



EGEA 2018
NUTRITION & HEALTH: FROM SCIENCE TO PRACTICE

**Household food insecurity and promotion of healthy
nutrition**

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- The dual problem of nutrition of school-aged children in Greece
- The politics
- The need → Solutions?
- The intervention
- Data collection
- Research Protocols
- Results- policy



The dual problem of nutrition of school aged children in Greece



➤ 2010 – 2018: The Greek Socioeconomic Crisis

The politics around the problem of food insecurity

- Government: *It's not a real problem*
Brands it an opposition talking point
- Press: *Multiple reports of children going to school hungry and fainting*
- Teachers: *Attempt to address the problem independently & Out-of-pocket*

Private sector intervention

- Citizens visit schools and offer food without any health controls
- Teachers collect money between themselves
- Traditional NGOs create soup kitchens that mainly address adults.

The Diatrofi Program

Spring 2010 Prolepsis pilot tests

- Comparison between distribution of food coupons and food delivery in schools every morning
- Estimation of:
 - food insecurity
 - hunger
 - obesity
 - undernutrition
 - quality of food at family level

The Program

- The program targets public school students throughout the country, in socio-economically vulnerable areas, with aims of:



DIATROFI in Numbers since 2012



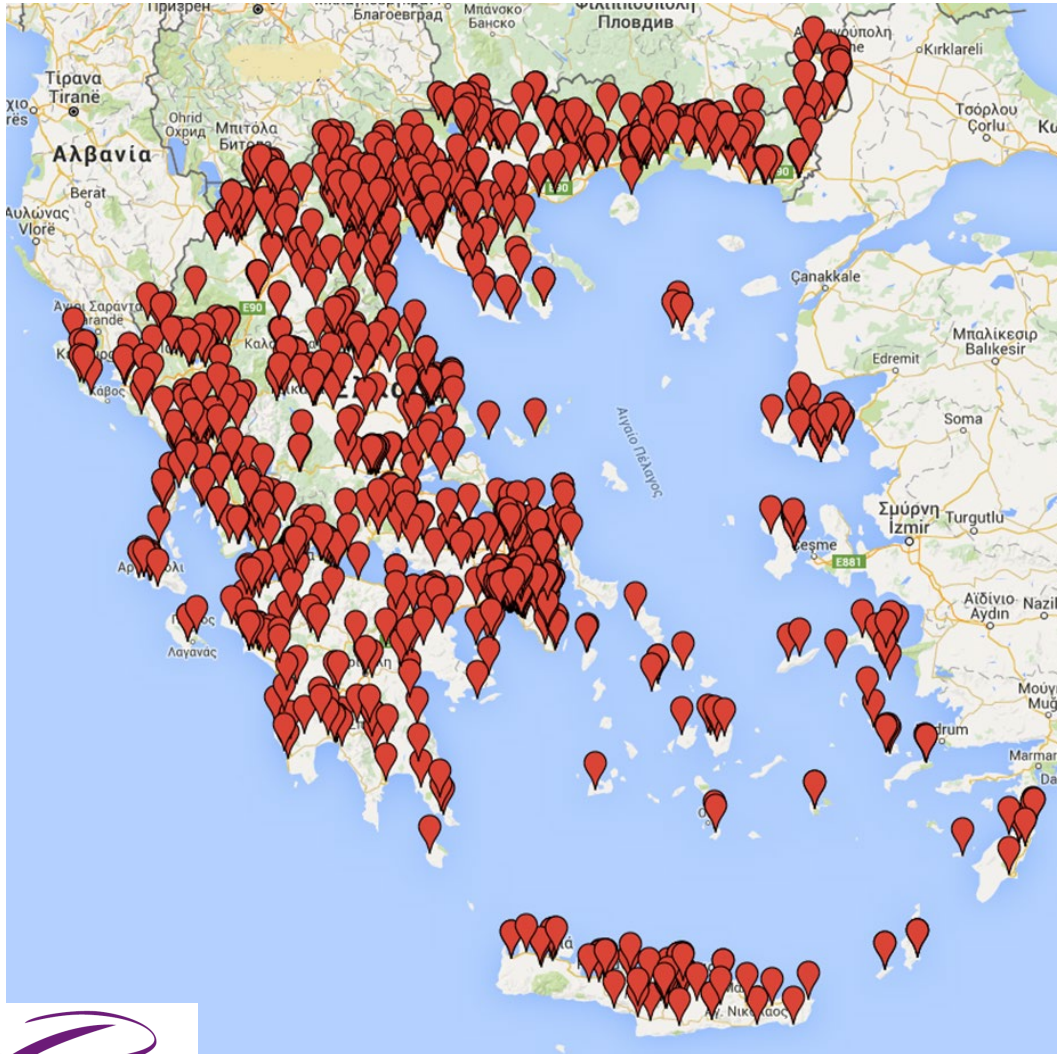
650
schools

>100,000
students

> 14,000,000
meals

>200
educational
events

The Need – School Applications since 2015

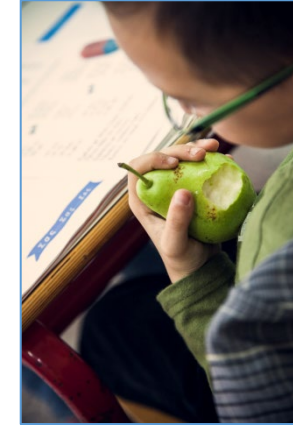


- **2,100 schools with 262,000 students**
- **1 million family members**
- **19% of Greek students**

Meal Design

► **Healthy choices & strict standards:**

- Exclusive use of olive oil
- Whole wheat flour (60%)
- Absence of preservatives
- Dairy
- Numerous and varied vegetables & fruits
- Greek products & produce



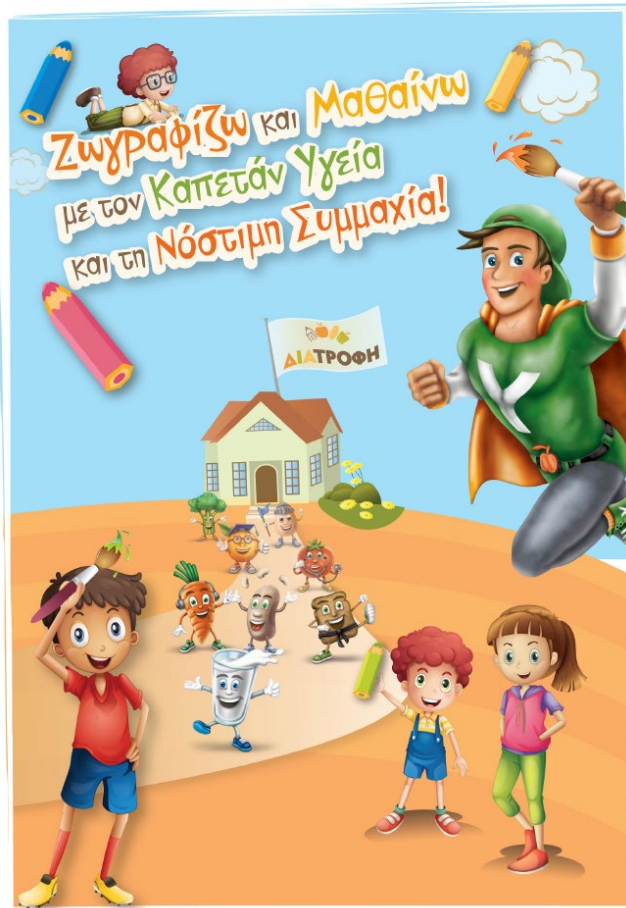
Covering daily needs:

- **Energy:** 20-30%
- **Protein:** 50-80%
- **Fiber:** 15-30%
- Other nutrients – indicatively:
 - **Calcium:** 30-60%
 - **Iron:** 30-50%

Weekly menu

Monday	Tuesday	Wednesday	Thursday	Friday
<ul style="list-style-type: none"> ❖ Cheese and vegetable sandwich ❖ Yogurt ❖ Fruit (red apple) ❖ Middle school: + grape must cookie 	<ul style="list-style-type: none"> ❖ Whole- grain sandwich with chicken and tomato ❖ Milk ❖ Fruit (red apple) ❖ Middle school: + raisin bread 	<ul style="list-style-type: none"> ❖ Whole- grain pie with leak ❖ Yogurt ❖ Fruit (red apple) ❖ Middle school: + grape must cookie 	<ul style="list-style-type: none"> ❖ Round whole- grain egg sandwich ❖ Milk ❖ Fruit (orange) ❖ Middle school: + raisin bread 	<ul style="list-style-type: none"> ❖ Whole- grain spinach pie ❖ Fruit (peach) ❖ Middle school: + grape must cookie

Educational Material



The Need – DIATROFI data

61.1% of families experienced food insecurity

24.7% of families experienced hunger

In **58,9%** of the families at least one parent had no source of income

In **16,7%** of the families both parents had no source of income

13.2% of students had no health insurance

9% of the households underwent a power cut that lasted over a week

31.6% of students were overweight/obese and **13.4%** underweight

Based on 3,806 validated questionnaires completed by parents of participating students during 2016-2017 (Beginning).

Our Results

*"For some children,
this is the only meal
of the day. As crazy
as this sounds..."*



- ✓ Food insecurity score reduced by 7%
- ✓ Food insecurity score for students facing hunger reduced by 18,9%

BODY MASS INDEX

BODY MASS INDEX DIFFERENCES	
START n= 23,972	END
Underweight n= 2,445	50.2% normal weight
Overweight n= 5,418	33.7% normal weight
Obese n= 2,185	16.4% normal weight
	27.5% overweight

➤ **32.9% of students who were over/underweight attained normal weight**

HEALTH RELATED QUALITY OF LIFE

PEDIATRIC QUALITY OF LIFE QUESTIONNAIRE RESULTS

	% of students that improved
Health related quality of life	51.5%
Physical functioning	37.9%
Psychological functioning	41.5%
Social functioning	32.3%

Percentage of students that reduced:

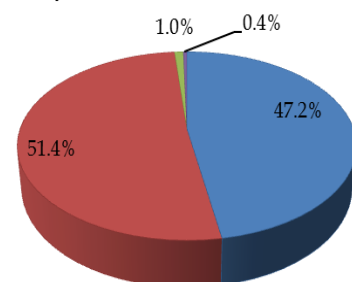
- **Anger 28%**
- **Sadness 25%**
- **Fear 24%**

Note: Data derived from the same questionnaires distributed both at the beginning and at the end of the school period **2015-2016** and processed in SPSS.

Dietary Changes – Weekly Consumption

Fruits

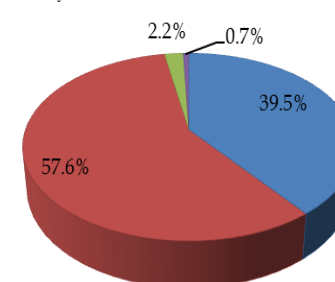
■ No improvement ■ Increase by 1 to 7 fold
 ■ Increase by 8 to 14 fold ■ Increase more than 14 fold



- ▶ **52.8%** of children reported an increase in their consumption of fruits
- ▶ **65.6%** of students who did not report consuming fruits, now do.

Vegetables

■ No improvement ■ Increase by 1 to 7 fold
 ■ Increase by 8 to 14 fold ■ Increase more than 14 fold

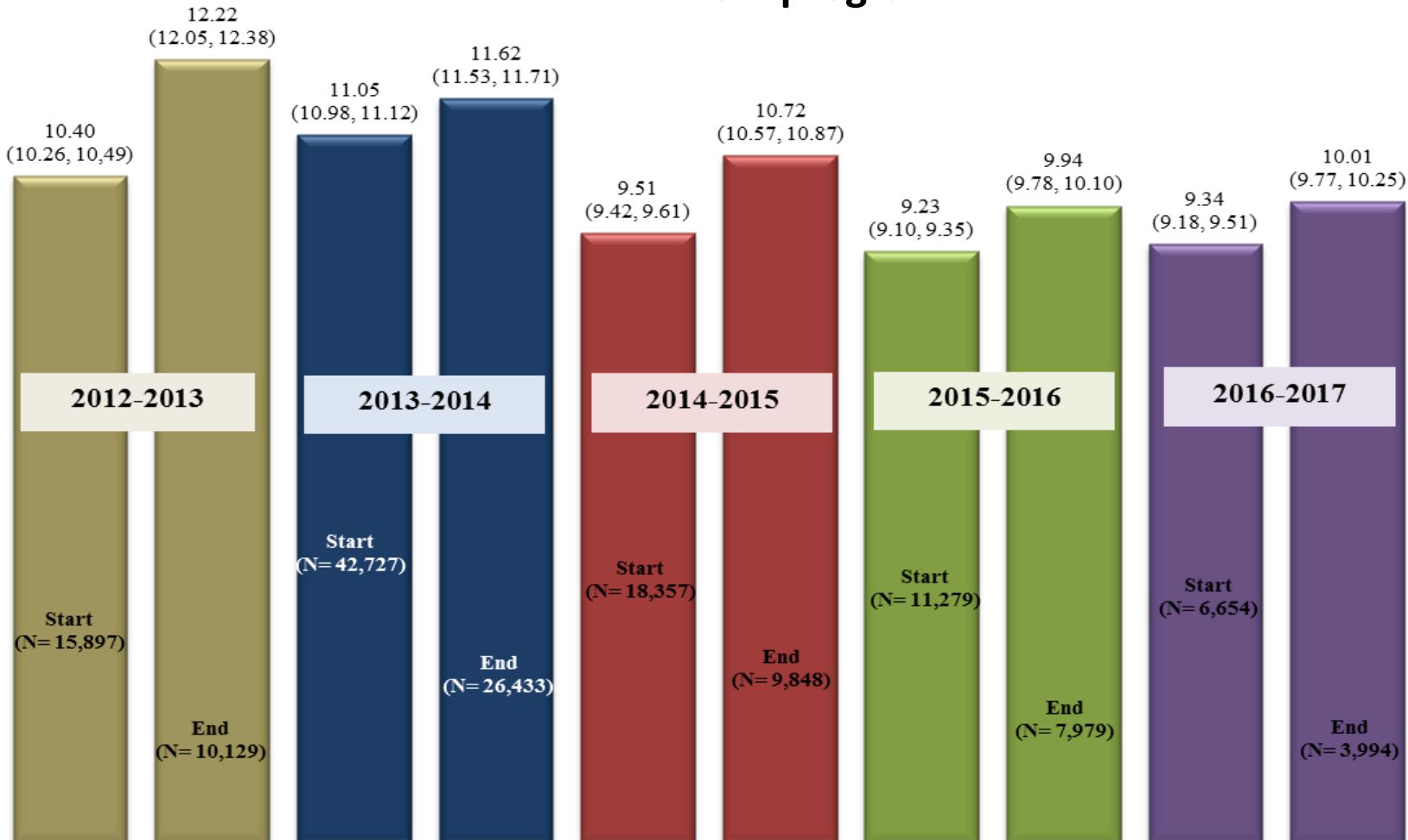


- ▶ **60.5%** of children reported an increase in their consumption of vegetables
- ▶ **55.6%** of students who did not report consuming vegetables, now do.

Note: Data derived from the same questionnaires distributed both at the beginning and at the end of the school period 2017-2018 and processed in SPSS.

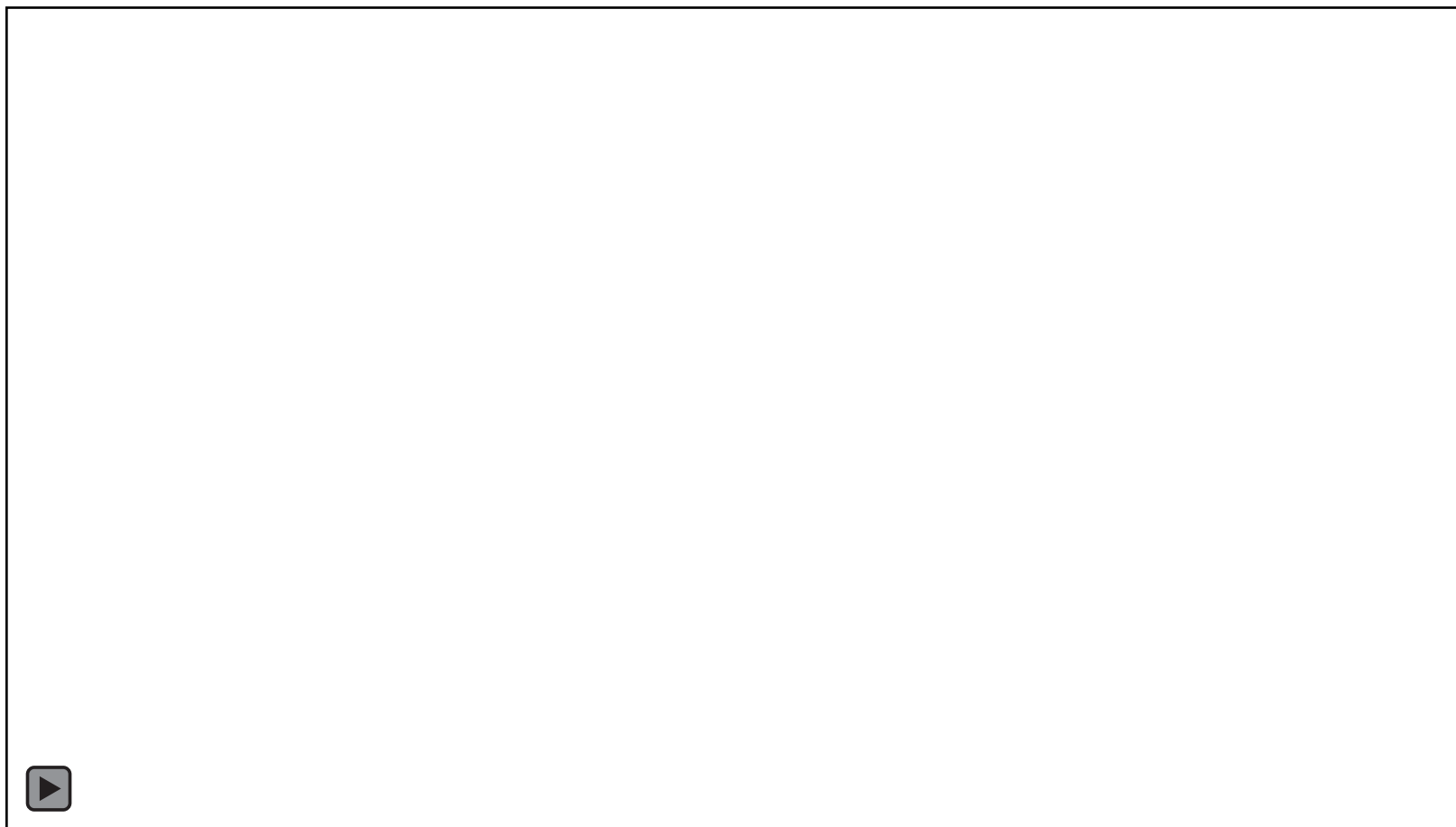
Our Results

Average weekly consumption of fruits and vegetables, per school year and time point of the DIATROFI program



Note: In the parentheses the 95% confidence interval for the mean consumption of fruits and vegetables is presented

... what are students say



Randomized Control Trials

► 2 randomized control trials:

- School year 2013 – 2014
- School year 2014 – 2015

► School year 2013 – 2014

AIM: To evaluate the effectiveness of two different types of healthy nutrition promotion interventions in school environments

146 schools
3.627 students

Environmental intervention (EI):
healthy daily meal

Multi-component intervention (MI):
Healthy daily meal
+
healthy nutrition educational program

Randomized Control Trials

Results (School year 2013 – 2014)

▶ Dietary habits changes:

➤ Children:

- The probability of an increase in consumption of **milk/yoghurt** was **1,25 times** higher for children of the MI group compared with their EI counterparts
- The probability of an increase in consumption of **fruits** was **1,22 times** higher for children of the MI group compared with their EI counterparts

➤ Adolescents

- The probability of an increase in consumption of **vegetables** was **1,40 times** higher for adolescents of the MI group compared with their EI counterparts

Zota D, Dalma A, Petralias A, Lykou A, Kastorini CM, Yannakoulia M, Karnaki P, Belogianni K, Veloudaki A, Riza E, Malik R, Linos A. Promotion of healthy nutrition among students participating in a school food aid program: a randomized trial. Int J Public Health. 2016 Jun;61(5):583-92.

Randomized Control Trials

Results (School year 2013 – 2014)

- ▶ **Weight status** changes:
- **Children**
 - The probability of improving weight status from **overweight/obese** to **normal** was 1,61 times higher for **children** in MI compared with their EI counterparts
 - The probability of improving weight status from **underweight** to **normal** was 2.5 times higher for **children** in MI compared with their EI counterparts
- **Adolescents**
 - The probability of improving weight status from **underweight to normal** was 2.87 times higher in MI.
 - In both intervention groups about 1 out of 4 overweight/obese adolescents attained normal weight

Zota D, Dalma A, Petralias A, Lykou A, Kastorini CM, Yannakoulia M, Karnaki P, Belogianni K, Veloudaki A, Riza E, Malik R, Linos A. Promotion of healthy nutrition among students participating in a school food aid program: a randomized trial. Int J Public Health. 2016 Jun;61(5):583-92.

Our Results

Percentage of students who improved their weekly consumption of fruits and vegetables, separately in each intervention group and in each age group; randomized trial in Greece, 2013-2014

Note: p-value refers to the difference between the two intervention groups, concerning the percent of students who improved their weekly consumption of fruits and vegetables. The statistically significant results are shown with bold (**p< 0.001, **p< 0.05)

	Weekly consumption of fruits	Weekly consumption of vegetables
Children (N= 2,556)		
Provision of healthy daily meal + Healthy nutrition educational program (N= 1,187)	34.2%	43.6%
Provision of healthy daily meal (N= 1,369)	30.1%	41.1%
p-value	0.034**	0.213
Adolescents (N= 1,071)		
Provision of healthy daily meal + Healthy nutrition educational program (N= 422)	36.0%	49.5%
Provision of healthy nutrition educational program (N= 649)	35.4%	41.2%
p-value	0.846	0.008**

Our Results

Percentage changes of weekly consumption of fruits and vegetables, separately in each intervention group and in each age group; randomized trial in Greece, 2013-2014

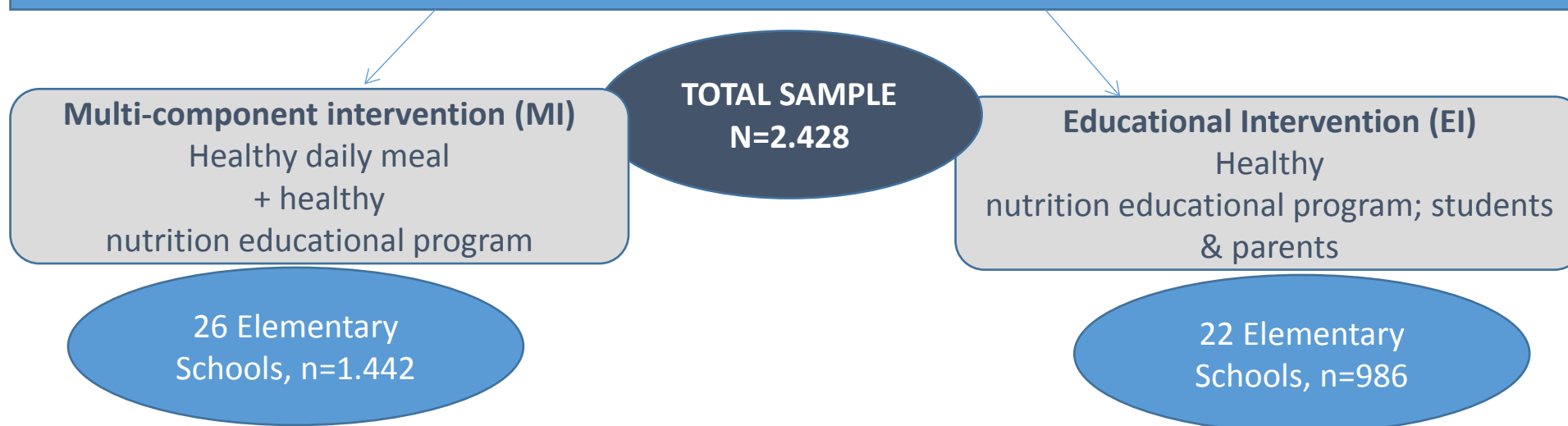
Note: p-value refers to the statistical significance of the percentage change caused by each intervention separately. The statistically significant results are shown with bold (**p< 0.001, **p< 0.05)

	Weekly consumption of fruits	Weekly consumption of vegetables
Children (N= 2,556)		
Provision of both healthy daily meal and healthy nutrition educational program (N= 1,187)	5.68%	9.59%
p-value	0.002**	<0.001***
Provision of healthy daily meal only (N= 1,369)	2.18%	1.59%
p-value	0.21	0.717
Adolescents (N= 1,071)		
Provision of both healthy daily meal and healthy nutrition educational program (N= 422)	6.61%	10.34%
p-value	0.124	0.014**
Provision of healthy daily meal only (N= 649)	3.95%	2.16%
p-value	0.237	0.363

► School year 2014 – 2015

Hypothesis tested

Students participating in Multicomponent Intervention (MI) face higher odds to improve household food insecurity as well as their Health Related Quality of Life (HRQOL) in comparison to students in the Educational Intervention



Results

Food insecurity

- Significantly larger decrease in household food insecurity in the MI group compared to the EI group; more evident for **food insecure families, overweight/obese and underweight children**
- The EI was also shown to decrease household food insecurity; **more evident for food insecure families with/without hunger**
 - **better management of household finances due to the educational actions; a recipe book with recipes for healthy, low-cost meals was provided**

Health Related Quality of Life

- Participation in MI in comparison to EI, indicated added improvement:
 - **school functioning of students suffering from food insecurity**
 - **physical, social and school functioning of underweight students**
 - **physical and emotional functioning of overweight/obese students**

Our Results

Percentage of students who improved their weekly consumption of fruits and vegetables in each intervention group, for those living in food insecure households (with/without hunger) and those living in households facing hunger; randomized controlled trial in Greece, 2014-2015

Note: p-value refers to the comparison between the two intervention groups, concerning the percentage of students who improved their weekly consumption of fruits and vegetables. The statistically significant results are shown with bold (**p< 0.05).

	Weekly consumption of fruits	Weekly consumption of vegetables
Food insecure households with/ without hunger (N= 1,043)		
Provision of healthy daily meal + Healthy nutrition educational program (N= 614)	46.8%	53.6%
Provision of healthy nutrition educational program (N= 429)	37.6%	52.0%
p-value	0.004**	0.614
Food insecure households with hunger (N= 325)		
Provision of healthy daily meal + Healthy nutrition educational program (N= 183)	51.4%	56.3%
Provision of healthy nutrition educational program (N= 142)	36.2%	53.0%
p-value	0.007**	0.560

Our Results

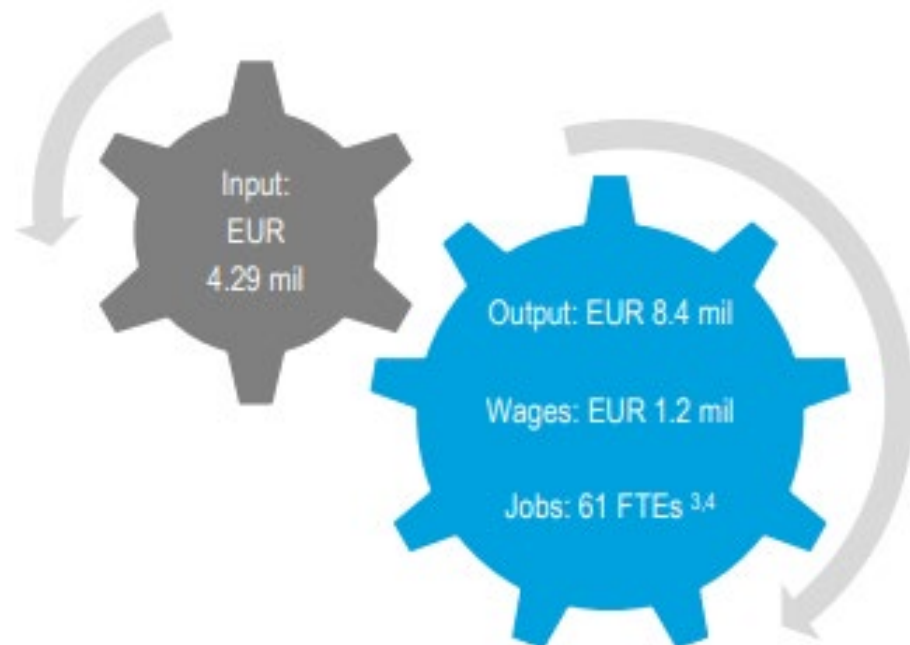
Percentage of students who improved their weekly consumption of fruits and vegetables in each intervention group, for the total sample and the students with normal weight at baseline; randomized controlled trial in Greece, 2014-2015

Note: p-value refers to the comparison between the two intervention groups, concerning the percentage of students who improved their weekly consumption of fruits and vegetables. The statistically significant results are shown with bold (**p< 0.05, *p< 0.10).

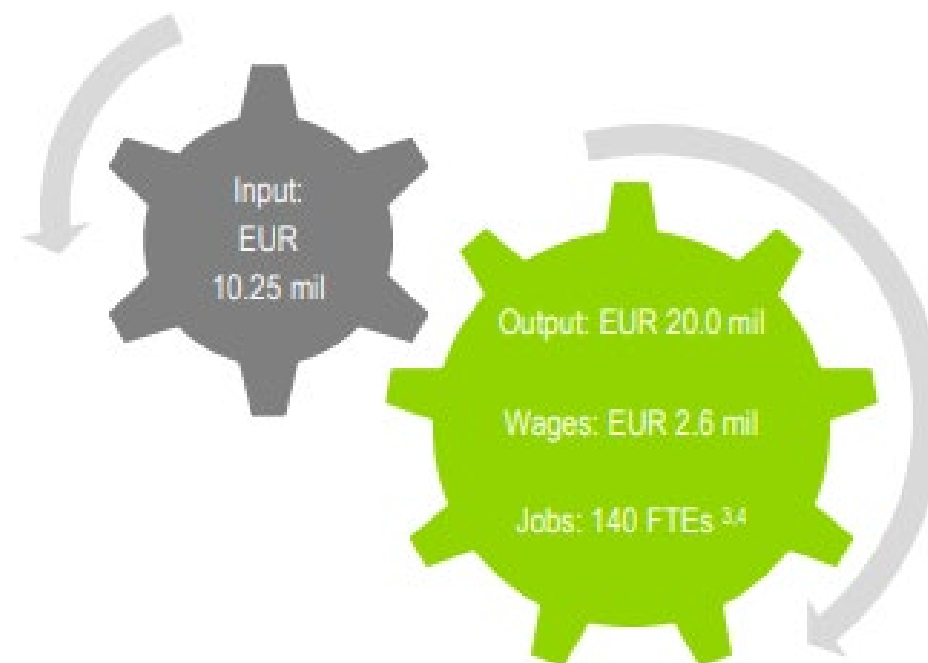
	Weekly consumption of fruits	Weekly consumption of vegetables
Total sample (N= 2,428)		
Provision of both healthy daily meal and healthy nutrition educational program (N= 1,442)	45.4%	51.9%
Provision of healthy nutrition educational program only (N= 986)	40.0%	50.2%
p-value	0.009**	0.712
Students with normal weight (N= 1,197)		
Provision of healthy daily meal + Healthy nutrition educational program (N= 714)	48.3%	53.7%
Provision of healthy nutrition educational program (N= 483)	42.7%	51.8%
p-value	0.061*	0.525

Economic benefits

Overall Economic Impact of Cycle A



Overall Economic Impact of Cycle B



*3.4 FTE = Full Time Equivalent

Veloudaki A., Petralias A., Zota D., Karnaki P., Dalma A., Riza E. and Linos A. (2016). Policy brief addressing food insecurity and obesity Case study: the DIATROFI program. *European Journal of Public Health*, 26

Policy brief addressing food insecurity and child obesity (in Greek). Athena Linos, Athanassios Petralias, Afroditi Veloudaki and Archontoula Dalma. Hellenic Foundation for European & Foreign Policy - ELIAMEP, Crisis Observatory, Policy Paper No. 25, October 2014.

- Honored with “Top-Rated NGO Award” in 2018 and 2017 by GreatNonprofits, the leading provider of user reviews of charities and nonprofits in USA
- Ranked 177th among the Top 500 NGOs worldwide evaluated by Global_Geneva, a Swiss non-profit organization

The New York Times

More Children in Greece Are Going Hungry

“Last year, an estimated 10 percent of Greek elementary and middle school students suffered from what public health professionals call “food insecurity,” meaning they faced hunger or the risk of it, said Dr. Athena Linos, a professor at the University of Athens Medical School who also heads a food assistance program at [Prolepsis](#), a nongovernmental public health group that has studied the situation. “When it comes to food insecurity, Greece has now fallen to the level of some African countries,” she said.”

Thank you!



<http://diatrofi.prolepsis.gr/en/>

Addendum 1: Research Papers

Publications in international scientific peer-review journals:

- "Promotion of healthy nutrition among students participating in a school food aid program: a randomized trial". Zota D, Dalma A, Petralias A, Lykou A, Kastorini CM, Yannakoulia M, Karnaki P, Belogianni K, Veloudaki A, Riza E, Malik R, Linos A. *Int J Public Health*. 2016 Jun;61(5):583-92. doi: 10.1007/s00038-016-0813-0. Epub 2016 Mar 29.
- "Socio-economic and lifestyle parameters associated with diet quality of children and adolescents using classification and regression tree analysis: The DIATROFI study". Mary Yannakoulia, Anastasia Lykou, Christina-Maria Kastorini, Eirini Saranti Papasaranti, Athanassios Petralias, Afroditi Veloudaki, Athena Linos on behalf of the DIATROFI Program Research Team. *Public Health Nutrition*, 2016. **19(2):339-47.**, DOI: 10.1017/S136898001500110X.
- "The influence of a school-based intervention program regarding adherence to a healthy diet in children and adolescents of disadvantaged areas in Greece: The DIATROFI Study". Kastorini CM, Lykou A, Yannakoulia M, Petralias A, Riza E, Linos A on behalf of the DIATROFI Program Research Team. *Journal of Epidemiology & Community Health*, 2016, 70(7):671-7 . DOI: 10.1136/jech-2015-205680.
- "Perceptions of parents and children, participating in a school-based feeding program in disadvantaged areas in Greece: A qualitative study". Dalma A, Kastorini C-M, Zota D, Veloudaki A, Petralias A, Yannakoulia M, Linos A. *Child: Care, Health & Development*, January 2016, DOI: 10.1111/cch.12315.
- "The impact of a school food aid program on household food insecurity" Petralias A, Papadimitriou E, Riza E, Karagas RM, Zagouras A, Linos A on behalf of the DIATROFI Program Research Team. *European Journal of Public Health*, 2016. 42(2):267-77. DOI: 10.1093/eurpub/ckv223.

Addendum 2: Research Papers

- A School Based Intervention for Combating Food Insecurity and Promoting Healthy Nutrition in a Developed Country Undergoing Economic Crisis: A Qualitative Study” Dalma A, Veloudaki A, Petralias A, Mitraka K, Kastorini C-M, Yannakoulia M, Linos A. Forum on Public Policy, in press.

Abstracts published in international scientific peer-review journals:

- “Perceptions and attitudes on healthy nutrition of parents and children, participating in a school-based feeding program in disadvantaged areas in Greece: A qualitative study”. Dalma A, Zota D, Kastorini C, Veloudaki A, Petralias A, Yannakoulia M, Linou A. International Journal of Community Nutrition , 0(Supplement), November 2014, 86-87.
- “The provision of a free school meal in underprivileged areas of Greece”. Petralias A, Lykou A, Veloudaki A, Haviaris AM, Zota D, Papadimitriou E, Linos A. International Journal of Community Nutrition , 0(Supplement), November 2014, 126.
- Publications in national peer-review series/reports:
- “Suggested policy to combat food insecurity and childhood obesity”. Linos A, Petralias A, Veloudaki A and Dalma N. Policy paper No. 25. Crisis Observatory, Hellenic Foundation for European & Foreign Policy. Athens: October 2014.

Addendum 3: Research Papers

- "Social Profile Report on Poverty, Social Exclusion and Inequality Before and After the Crisis in Greece". Katsikas, D., Karakitsios, A., Filinis, K. & Petralias, A. Crisis Observatory, Hellenic Foundation for European & Foreign Policy. Athens: December 2014
- Posts in international scientific blog posts
- A program on food aid and promotion of healthy nutrition in schools of underprivileged areas in Greece. International Journal of Public Health, Springer. April 19th 2016.
- Presentations of the DIATROFI Program in international scientific conferences:
- "Increasing Health Literacy in relation to nutrition among disadvantaged students: The DIATROFI Programme". Dina Zota, Archontoula Dalma, Afroditi Veloudaki, Pania Karnaki, Athanassios Petralias and Athena Linos. The 3rd European Health Literacy Conference. 17-19 November 2015. The Management Centre Europe, Brussels.
- "Perceptions and attitudes of educators and School Principals participating in a school-based feeding program in disadvantaged areas in Greece: a qualitative study". Dalma A, Veloudaki A, Petralias A, Mitraka K, Kastorini C-M, Yannakoulia M, Linos A, on behalf of the DIATROFI Program Research Team. 2nd International Conference on Global Food Security. 11-14 October 2015. Cornell University, Ithaca, New York, USA.
- A School Based Intervention for Promoting Healthy Nutrition: A Qualitive Study. Dalma A, Veloudaki A, Petralias A, Mitraka K, Zota D, Kastorini C-M, Yannakoulia M, Linos A. 26-29 July 2015. Oxford Round Table on Critical Public Issues, Manchester College, University of Oxford, UK.

Addendum 4: Research Papers

- “The provision of a free school meal in underprivileged areas of Greece”. Petralias A, Lykou A, Veloudaki A, Haviaris AM, Zota D, Papadimitriou E, Linos A. III World Congress of Public Health Nutrition, 9-12 November 2014, Las Palmas de Gran Canaria.
- “Perceptions and attitudes on healthy nutrition of parents and children, participating in a school-based feeding program in disadvantaged areas in Greece: A qualitative study”. Dalma A, Zota D, Kastorini C, Veloudaki A, Petralias A, Yannakoulia M, Linou A. III World Congress of Public Health Nutrition, 9-12 November 2014, Las Palmas de Gran Canaria.