared with 10% of boys)
- Substantial proportion had intakes below the **LRNI** for many vitamins and minerals, e.g.:
 - 51% below LRNI for magnesium
 - 46% below LRNI for iron

magnesium and iron is so low that we went for the lower threshold which actually only applies to a small proportion but this highlights the concerns around teenage girls diets. And as I said earlier the data set of NDNS is very rich and we've got very detailed data on the food items and nutrients and portion sizes and the sort of setting of what is consumed which means that we don't have a very big sample but we have very rich data.

SLIDE 5

So from years one to four combined we had 395 girls in the core data set. I've investigated the core data set only because this is the data that's been archived already so there will be a slightly larger sample that we can investigate on in a few years' time, in a few months' time once the overall sample has been archived. And we've investigated girls aged eleven to eighteen but only those in full-time education because we acknowledged that particularly older adolescents aged sixteen or over who are already in employment might have different factors that play a role in their diet.



SLIDE 6

So the main aims was first to develop a diet quality index that's appropriate first of all to the age group and also applicable to the data that we have on NDNS so many indices – and I'll briefly touch on that on the next slide – are applied, or there's a questionnaire given out and we retrospectively wanted to apply an index to the dataset that we have. And also many diet indices are for adults so they include drinking behaviours and all sorts and we wanted to make one appropriate for girls. And as a second step we then needed to identify factors, both positive



and negative that affected diet quality, the scores that we gave, of those teenage girls.

SLIDE 7

**Developing the
ADQI**

2.

SLIDE 8

So we did a literature review on all sorts of indices that there are and found that there are a range of well-established diet quality indices and healthy eating indices in the literature, like I said many of which apply to adults or are given out in certain questionnaires all of which is not necessarily covered in NDNS but also on NDNS we have richer data on nutrients and nutritional status that isn't always covered in questionnaires. So we wanted to take advantage of this detailed information that we have. There are lots of variations of those indices so we've got an alternative index that includes predictors for CVD and other chronic diseases and we've got, there are children dietary health indices

Existing Diet Quality Indices

Examples:

- Diet Quality Index (DQI) by Holmes and Roberts
- Healthy Eating Index (HEI) based on American guidelines (1995, MyPyramid)
- Alternative Healthy Eating Index (AHEI), reviewed index including predictors for CVD and other chronic diseases
- Mediterranean diet index for children (KIDMED), includes negative eating behaviours (skipping breakfast, eating fast food and confectionary)

Literature offers many variations of the above.

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that include negative eating behaviours like the KIDMED which is a Mediterranean eating index for children and which includes behaviours but not all of which are covered in NDNS. So there are lots there but we wanted to make our own.

SLIDE 9

So this is the adolescence diet quality index that we developed. The scores that are awarded are all based on UK dietary recommendations established by the COMA group in 1991, so those are the common recommendations that PHD measure. PHD are also the joint sponsors with the Food Standards Agency of the National Diet and Nutrition Survey. So the items that we chose were two items covering negative eating behaviours so measuring whether or not the girls exceeded the recommendation for non-extrinsic sugars, so this would cover things like confectionary and sugary drinks and bad sugars as well as saturated fat. So the recommendation for both is not to exceed eleven per cent of total food energy. Then we've got fruit and vegetables but as illustrated earlier the proportion of girls actually achieving the recommendation of five a day is so low that in order to award a score we decided to choose the median which is 2.7 to either score 1 or 0. And for the nutrients so calcium, fibre, foliate, iodine, iron, magnesium and zinc we went with the RNI, but not for iron and magnesium because as I said earlier the proportion achieving was virtually zero. So we used those scores where applicable. We

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discussed including Vitamin D and Vitamin C because they're very important. Vitamin D we decided against because there's currently no recommendation for this age group. So there's a recommendation for the elderly and for very young children but not for adolescents. So it was difficult to include this in here. Vitamin C is important but overall the whole sample exceeded Vitamin C by far so it would have been like including a dummy in there.

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Adolescent Diet Quality Index (ADQI)

- Scores based on UK dietary recommendations (COMA, 1991)*
- 11 items

Adolescent Diet Quality Index		
Item	Scored 0	Scored 1
Non-milk extrinsic sugars	> 11% total food energy	<= 11% total food energy
Saturated fat	> 11% total food energy	<= 11% total food energy
Portions of fruit & vegetables a day	< 2.7 portions (median)	>= 2.7 portions (median)
Calcium	RNI not achieved	RNI achieved/exceeded
Fibre	Less than 18g	18g or more
Folate	RNI not achieved	RNI achieved/exceeded
Iodine	RNI not achieved	RNI achieved/exceeded
Iron	LRNI not achieved	LRNI achieved/exceeded
Magnesium	LRNI not achieved	LRNI achieved/exceeded
Zinc	RNI not achieved	RNI achieved/exceeded

8 *where applicable

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Adolescent Diet Quality Results

3.

SLIDE 12

So we awarded scores zero to eleven and then decided on quartiles from poor to very good. And this is what we found. Not surprisingly three quarters of girls across the ages have a poor or fair diet but this is reflecting what we found in results but it is quite shocking to see that only a quarter of girls have a diet that we would class as a good diet. But there are not big differences between the older or younger girls in here.

ADQI results

ADQI score grouped	ADQI quartiles by age					
	Age in two groups					
	11 -14 years		15 - 18 years		Total	
	N	%	N	%	N	%
Poor diet	108	51	90	49	198	50
Fair diet	55	26	47	26	102	26
Good diet	45	21	38	21	83	21
Very good diet	5	2	7	4	12	3
Total	213		182		395	

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SLIDE 13

Factors influencing diet and nutrient intake

Logistic regression

4.

SLIDE 14

We then continued investigating different factors that might play a role so those are the variables. We investigated general socio-demographic variables including the number of siblings under sixteen in the household so that might have an effect, being a smoker, drinker, by what we mean those are both binary variables so whether those ever smoked or never smoked, and with drinking the same way. I mean, we discussed earlier today that it's quite different how we treat drinking and smoking and the data will show a similar picture.

Variables included

- Age
- NS-SEC (4 categories)
- Ethnicity
- Tenure (5 categories)
- Index of Multiple Deprivation (quintiles)
- Whether eats cooked school meal (binary)
- BMI
- Number of siblings under 16 in HH (4 categories)
- Smoker
- Drinker
- Food Kcal
- Household has dining table

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SLIDE 15

In the final model what was also included was whether the child has the school meal. And NDNS actually provides the data on whether they're entitled to a free school meal or not and whether they take it up. So we have that detailed data but it didn't have any effect in the model that we applied. The BMI, having had a cigarette and the total food energy consumed ...

Body Mass Index

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
BMI	Normal	1			
	Overweight	.0.819	0.381	1.761	.608
	Obese	.4	0.199	0.807	.011
Base					395

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... as well as whether the house has a dining table - those are all variables that were significant when investigated on their own but that changed in the final model. So on their own being obese was a significant factor for having a poorer diet. And also not having a dining table in the household was another factor. I've singled out those two predictors because in the final model neither one of those actually have an impact when we control for socioeconomic factors. So by including things like the index of multiple deprivation and tenure and all sorts we've basically included the effects that having a dining table or not has but interestingly also obesity.

Dining table

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
Household has a dining table	Yes	1			
	No	.126	0.029	0.544	.006
Base					395

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Final model

Preliminary findings

5.

SLIDE 18

When looking at age being seventeen years old compared to eleven has a higher likelihood of having a good diet and although all the other values aren't significant it's a sort of, when looking at the effects it's a sort of U-shape so thirteen, fourteen year olds are most likely to have a poorer diet than eleven year olds. And I think that sort of reflects the discussions we had earlier. Whereas when they're seventeen they might be more independent and make their own choices and have less influence from their parents and more control over what they do so this might have an effect over actually improving their diet.

Age

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Range	OR	95% CI		P
			Lower	Upper	
Age	11	1			
	12	.593	0.167	2.102	0.417
	13	.594	0.188	1.878	0.374
	14	2.154	0.626	7.410	0.223
	15	1.053	0.276	4.014	0.94
	16	2.322	0.638	8.445	.2
	17	3.782	1.004	14.25	.049
	18	4.339	0.793	23.745	.09
Base					395

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Ethnicity had a small effect. I have to say first of all we had to use a binary because the sample was fairly small so we only have White or non-White. But being from a non-White ethnic background predicted a slightly greater likelihood of having a poor diet than being from a White background.

Ethnicity

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
Ethnicity	White	1			
	Non-white	.255	0.08	0.813	0.021
Base					395

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SLIDE 20

The strong predictor was smoking status. So never having smoked increased the likelihood of having a good diet by a lot. So this reflects the overall health behaviours so girls who had a good diet were also usually non-smokers.

Smoking status

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
Ever smoked a cigarette?	Smoked a cigarette at least once	1			
	Never smoked	7.978	2.246	28.342	0.001
Base					395

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With drinking we don't have the same picture but I've included this even though it's not significant to the extent that we'd report it but it's sort of borderline and it also reflects that maybe having a binary of ever having had a drink or not doesn't really work. So we could either include a third variable in here or maybe just have to see and acknowledge that drinking and smoking aren't quite the same.

Drinking status

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
Drinks or drank alcohol?	Never drank alcohol	1			
	Drinks alcohol	.487	0.227	1.041	.064
Base					395

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But most interestingly the strongest factor to predict a good diet is eating enough food. And that's quite interesting because first of all in the final model obesity wasn't a predictor anymore. And actually yeah, eating plenty of food suggests that girls are more likely to get the nutrients that they need which is something to bear in mind when discussing obesity in the same context as healthy eating and ensuring there's, unfortunately we didn't have a variable – that's maybe something to include in the future – for physical activity but it's definitely very important to bear in mind that it's important for girls to eat enough food or for everyone to eat enough food but not to focus too much on obesity in the same context as healthy eating. Because actually those

Total food energy

Predictors of a good or very good ADQI score					
Base: Girls aged 11-18 years in FT education (NDNS Y1-4 comb., core)					
Outcome: Has a good or very good ADQI score					
Factor	Categories	OR	95% CI		P
			Lower	Upper	
Daily consumed energy from food	>1200 kcal	1			
	1200 – 1599 kcal	.542	1.389	21.173	.015
	1600 – 1999 kcal	23.074	5.732	92.878	<.000
	>= 2000 kcal	126.4822	29.876	535.468	<.000
Base					395

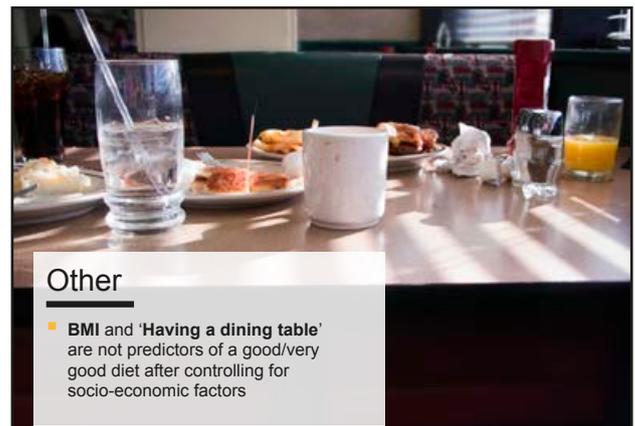
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categories of calories consumed are based on the total energy consumed and reported in the dataset just to have fairly even categories but actually the recommendations for girls in the whole age group is to have over 2,000 calories of food a day.

SLIDE 23

And I guess BMI and having a dining table are not significant anymore after controlling for other factors.



SLIDE 24

And I guess BMI and having a dining table are not significant anymore after controlling for other factors.



SLIDE 25

Future plans

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SLIDE 26

Some future plans, this was on the slides earlier and these are fairly preliminary results, it's not the final paper yet, so just came out of the analysis, but we will investigate the factors and the variables that we've got in the dataset to include more parental factors because we learned today this plays a big role, and also looking at the age curve seeing whether there might even be a negative predictors from what we know about the parents. There are limitations in the NDNS dataset because it's not longitudinal but it's also not the full household survey. So in a few cases, in some cases because of the sampling we have it's a parent and the child but in some cases we only have the child. We then have some information from the main food provider but yeah, we'd have to consider carefully which factors would be good to include

What's next?

- Explore parental factors: e.g. education, their health behaviours
- Consider including variety and moderation score in ADQI
- Linear regression to investigate which factors move girls across quartiles

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in further analyses. Also it might be worth considering a variety of moderations or seeing that the food intake is such a big influence in the final model but also to try different models of analysis to see which factors would move girls from one category to another, rather than a binary approach.

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