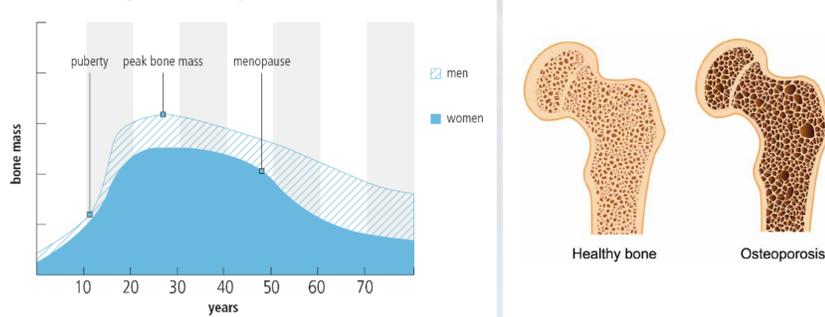# Don't Ditch your Dairy
Why Teenage Girls need to be Bone Health Aware

INSPIRATION FOR OUR PROJECT

We first became inspired to pursue the topic of Osteoporosis, bone health and Calcium and Vitamin D intake after a Home Economics class on the topic. We became really interested in the topic, however we felt that the information we received was not comprehensive enough and left us with a lot of unanswered questions. We decided to take this a step further and look at our own Calcium intake for a day and were shocked to discover that we were consuming less than half the recommended daily amount! This had a strong and lasting impact on us, making us worry for our bone health now and in the future. We reckoned that we were not alone, and that many other teenage girls were also consuming an inadequate amount of Calcium and Vitamin D, increasing their risks of developing Osteoporosis. An amazing one in three women over 50 will experience osteoporotic fractures making bone health a big concern for teenage girls. This led us to ask why we had not heard more about this major issue affecting the lives of so many women? Why has it not been talked about and promoted more amongst teenagers? Why was our Calcium intake so low and what might improve it? From this we felt inspired to investigate this issue further and examine what we could do to improve the situation. We were eager to see if more education for adolescent girls is a solution for better bone health in women.

Bone mass throughout the life cycle

EXPERIMENTAL METHODS

Our experimental methods consisted of four stages
- Stage One: Distribution of a questionnaire containing 14 questions aimed at assessing teenage girls' knowledge of Osteoporosis, bone health and Calcium and Vitamin D consumption.
- Stage two: Distribution of first food logs to a research group of 100 girls from 1st to 5th year pre Intervention recording their intake of Calcium and Vitamin D over a 5 day period.
- Stage three: Stage an educational intervention
- Stage four: Distribute second food log to research group after the intervention

Intervention

Aims of the intervention:
- To inform teenage girls about Osteoporosis and the risk that it poses to them
- To inform teenage girls how to improve their bone health with a focus on the importance of consuming dairy products
- To highlight the importance of Vitamin D in absorbing Calcium and the sources of Vitamin D.
- To promote the health benefits of dairy and reduce the stigma that it is fattening and unhealthy.

This intervention consisted of 2 Educational talks to students by Dietitian Dr. Claire MacGartland and Dr. Niamh Murphy, Production of an Information Booklet, Product Giveaway and a Facebook page "Project C".
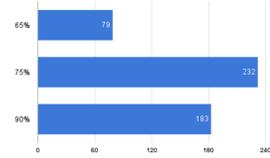
QUESTIONNAIRE RESULTS

We distributed a questionnaire through google forms to a wide variety of teenage girls from all over Leinster. We received a total of 509 responses, which generally showed that teenage girls are lacking in their knowledge of this topic.
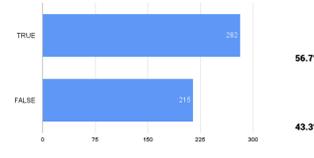
Approximately what % of adult bone is already built by the age of 17? 183 / 494 correct responses
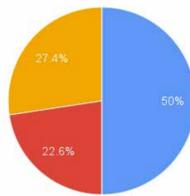
Answer : 90%

More Calcium is found in full fat milk than in low fat milk.215 / 497 correct responses
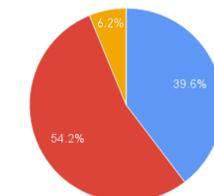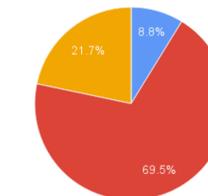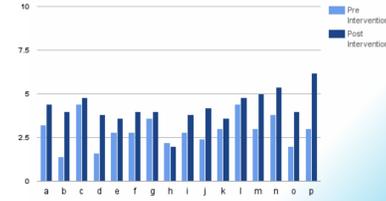
Answer: False

How many glasses of milk (skimmed/low or full fat) do you consume each day on average?(496 responses)

Who needs the most Calcium in their diets?(497 responses) Answer: Teenage/Preteens aged 9-18 yrs

How many daily servings of milk, cheese or yogurt are recommended for teenagers? (498 responses) Answer: 5

FOOD LOG RESULTS

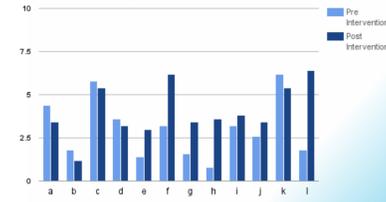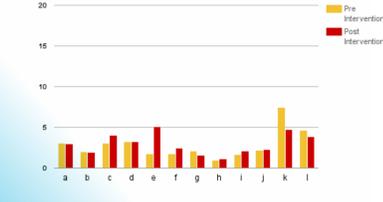Average number of portions of calcium consumed daily,4th Years

Average daily Vitamin D intake measured in micrograms. 4th Year
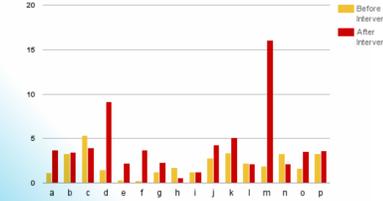
Average daily number of calcium portions consumed. 1st year

Average daily Vitamin D intake measured in micrograms 1st year

STATISTICAL ANALYSIS

To correctly evaluate our statistical data we used a one sided criterion test. We found this to be the best way to study our paired data and effectively lay out our final results. We calculated a level of significance of 0.05, giving us a 95% confidence level in the results we received. Although we received 85% of the food diaries back from Stage 1, we received 65% back from Stage 2, resulting in our total number for this paired test being 65. The aim of our statistical analysis was to disprove our two null hypotheses, the educational intervention does not make a difference in the intake of Calcium and Vitamin D by all the students and secondly the educational intervention does not make a difference in the intake of Calcium and Vitamin D by students in different years.

We used a normal distribution table to analyse both the total Calcium results and the total Vitamin D results because there were over 30 food diaries in each. Firstly we got the averages of 1.29 for Calcium than 1.19 for Vitamin D against the expected average of 0, which meant there was already an increase in intake levels for Calcium and Vitamin D. We filled this data into the formula to get the Z- score of 9.3 for Calcium and 3.67 for Vitamin D. We analysed each year group separately using the formula giving us the T-scores. The normal distribution table gave us our critical values for Calcium and Vitamin D, which we put against the z-score. If the Z- score was higher than the critical value, that meant that our educational intervention had been a success as the result was statistically significant. The Z- score of the total amount of Calcium food logs was 9.3. The critical value was 1.645. For Vitamin D the Z-score was 3.66, considerably lower than the Z- score of Calcium. The critical value was also 1.645, seeing as both Calcium and Vitamin D have the same significance level and would end up on the same line in the normal distribution table.

This clearly shows that, as a whole, increased education on the topic of Osteoporosis and the importance of dairy in the diet will increase the intake of Calcium and Vitamin D in teenage girls. An interesting observation is the fact that although both Calcium and Vitamin D had the same Critical Value, Vitamin D had a considerably lower Z-score. We used another table called the t-table to analyse the Calcium and Vitamin D results for each individual year. We used this table since there was less than thirty food diaries from each year. These results were more varied. Results from the test showed an overall increase in Calcium intake for all year groups and an overall increase in Vitamin D intake for 3 out of the five year groups.

Summary Statistics from Food Logs

Test Group	H_0	H_1	α	n	TestStatistic	DegFrdm	$\bar{x}$	μ_0	s	Z-Score	t-score	CriticalValue	T-Value	Significant ?
Calcium intake	$\mu=\mu_0$	$\mu > \mu_0$	0.05	65	$z = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$		1.29	0	1.12	9.30		1.645		Yes
VitaminDintake	$\mu=\mu_0$	$\mu > \mu_0$	0.05	65	$z = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$		1.19	0	2.62	3.66		1.645		Yes
Calciumintakeyear1	$\mu=\mu_0$	$\mu > \mu_0$	0.05	11	$t = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$	11	1.00	0	1.79		1.94		1.796	Yes
Calciumintakeyear2	$\mu=\mu_0$	$\mu > \mu_0$	0.05	12	Ditto	11	1.45	0	0.89		5.66		1.796	Yes
Calciumintakeyear3	$\mu=\mu_0$	$\mu > \mu_0$	0.05	13	Ditto	12	1.17	0	1.07		3.94		1.782	Yes
Calciumintakeyear4	$\mu=\mu_0$	$\mu > \mu_0$	0.05	16	Ditto	15	1.33	0	0.93		5.70		1.753	Yes
Calciumintakeyear5	$\mu=\mu_0$	$\mu > \mu_0$	0.05	11	Ditto	11	1.50	0	0.82		6.30		1.796	Yes
VitaminDintakeyear1	$\mu=\mu_0$	$\mu > \mu_0$	0.05	12	Ditto	11	0.06	0	1.40		0.14		1.796	No
VitaminDintakeyear2	$\mu=\mu_0$	$\mu > \mu_0$	0.05	12	Ditto	11	2.01	0	1.84		3.78		1.796	Yes
VitaminDintakeyear3	$\mu=\mu_0$	$\mu > \mu_0$	0.05	13	Ditto	12	(0.11)	0	1.30		-0.29		1.782	No
VitaminDintakeyear4	$\mu=\mu_0$	$\mu > \mu_0$	0.05	16	Ditto	15	2.05	0	3.90		2.10		1.753	Yes
VitaminDintakeyear5	$\mu=\mu_0$	$\mu > \mu_0$	0.05	11	Ditto	11	1.77	0	2.57		2.39		1.796	Yes
	Null Hypothesis	Alternate/ Research Hypothesis	Significance Level	Sample Size			Average intake		Standard deviation of intake	Calculated from sample	Calculated from sample	From Normal Distribution Table	From T-test Table	

CONCLUSIONS

We have concluded that education on osteoporosis and the importance of consuming adequate Calcium and Vitamin D during adolescence is critical. While teenagers had a good basic understanding of Calcium and bone health, they are not putting this into practice in their daily lives. These are our main conclusions:
- Our statistical analysis concluded that we disproved our 2 null hypotheses. We reject the null hypotheses of our campaign making no difference to Calcium and Vitamin D intake as the results were statistically significant. The educational intervention results were statistically significant overall , deeming it to be successful.
- Teenage girls need to be better educated on all causes of osteoporosis and the importance of consuming adequate levels of Calcium and Vitamin D during adolescence. Ongoing education is vital.
- While our educational intervention increased Calcium and Vitamin D intake generally, a large % of teenage girls are still failing to reach the recommended intake and this is concerning.
- Teenage girls are not consuming enough dairy food to meet their daily requirements and are largely unaware that they require 5 portions of Calcium rich foods per day.
- Teenage girls are generally unaware of the importance of Vitamin D and weight bearing exercise as factors in the prevention of osteoporosis.

RECOMMENDATIONS

- All milk and yoghurt products should be fortified with Vitamin D.
- Greater emphasis needs to be placed on "nutrition education" for teenagers. Consideration needs to be given to incorporating distinct nutrition modules into the school curriculum, perhaps by expanding the current SPHE curriculum.
- Advertising campaigns for dairy products need to be targeted specifically at teenage girls consumption of dairy products, reinforcing the message that dairy food is a low fat, healthy option, rich in Calcium and Vitamin D.
- More teenage girls should be seen in TV and media advertising for dairy products..
- Packaging of Calcium rich foods should be compulsorily labelled as "1 of your 5-a-day for Teens" promoting the need for teenagers to consume 5 portions of Calcium daily.
- Teenagers must be encouraged to eat more oily fish, such as salmon or tinned sardines, and fortified breakfast cereals, especially in cases where teenagers are consuming little or no dairy food. More non- dairy foods should be fortified also.
- Education of parents is vital to establish good eating habits at home and to purchase more Calcium and Vitamin D foods as part of the weekly food shop.

Cheddar cheese   Cheese   Cottage cheese   Cream cheese   Feta   Yogurt   Cow's milk   Sour cream   Semi-soft cheese   Swiss cheese   Butter   Cream   Ice cream