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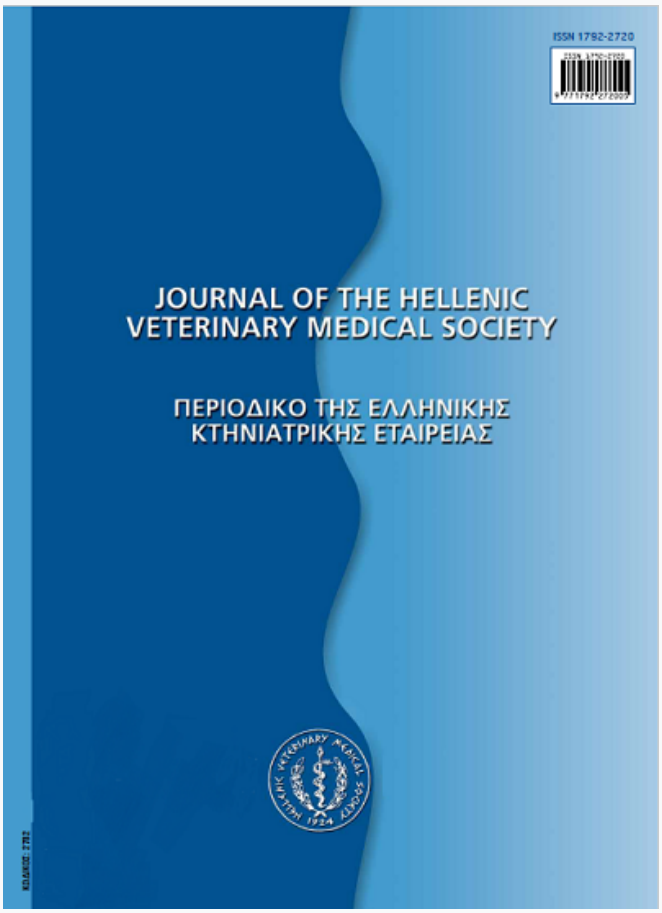

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Research article
Ερευνητικό άρθρο

Consumer Protection and Food Safety in Greece: Sanctions imposed by Hellenic Food Authority, in the years 2005-2013

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ABSTRACT. The enforcement of food safety legislation consists of a number of procedures, that may lead in certain cases in imposing administrative penalties and fines, in an effort to alter the nonconformity status of certain food establishments, according to the predefined legislative standards. The aim of this study is to evaluate data upon nonconformity of food establishments in Greece, in order to define trends and frequencies in the general framework of food safety and consumer protection. Hellenic Food Authority (EFET), the competent authority for food safety in Greece, during the period 2005-2013, imposed fines to food establishments that mount to 17,513,900€ for food safety violations. Most of the fines were imposed at mass catering establishments (21.6%) followed by supermarkets (16.2%), food industry (15.1%) and food manufacture establishments (10.7%). Moreover Attica Prefecture is the region with the highest, in number, imposed fines (32.4%), followed in descending order by the Prefecture of Central Makedonia (31.5%) and of Crete (9.6%). Significant difference, in imposing fines ($\chi 2$ test, $p \leq 0.05$), was observed between mass catering establishments and violations concerning: i. Good Hygiene Practice (GHP) ii. infrastructure, iii. consumer misleading, iv. sale of unsuitable foods, v. preservation temperatures, vi. lack of food handlers training in food safety, vii. lack of food handlers booklet and viii. traceability systems. Moreover significant differences were observed between the level of the imposed fine and the type of violations (t-test, $p \leq 0.05$) concerning: i. only or and GHP, ii. only or and the sale of unsafe foods and iii. only or and issues of consumer misleading. According to Pearson coefficient there is a weak negative although significant ($p \leq 0.001$) correlation between years and the level of the imposed fines ($r = -0.079$). In addition violations related to HACCP system, that resulted in imposing fines to food establishments by EFET in 2012, corresponded to 31.8% of the total delinquency concerning HACCP system ascertained by the Prefectural Directorates, that are in charge of official control in the field of food hygiene.

Keywords: food safety, hygiene, violations, sanctions

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INTRODUCTION

High profile food threats in the industrialized world, amplified by the media, have served to fuel consumer concerns and erode confidence in prevailing mechanisms of food safety controls (Henson & Jaffe, 2008; World Bank, 2005; Henson & Caswell, 1999). As a result consumer confidence in the efficacy of the enforcement of food safety legislation has been undermined (Berg, 2004; de Jonge *et al*., 2007; Eiser *et al*., 2002; Frewer *et al*., 1996; Houghton *et al*., 2008), with conspicuous instances of food safety failure perceived as "signals" of problems in the wide system of control. This public concern has placed increasing pressure on government agencies to be more proactive.

In this context, in Greece, in 1999, the Hellenic Food Authority (EFET) was enacted by Law 2741/1999. Its mission is the consumer protection by ensuring the import, production and distribution of safe food, and the prevention of consumer deception in relation to hygiene, composition, labeling, presentation and advertisement of foods. EFET, within its responsibilities, through its departments of Food Control in Prefectural level, conducts inspections to food establishments, in preventive and repressive level.

The fines to food establishments, until December 2013, had been imposed under Ministerial Decisions 15523/2006 and 10755/2006, for violations of food safety legislation. In January 2014 the Law 4235/2014 was adopted and introduced a new common ratification system in the field of food safety. Penalties with the new legislative framework were imposed from September 2014, due to administrative procedures for issuing circulars for the application of the new legislative framework. Though since February 2014 no official reports concerning fines at food establishments have been published in regular basis.

MATERIAL AND METHODS

The data of the study were derived from reports (press releases) issued by EFET, public available at its official website at: www.efet.gr, as well as from the Annual Reports of the Multi-Annual National Control Plans (MANCP) in the field of food safety. The data refers to 8 calendar years, from January 2005 until December 2013. The reports were coded per year and penalty case and the contexts of the press releases were studied meticulously, in order to extract information concerning i. the type of the food establishment to which fine was imposed (mass catering, supermarkets, food industry establishments, food manufacture establishments, bakeries, butcher shops, groceries, pastries, hotels' food services units, storage and food marketing firms, food production and trade establishments, bakeries & pastry shops, dairy plants, food import and trade establishments, confectionery outlets, fish stores, bottling companies, flee markets, hospitals' food services units, olive oil mill plants, street outlets, various other food businesses), ii. the type of infringements for which fine was imposed, iii. the number of infringements per case for which fines were imposed, iv. the amount (in number) of the fines imposed, v. the range of the imposed fines, vi. the Prefecture where the food establishment was active and vii. whether the infringements were observed after re-inspection. Following data entry, the data file was subject to a number of data validation procedures, as well as inter and intra variable checks. The data were registered in spreadsheets that turned out to have 2654 cases (rows) and 22 variables (columns).

The registered infringements were classified in thematic categories as follows, infringements associated to: i. infrastructure of the food establishment, ii. equipment of the establishment, iii. Good Hygiene Practice (GHP) iv. keeping of records, v. sale of unsafe food, vi. lack or inefficient application of Hazard Analysis Critical Control Point (HACCP) system, vii. lack of establishment's license, viii. modification of operation conditions of the food establishment without the appropriate licence (alteration of licence terms), ix. sale of irregular food, x. food preservation conditions, xi. lack of staff training in food safety, xii. lack of staff health booklets, xiii. Good Manufacture Practice (GMP), xiv. traceability systems and xiv. inhibition of official control. All these categories were grouped by the year that the fine was imposed, the amount of the fine, the range of the fine, the Prefecture where the food company was active and whether the infringement was found in re-inspection.

Moreover, the infringements concerning HACCP, GHP, the sale of unsafe food and the total number of violations, for which fines were imposed to food establishments from 2007 to 2013 from EFET, were compared to the overall delinquency data, as they are

presented at the public available official reports of the MANCP, published annually since 2007. The data presented at the above mentioned reports originated from reports from the Prefectural Directorates responsible in the field of food safety in Greece and more specifically the Prefectrural Directorates of i. Public Health, ii. Rural Economy and Veterinary Services, iii. Trade and iii. EFET Prefectural Directorates.

The statistical analysis was performed with IBM SPSS 20 and StatSoft Statistika 8.0 and for data corrections, transformations and graphical displays Open Office Calc 3.0 was used.

Descriptive statistics were performed, as well as chi-square test ($p \leq 0.05$), Pareto analysis and contingency coefficient test (for qualitative variables), Pearson correlation coefficient, ANOVA and t-tests ($p \leq 0.05$) (for quantitative variables, as the asymptotic normality assumption can be safely assumed because of the sample size) and eventually data mining analysis, with the "a priori" algorithm, among non parametric data in order to identify frequent item sets and association rules.

RESULTS

During the period 2005 - 2013 EFET imposed 2,654 fines to food establishments. The overal amount of the imposed fines was 17,513,900€, the average fine was 6,600.94€ (±275.17) while the maximum was 500,000€ and the minimum 500€. The highest percentage of fines was imposed in 2012 (19.9%), followed by the years 2013, 2011 and 2010 as it is shown in **Figure 1**.

The 64.2% of fines were below 5,000€, 28% of

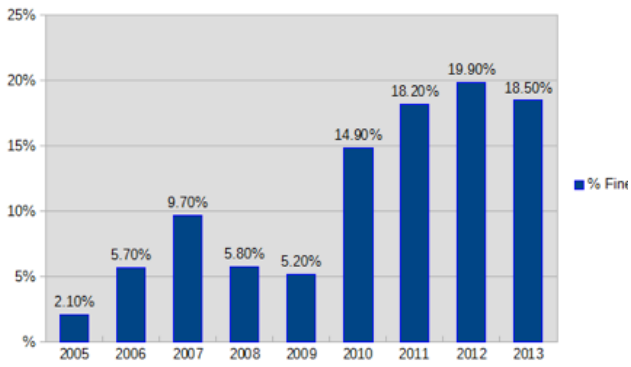


Figure 1: Per year percentage of the imposed fines

fine ranged from 5,000€ to 20,000€, while fines over 50,000€ were less than 1%.

According to the Pareto analysis the 80% of the fines were imposed in descending order at mass catering (21.6%), supermarkets (16.2%), food industry establishments (15.1%), food manufacture establishments (10.7%), bakeries (6.1%), butcher shops (4.1%), groceries (3.8%), various other food businesses (3.6%), storage and food marketing firms (3.4%) and pastries (2.2%)

Moreover the 80% of the fines imposed for violations pertained, in descending order: to sale of unsafe foods (20.84%), GHP (20.65%), inefficient or lack of implementation of HACCP system (11.55%), sale of unsuitable foods (10.31%), lack of operation licenses (8.43%) and infrastructure issues (5.91%). It should be mentioned that in a number of cases, fines were imposed because of more than one type of violations in a food establishment.

At **Table 1** we notice that in 58.5% of cases, fine

Table 1: Number of violations for which fines were imposed per food establishment

N of violations/food establishments	*%*
1 violation	*58,5*
2 violations	*28,6*
3 violations	*9,8*
4 violations	*2,2*
5 violations	*0,6*
7 violations	*0,2*
6 violations	*0,1*

was imposed for one (1) violation, in 28.6% for two (2) and lower rates for the rest of cases.

In 2007 the number of violations, for which fines were imposed by EFET, accounted to 6.1% of the total figures of delinquency reported by the Prefectural Directorates in charge of official control in the field of food safety in a wide range of food establishments (manufacturers & packers, distributors & transporters, retailers, food service business, manufacturers selling primarily on a retail basis), which fall under the provision of Regulation 852/2004. The relevant rates for the years 2007-2013 are shown in **Figure 2.**

The violations upon GHP regulations, that resulted in imposing fines in 2010 by EFET, accounted to 9.4% of the total figure delinquency concerning GHP, reported by the Prefectural Directorates, in the above

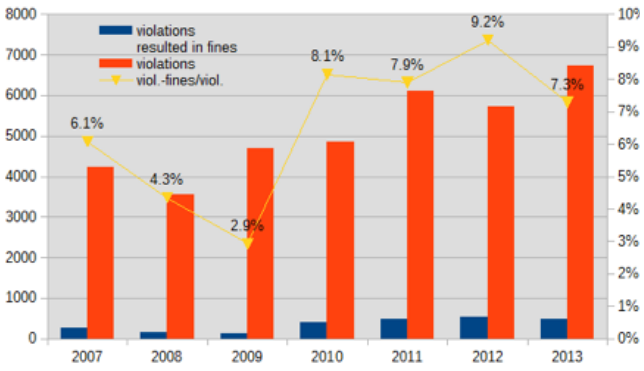


Figure 2: Rate of violations, where fines were imposed, over the total figures of delinquency per year (2007-2013).

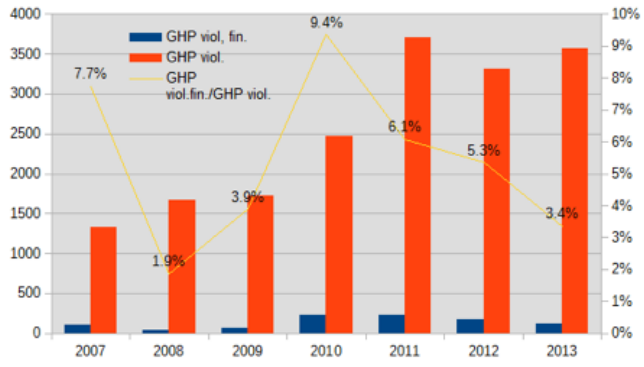


Figure 3: Rate of violations concerning GHP, where fines were imposed, over the total figures of delinquency concerning GHP, per year (2007-2013).

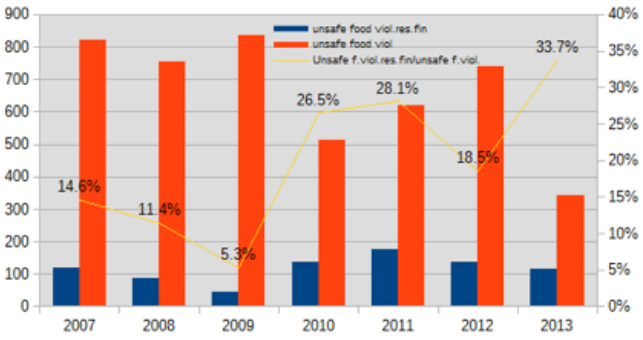


Figure 4: Rate of violations concerning sale of unsafe food, where fines were imposed, over the total figures of delinquency concerning unsafe food per year, (2007-2013).

mentioned food establishments. The relevant rates for the years 2007-2013 are shown in **Figure 3**.

The violations pertained to sale of unsafe foods, that resulted in imposing fines to food establishments by EFET in 2013, accounted to 33.7% of the total figures of delinquency concerning unsafe foods reported by the Prefectural Directorates, that were in charge of official control in the field of food safety in the above mentioned food establishments. The relevant rates for the years 2007-2013 are shown in **Figure 4**.

The violations pertained to the inefficient or lack of implementation of HACCP system, that resulted in imposing of fines to food establishments by EFET in 2012, accounted to 31.8% of the total delinquency concerning HACCP system reported by the Prefectural Directorates, that were in charge of official control in the field of food safety in the above mentioned food establishments. The relevant rates for the period 2007-2013 are shown in **Figure 5**.

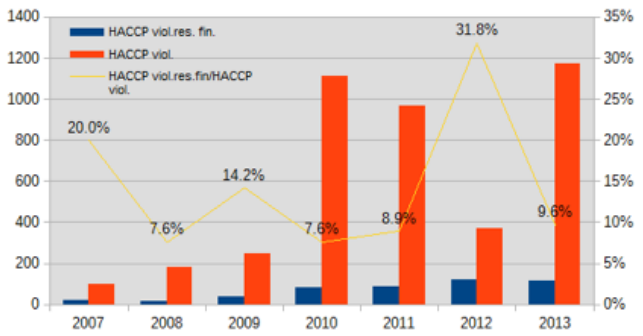


Figure 5: Rate of violations concerning HACCP system, where fines were imposed, over the total figures of delinquency concerning HACCP per year (2007-2013).

Significant differences were observed between the type of food establishments and the type of violations, in imposing fines (χ^2 test, $p \leq 0.05$), in the following cases:

- mass catering and violations concerning: i. GHP, ii. infrastructure, iii. consumer misleading, iv. alteration of license's terms, v. sale of unsuitable foods, vi. preservation temperature of foods, vii. lack of food handlers training in food safety, ix. lack of food handlers booklet and x. traceability system.
- supermarkets and violation concerning: i. sale of unsafe foods, ii. inefficient or lack of implementation of HACCP system, iii. consumer misleading, iv. alteration of terms of license, v. sale of unsuitable foods, vi. lack of operation license, vii. lack of food handlers booklet and ix. traceability system.
- food industry and violation concerning: i. GHP ii. sale of unsafe foods, iii. inefficient or lack of implementation of HACCP system, iv. consumer misleading, v. alteration of terms of license, vi. sale of unsuitable foods, vii. lack of operation license, viii. preservation temperature of foods, ix. lack of food handlers training in food safety, x. lack of food handlers booklet and xi. traceability systems

According to Contingency Coefficient test the relationship between food establishments and violations, for which fines were imposed, is low (o -0,30),

Table 2: Pareto Analysis of the frequency of fines' per Prefecture

Perfecture of	Count	%
Attica	860	32.4%
Central Makedonia	837	31.5%
Crete	255	9.6%
Thessaly	230	8.7%
West Greece	158	6.0%
Ipeirous	136	5.1%
East Makedonia & Thrace	105	4.0%
Ionian Islands	30	1.1%
Peloponnese	17	0.6%
North Aigaiou	11	0.4%
Sterea Greece	9	0.3%
West Makedonia	5	0.2%

The 80% of fines, according to the Pareto analysis, imposed, in descending order, to Prefecture of Attica (32.4%), of Central Makedonia (31.5%) and of Crete (9.6%) (**Table 2)**.

Significant differences were observed between the following types of violations and Prefectures, in imposing fines (χ^2 test, $p<0.05$):

- violations concerning the sale of unsafe foods and Prefecture of: i. Attica, ii. Central Makedonia, iii. Thessaly, iv. Crete, v. Ionian Islands and vii. East Makedonia & Thrace.
- violations concerning GHP and Prefecture of: i. Attica , ii. Central Makedonia, iii. Thessaly and iv. Crete.
- violations concerning the inefficient or lack of implementation of HACCP system and Prefecture of: i. Attica, ii. Central Makedonia, iii. Epeirous and iv. West Greece.
- violations concerning the sale of unsuitable foods and Prefecture of: i. Thessaly, ii. Crete, and iii. Epeirous.
- violations concerning the lack of food handlers training in food safety and Prefecture of: i. Attica, ii. Central Makedonia, iii. Thessaly and iv. Crete
- According to Contingency Coefficient test the relationship between food establishments, to which fines were imposed and Prefectures where these companies were active, is medium (0,677).

In addition significant differences were observed between the level of the imposed fine and the type of violations (t-test, $p \leq 0.05$) concerning: i. only or and GHP (mean=8,162.13€, ±737.61€, minimum=1,000€), ii. only or and sale of unsafe foods (mean =7,632.71€, ±672.63€, minimum=1,000€), iii. only or and consumer misleading (mean=9,842.79€, ±1,044.90€ minimum=500€). According to Pearson correlation, as the years go by, the level of the imposed fines is reduced ($r= -0.079$) ($p \leq 0.001$).

Moreover significant differences were observed between the level of the fines imposed to food establishments and Prefectures of Central Makedonia (mean=7,801.55€, ±397.56€), Thessaly (mean=5,126.09€, ±509325€), Crete (mean=3,970.59€ ±266.85€) and West Greece (4,481.01€ 334.97€) (t-test, $p<0,05$).

Table 3: Association rules resulted from the use of "a priori" algorithm

Body	==>	Head	Support(%)	Confidence(%)	Correlation(%)
2013	==>	<5,000	14.43	78.00	41.88
Mass catering	==>	<5,000	15.97	73.86	42.88
2012	==>	<5,000	14.50	73.05	40.63
2011	==>	<5,000	12.05	66.25	35.28
Unsuitable foods	==>	<5,000	10.17	63.98	31.84
Attica Prefecture	==>	<5,000	20.68	63.83	45.36
Unsafe food	==>	<5,000	18.19	56.62	40.07
GHP	==>	<5,000	17.93	56.33	39.67
Central Makedonia Prefecture	==>	<5,000	17.25	54.71	38.36
5,000 to 20,000	==>	Unsafe food	11.34	40.51	37.80
Central Makedonia Prefecture	==>	GHP	12.32	39.06	38.88
5,000 to 20,000	==>	Central Makedonia Prefecture	10.88	38.89	36.64
GHP	==>	Central Makedonia Prefecture	12.32	38.69	38.88
Central Makedonia Prefecture	==>	Unsafe food	12.17	38.59	38.22
Unsafe food	==>	Central Makedonia Prefecture	12.17	37.86	38.22
5,000 to 20,000	==>	GHP	10.58	37.81	35.46
Unsafe food	==>	5,000 to 20,000	11.34	35.28	37.80
Central Makedonia Prefecture	==>	5,000 to 20,000	10.88	34.52	36.64
GHP	==>	5,000 to 20,000	10.58	33.25	35.46
<5000	==>	Attica Prefecture	20.68	32.23	45.36
<5000	==>	Unsafe food	18.19	28.36	40.07
<5000	==>	GHP	17.93	27.95	39.67

The association rules that resulted from the "a priori" algorithm are presented below in Table **3**. These rules have got a certain rate of support, confidence and correlation and can be used for the composition of logical assumptions, where the "**body**" is the "**IF**" and the "**head"** is the "**THEN**" and "**,**" is the "**AND**".

So:

If the fine was imposed in 2013, **then** its level would be <5000€ (with a rate of confidence 78%).

If the fine was imposed to mass catering establishment, **then** its level would be <5.000€, with a rate of confidence 73,86%.

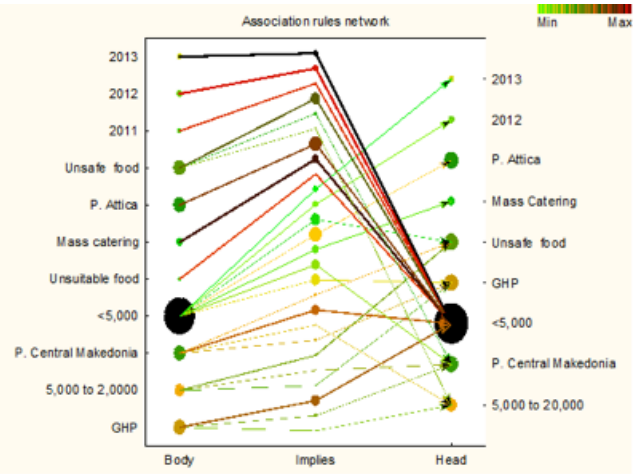
If the fine was imposed for the sale of unsuitable food, **then** its level would be <5.000€, with a rate of confidence 63,98%.

The following Graph (**Graph 1**) illustrates the most important association rules.

DISCUSSION

The changes in food systems and in consumer expectations have placed additional stress on the need for better control of food safety risks (Marian Garcia Martinez, *et. al.* ,2007; Lupien JR, 2007) and for imposing adequate sanctions.

Of particular interest is the implementation of HACCP system, that is obligatory according to Regulation 852/2004, since 2006, at all types of food establishments. During the period 2005-2013, the implementation of HACCP was not the case for several types of food establishments, like mass catering, food industry, food manufacturing establishments, supermarkets, hotel catering and bakeries. In 2010 the rate of delinquency concerning HACCP was high, though the rate of violations concerning HACCP that resulted in imposing fines from EFET to the total delinquency concerning HACCP that year was only 7.6%. In 2012 the delinquency concerning HACCP was lower than 2010, although the rate of violations concerning HACCP that resulted in imposing fines from EFET to the total delinquency concerning HACCP this year was very high.



Graph 1: Net of association rules with min support of 10% occurrence *(at this graph the thickness of each line is proportional to the percentage of confidence, the size of each dot is proportional to the rate of support, the central dots implies the rate of support of the rule, while the lateral dots implies the support rate of each case separately).*

The number of fines concerning violations of GHP predominate in the case of mass catering establishments in comparison with all the other types of food establishments. The delinquency concerning GHP was the highest in 2011 (during the period 2007-2013), according to MANCP, though the rate of violations concerning GHP, that resulted in imposing fine from EFET in relation to the total delinquency concerning GHP this year, was at 6.1%.

In addition, in 2009 we notice the lowest rate of violations that resulted in imposing fines from EFET in relation to the total delinquency according to the MANCP, while the highest rate was observed in 2012, during the period 2007-2013.

Moreover the rate of violations that resulted in imposing fines during the period 2007-2013 to the overall delinquency according to the MANCP was higher for the violation concerning unsafe food, than to violations concerning GHP or HACCP.

As the years go by, the level of the imposed fines is reduced that proves that the food law enforcement practices gradually have an effect on reducing delinquency. On the other hand the increase of the number of fines imposed to food establishments, during the period 2005-2013, from EFET, is due to the increase of the establishment of EFET's Prefectural Directorates and the increase of the number of its staff.

The high rates of fines imposed to mass catering, super markets and food industry, is due to the policy design of food control plan, by EFET administration,

derived from the analysis and evaluation of food control results of each year and from the application of a risk based food inspection program.

Most of the fines are imposed to food establishments, that have their premises in Prefecture of Attica (32.4%) and Central Makedonia (31.5%). This is due to the fact that more than half of Greek population is gathered to these two (2) Prefectures and it's a parameter that EFET administration takes into consideration in the design of food control plans. Though it's remarkable that in Cyclades, EFET has imposed no fine during the period 2005-2013 and at Dodekanisa Prefecture only one (1). This is due to the fact that EFET organizational development has not been completed, because of the lack of financial resources and political will.

CONCLUSION

According to article 11 of Regulation (EU) 2017/625 on official controls the competent authorities in the field of food safety shall ensure the regular and timely publication on information on the type, number and outcome of official controls, the type and number of cases of non-compliance detected and establish procedures to ensure that any inaccuracies in the information made available to the public are appropriately rectified.

The development of a European platform, where all the Member States of the European Union would be able to publish enforcement measures and penalties imposed to food establishments could contribute to the increase of transparency in the sector of food safety, the protection of European consumer health and interests and the comparison of sanctions in this field between the competent authorities of the Member-States (M-S)

CONFLICT OF INTEREST

The authors declare no conflict of interest..

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