University of Brescia

Department of Economics and Management

Scientific Conference on

Statistics for Health and Well-being

University of Brescia

Department of Economics and Management

25 – 27 September 2019

ASA CONFERENCE 2019
Statistics for Health and Well-being

BOOK OF SHORT PAPERS

Maurizio Carpita and Luigi Fabbris
Editors

ASA Conference 2019 - Book od Short Papers
Statistics for Health and Well-being
University of Brescia, September 25-27, 2019
Maurizio Carpita and Luigi Fabbris (Editors)

ISBN: 978-88-5495-135-8
This Book is published only in pdf format.

Copyright © 2019 CLEUP sc
Cooperativa Libraria Editrice
University of Padova
via G. Belzoni 118/3
35121 Padova
info@cleup.it

INTRODUCTION

This Book includes a selection of 53 peer-reviewed short papers submitted to the Scientific Conference "*Statistics for Health and Well-Being*", held at the University of Brescia from 25 to 27 September, 2019.

The Conference, aimed at promoting applications that use statistical techniques and models suitable for health and well-being analyses, was organized by the ASA (Association for Applied Statistics) and the DMS StatLab (Data Methods and Systems Statistical Laboratory) of the Department of Economics and Management, University of Brescia.

The programme of the Conference included 25 parallel sessions with a total of 82 contributions with about 100 attendants, 4 plenary sessions (organised by ISTAT, the Italian National Statistical Institute, and USCI, the Statistical Union Italian Municipalities; SIS, the Italian Statistical Society, and ASA; AICQ-CN, the Italian Association for Quality Culture-North and Centre of Italy, and AISS, the Italian Academy for Six Sigma; and DBSPORTS, Big Data Analytics in Sports Project, respectively) and 4 special events (ISTAT and ASA Open Conference with the President of ISTAT, IASA Sensory Experiment, Visit to Capitolium, and Kick-off meeting ISI-SPG in Sports Statistics). Thank you very much to Eugenio Brentari, Chair of the Local Program Committee. For more information about the programme and other material visit the website www.sa-ijas.org/statistics-for-health-and-well-being/.

As co-chairs of the ASA Conference 2019, we are very grateful to the authors for submitting their interesting research with various real application of statistics in so many contexts of health and well-being, and to the members of the Scientific Committee for collaborating to the peer-reviewing process.

October, 2019

Co-chair Scientific Program Committee

Maurizio Carpita
University of Brescia

Luigi Fabbris
University of Padova

Conference session topics include, but are not limited to, the following areas of special interest:

Health and healthcare
Education and health
Health Psychology
Work and life balance
Economic well-being
Social relationships and social health
Welfare and well-being
Safety and security
Subjective well-being
Environment and pollution
Innovation, research and creativity
Quality of health services
Equitable and sustainable well-being
Resilience and vulnerability
Sport, Health and wellbeing
Sport analytics
Health and fitness
Sport psychology
Statistics and tourism
Food and beverage, health, well-being and life quality
Qualitative and quantitative methods for sensory analysis
Psychology and food
Food and beverage industries and markets
Methods and models for health and well-being analysis
Technology for health analysis

Scientific Program Committee:

Luigi Fabbris (University of Padua, co-chair)
Maurizio Carpita (University of Brescia, co-chair)

Giuseppe Arbia (SIS - Università Cattolica di Milano)
Rossella Berni (University of Florence)
Matilde Bini (SIS - European University of Rome)
Giovanna Boccuzzo (University of Padova)
Eugenio Brentari (University of Brescia)
Vittoria Buratta (ISTAT)
Giulia Cavrini (University of Bolzano-Bozen)
Alessandro Celegato (AICQ-AISS, PSV Project Service and Value)
Giuliana Coccia (ISTAT)
Adriano Decarli (University of Milan)
Tonio Di Battista ('G. D'Annunzio' University of Chieti and Pescara)
Simone Di Zio ('G. D'Annunzio' University of Chieti and Pescara)
Benito Vittorio Frosini (Sacred Heart Catholic University of Milan)
Antonio Giusti (University of Florence)
Silvia Golia (University of Brescia)
Maria Gabriella Grassia (Federico II University of Naples)
Maria Iannario (Federico II University of Naples)
Domenica Fioredistella Iezzi (Tor Vergata University of Rome)
Michele Lalla (University of Modena and Reggio Emilia)
Fabio Lucidi (SIPSA - La Sapienza University of Rome)
Marica Manisera (University of Brescia)
Paolo Mariani (University of Milan-Bicocca)
Francesco Mola (University of Cagliari)
Antonio Mussino (La Sapienza University of Rome)
Luigi Odello (International Academy of Sensory Analysis)
Francesco Palumbo (Federico II University of Naples)
Maurizio Pessato (Assirm)
Alessandra Petrucci (University of Florence)
Alfonso Piscitelli (Federico II University of Naples)
Marco Trentini (Unione Statistica Comuni Italiani)
Fabio Vernau (Federico II University of Naples)
Domenico Vistocco (Federico II University of Naples)
Paola Zuccolotto (University of Brescia)

Local Program Committee:

Eugenio Brentari (University of Brescia, chair)

Maurizio Carpita (University of Brescia)
Silvia Golia (University of Brescia)
Marica Manisera (University of Brescia)
Manlio Migliorati (University of Brescia)
Anna Simonetto (University of Brescia)
Marika Vezzoli (University of Brescia)
Mariangela Zenga (University of Milano-Bicocca)
Paola Zola (University of Brescia)
Paola Zuccolotto (University of Brescia)

Visit to the Capitolium. Brescia, 26th September 2019

INDEX OF SHORT PAPERS

Giuseppe Alfonzetti, Laura Rizzi, Luca Grassetti, Michele Gobbato
Observed expenditures vs estimated burden of health care: a comparative evaluation based on spatial analysis ..... pag. 1

Pietro Amenta, Antonio Lucadamo, Gabriella Marcarelli
Computing ordinal consistency thresholds for pairwise comparison matrices ..... pag. 5

Ilaria Lucrezia Amerise, Agostino Tarsitano
Household wealth and consumption in Italy: analysis by density-weighted quantile regression ..... pag. 9

Fabrizio Antolinia, Francesco Giovanni Truglia
Ecotourism and food geographic areas ..... pag. 13

Bruno Arpino, Silvia Bacci, Leonardo Grilli, Raffaele Guetto, Carla Rampichini
Issues in prior achievement adjustment for value added analysis: an application to Invalsi tests in Italian schools ..... pag. 17

Silvia Bacci, Bruno Bertaccini, Alessandra Petrucci
Museum preferences analysis: an item response model applied to network data ..... pag. 21

Chiara Bocci, Silvana Salvini
Elderly with and without children: do they report different health conditions? ..... pag. 25

Chiara Bocci, Laura Grassini, Emilia Rocco
A multi-inflated hurdle regression model for the total number of overnight stays of Italian tourists in the years of the economic recession ..... pag. 29

Riccardo Borgia, Elena Castellari, Paolo Sckokai
Family lifestyle habits: what is passed down from adults to children? ..... pag. 33

Elena Bortolato, Luigi Fabbris, Marco Vivian
Quantity and mood of final open-ended comments on an Erasmus+ VET mobility questionnaire pag. 37

Rafaela Soares Bueno, Luiz Sá Lucas, Ana Carolina Sá Lucas
Balancing multi-class imbalanced data into a training dataset using SCUT method ..... pag. 41

Stefania Capecchi, Carmela Cappelli, Maurizio Curtarelli, Francesca Di Iorio
Investigating well-being at work via composite indicators ..... pag. 45

Maurizio Carpita, Enrico Ciavolino, Paola Pasca
Exploring the statistical structure of soccer team performance variables using the Principal Covariates Regression ..... pag. 49

Maurizio Carpita
The mobile phone big data tell the story of the impact of Christo's The Floating Piers on the Lake Iseo ..... pag. 53

Daniela Caso, Maria Iannario, Francesco Palumbo
Athletes' mental skills, personality and other drivers to assess the performance in a study on volleyball ..... pag. 57

Rosanna Cataldo, Maria Gabriella Grassia, Marina Marino
Partial Least Squares Path Modelling approach for sustainability using qualitative information ... pag. 61

Carlo Cavicchia, Pasquale Sarnacchiaro, Maurizio Vichi
A composite indicator via hierarchical disjoint factor analysis for measuring the Italian football teams' performances ..... pag. 65

Giulia Cavrini, Andrea Lazzerini
The determinants of vaccination behaviour of general practitioners in South Tyrol: Differences and similarities between Italian and German respondents..... pag. 69

Anna Crisci, Luigi D'Ambra
Analysis of the financial performance in Italian football championship clubs via longitudinal count data and diagnostic test ..... pag. 73

Angela Maria D'Uggento, Nunziata Ribecco, Ernesto Toma, Ignazio Grattagliano
Cyberbullying: a threat for relationships and social health..... pag. 77

Cristina Davino, Pasquale Dolce, Stefania Taralli, Domenico Vistocco
Quantile Composite-based path modelling to handle differences in territorial well-being ..... pag. 81

Gioia Di Credico, Jerry Polesel, Luigino Dal Maso,Carlo La Vecchia, Francesco Pauli, Nicola Torelli, Valeria Edefonti
Modeling the joint effect of intensity and duration of alcohol drinking with bivariate spline models pag. 85

Matteo Di Maso, Laura Tomaino, Monica Ferraroni, Carlo La Vecchia, Valeria Edefonti, Francesca Bravi
Potential impact fraction for a continuous risk factor: assessing the burden of oral and pharyngeal cancer according to the adherence to the healthy eating index..... pag. 89

Leonardo Egidi, Nicola Torelli
Comparing statistical models and machine learning algorithms in predicting football outcomes .. pag. 93

Rosa Fabbricatore, Carla Galluccio, Cristina Davino, Daniela Pacella, Domenico Vistocco, Francesco Palumbo
The effects of attitude towards Statistics and Math knowledge on Statistical anxiety: a path model approach ..... pag. 97

Luigi Fabbris, Alessandra Andreotti, Bruno Genetti, Paolo Vian, Claudia Mortali, Luisa Mastrobattista, Adele Minutillo, Roberta Pacifici
Personal and familial determinants of gambling risk among adolescent Italian students ..... pag. 101

Francesca Fortuna, Giulia Caruso, Tonio Di Battista
A functional data analysis of Google Trends on health and wellness ..... pag. 105

Alberto Franci, Pietro Renzi
Measuring health inequalities: some application in Marche region ..... pag. 109

Carlotta Galeone, Rossella Bonzi, Federica Turati, Claudio Pelucchi, Carlo La Vecchia
Socioeconomic inequalities and cancer risk: the challenges and opportunities of worldwide epidemiological data consortia..... pag. 113

Ilaria Giordani, Gaia Arosio, Ilaria Battiston, Francesco Archetti
A data analytics framework: medical prescription pattern dynamics ..... pag. 117

Laura Giuntoli, Giulio Vidotto
Applying network modelling to uncover the relationships among well-being dimensions..... pag. 121

Francesca Greco, Silvia Monaco, Michela Di Trani, Barbara Cordella
Emotional text mining and health psychology: the culture of organ donation in Spain..... pag. 125

Elena Grimaccia, Alessia Naccarato
Validation of a food insecurity scale through structural equation models..... pag. 129

Maria Iannario, Domenico Vistocco, Maria Clelia Zurlo
A mixture model with discrete variables for depression diagnosis in infertile couples ..... pag. 133

Rosaria Lombardo, Ida Camminatiello, Antonello D'Ambra
Three-way log-ratio analysis for assessing sport performance..... pag. 137

Alessandro Lubisco, Stefania Mignani, Carlo Trivisano
Assessment of game actions performance in water polo: a data analytic approach ..... pag. 141

Luiz Sá Lucas, Ana Carolina Sá Lucas, Rafaela Bueno
Selecting features for Machine Learning in Alzheimer's diagnostics ..... pag. 145

Paolo Mariani, Andrea Marletta, Nicholas Missineo
Missing values in social media: an application on Twitter data ..... pag. 149

Milica Maricic
Application of multivariate statistics in sports: exploration of recall and recognition of UEFA Champions League sponsors..... pag. 153

Daria Mendola, Paolo Li Donni
Short-run and long-run persistence of bad health among elderly ..... pag. 157

Vittorio Nicolardi, Caterina Marini
Harmonised Administrative Databases: a new approach in the era of Big Data ..... pag. 161

Antonio Notarnicola, Vito Santarcangelo, Nicola Martullib, Francesco Abbondanza
The blockchain for the certification of the dairy supply chain, the "Lucanum" basket and the bakery products for well-being ..... pag. 165

Omar Paccagnella, Ilaria Zanin
Another look at the relationship between perceived well-being and income satisfaction ..... pag. 169

Anna Parola, Francesco Palumbo
Profile pattern of italians NEET by nonlinear PCA..... pag. 173

Anna Maria Parroco, Vincenzo Giuseppe Genova, Laura Mancuso, Francesca Giannone
Assessing mental health therapeutic communities functioning ..... pag. 177

Eugenio Pomarici, Alfonso Piscitelli, Luigi Fabbris, Raffaele Sacchi
A pre-post sensory experiment on the effect of a seminar on olive oil preferences of Italian consumers..... pag. 181

Luca Romagnoli, Luigi Mastronardi
Understanding local administrations policies effects on well-being in Italian inner areas..... pag. 185

Vito Santarcangelo, Emilio Massa, Diego Carmine Sinitò, Giuseppe Scavone
Intelligent systems to support patients ..... pag. 189

Anna Simonetto, Silvia Golia, Buirma Malo, Gianni Gilioli
Food quality perception in children: a comparison between Bayesian Network and Structural Equation Modelling..... pag. 193

Federico M. Stefanini, Yura Loscalzo
The studyholism comprehensive model: towards a bayesian reanalysis ..... pag. 197

Alessio Surian, Andrea Sciandra
City Prosperity Index: a comparative analysis of Latin American and Mediterranean cities based on well-being and social inclusion features ..... pag. 201

Emma Zavarrone, Maria Gabriella Grassia, Rocco Mazza
Invariance in the structural topic models ..... pag. 205

Paola Zola, Costantino Ragno, Paulo Cortez
Inferring Twitter users home location based on trend topics..... pag. 209

Assessing mental health therapeutic communities functioning

Anna Maria Parroco[a], Vincenzo Giuseppe Genova[b], Laura Mancuso[a], Francesca Giannone[a]

[a] Department of Psychology, Educational Science and Human Movement, University of Palermo, Italy.

[b] Department of Economics, Business and Statistics, University of Palermo, Italy.

1. Introduction

This work is part of a research that aims at introducing empirical investigation methods for understanding and evaluating treatments in Mental Health. A commitment that is attributable to a more general clinical and social requirements: the ethical and scientific interest of the professional community of Mental Health for the promotion of effective care interventions as well as the entrepreneurization processes of the health sector which is designed to identify and consolidate proven effective care practices.

The aim of this paper is the evaluation of the functioning of residential therapeutic communities for severe patients (Angelini *et al*. 2017). Therapeutic communities are complex settings where numerous organizational and relational variables act (structures, activities, care characteristics, relationship between members, group dynamics). The empirical assessment of their functioning is a complex challenge, with clear implications for the promotion of effective interventions and for the improvement of the quality of care. The results of this study constitute a first step forward to understand, through a quantitative approach, a context which is complex both for the multiplicity of the involved stakeholders and the treatment variables to be analyzed.

2. Materials and methods

In order to analyse functioning, survey data have been collected. Two instruments have been used to gather the data: a self-report questionnaire at an individual level and an assessment table at the community one. The first, the VIVACOM Questionnaire (VIsiting for VAluation of COMmunities), (Biaggini *et al*. 2012) consists of 77 items, clustered in ten dimensions representing the major areas of communities functioning (general organisation, personalisation and rights, therapeutic climate and setting comfort, general treatment features: individual and group, family-focused activities, resident and caregiver safety, staff management and training, organisational supplements and collaboration, clinical documentation and reporting system, quality assessment and research). Respondents are asked to give a score y_{ij} on these set of items, with a scale bonded at both ends (1 to 5). For each dimension an index of functioning (FI_i $i=1,2,..10$) has been calculated as the average of the items score assigned by the respondent. A general Functioning Index (FI) has also been obtained to get a general score for each community.

The assessment table, the GAS-SET (Grid for the Analysis of Set(ting)-Set) (Giannone and Lo Verso, 2011; Bruschetta, 2014) reports data on each community that mainly concern the range of services that aid and support the patient during the care program. The table is organized into different sections: structure data, collaborations, treatment data, intervention area, psychotropic drugs management, community regulation, activities area, staff member and patients data. Based on these information, several structural and organizational variables have been identified. In this study, variables have been aggregated to obtain dichotomous indicators, which assume value equal to 1 when the community offers a number of service equal or grater than the average, and 0 otherwise.

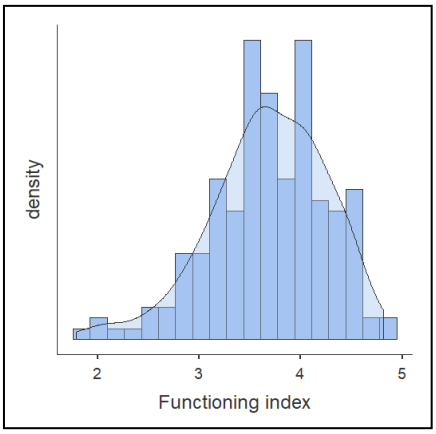
The sample under investigation includes 18 adult therapeutic communities, located in Italy,

ISBN: 978-88-5495-135-8

and 191 units. All the participants have been involved in the Visiting DTC project, a national Italian - training, evaluation, research and accreditation of "Community Group-Quality" project, promoted by LegaCoop-sociale.

As shown in figure 1, FI has an asymmetric distribution (*M = 3.68, S = 0.570*). Although it provides a synthetic measure of functioning, a tendency to assess functioning with medium and high scores (*Q1= 3.32; Q2=3,7)* has been observed. We think that this function could be considered as a *proxy* of the recognition, in staff members' perception, of a good work that has very often reached high levels of efficacy, so corresponding to the programmed targets.

Figure 1: FI Plot



The main descriptive statistics of the Functioning Index (FI) according to the levels of the factors with which it could be potentially associated, are reported in Table 1.

Table 1: Summary statistics of the Functioning Index by the levels of the potentially explanatory variables.

Variable	Categories	Functioning Index (FI)			
		N	Mean	Median	St.dev
Gender	F	129	3.72	3.73	0.561
	M	57	3.61	3.58	0.584
Age	<=30	19	3.76	3.71	0.559
	31-40	41	3.77	3.85	0.535
	41-50	45	3.70	3.73	0.525
	>=50	69	3.67	3.69	0.576
Professional Role	Expert	13	3.85	3.94	0.489
	Health	105	3.62	3.65	0.595
	Socio-Pedagogical	71	3.75	3.73	0.538
Collaborations	0	86	3.51	3.61	0.575
	1	105	3.82	3.82	0.530
Treatment data	0	64	3.51	3.53	0.657
	1	127	3.77	3.74	0.503
Intervention area	0	46	3.91	4.14	0.741
	1	145	3.61	3.63	0.486
Psycotropic drugs management	0	106	3.48	3.51	0.508
	1	85	3.94	4.06	0.543
Community regolation	0	73	3.50	3.53	0.546
	1	118	3.80	3.82	0.558
Activities area	0	56	3.65	3.67	0.555
	1	135	3.70	3.72	0.578

This first results reveal a high presence of women workers (69%) compared to men (31%). Nearly two out of three (65%) were more than 40 years of age while only 10% were younger than 30 years of age. Regarding their professional role, 60% of respondents carried out its role in

health, 30% in socio-pedagogical area, 10% were experts (psychologist, psychiatrist and pedagogist). The average values of FI conditioned to the levels of potentially explanatory variables (Col.4, Table 1) show that respondents working in communities whose number of activities is higher than the mean, award higher scores than the others, with the exception of intervention fields.

We are interested in the effects of the variables described in table 1 on FI. This presentation offers only the analysis of the general functioning index, as an example of the adopted method both for the sake of brevity and because data collection is still in progress. Due to the characteristics of Y, a beta regression model with random intercept, has been adapted and thus the dependent variable has been converted in a (0,1) interval (Verkuilen and Smithson, 2012). After estimating the null model without any explanatory variables, which highlights that the between-community variance is non-zero, a beta regression model, with a link logit and a random intercept was estimated.

3. Results

In order to consider the effects of the set of the considered independent variables on FI, the results relating to the estimated random intercept model are reported in Table 2. This model has been compared with the one including the fixed effects of all the independent variables above listed. The Chi-squared test used to evaluate the best fit of data does not show a significant difference between the two models, so only the estimates relating to the more parsimonious model have been reported.

Albeit subject to the limitations pointed out by the reduced sample size, which may explain a large part of overdispersion, these findings could make stakeholders reflect on some aspects of communities work. By analysing the estimates reported in Table 2, we observe that a positive effect on the dependent variable is higher when the indicators "Care data" and "Psychiatric drugs" take the '1' value, compared to the reference level, that is they count a greater number of interventions than the average. This is more evident for the "Care data-Section" for which the estimated coefficient is three times larger then the size of "Psychiatric drugs" estimated coefficient. In the opposite direction "Intervention Area" and "Activities Area" move: a positive effect is obtained as the number of activities related to these dimensions is below the average. Similarly looking at professional roles: for both levels of this variable, the results show a negative effect compared to the reference category, which is composed by experts.

Table 2: Model results

Random effect	Variance	Std. Dev		
Community (Intercept)	0,04561	0,2136		
Conditional model:	Estimate	Std. Error	Z value	Signif. level
(Intercept)	1,8897	0,2157	8,761	***
Treatment data	1,3383	0,3049	4,389	***
Intervention area	-0,6169	0,1482	-4,161	***
Psycotropic drug management	0,3314	0,1234	2,686	**
Activities area	-1,2856	0,3146	-4,086	***
Health role	-0,5389	0,1438	-3,755	***
Socio-pedagogical Role	-0,5084	0,1455	-3,47	***
Overdispersion parameter for beta family (): 32.9				
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				

So, among the variables examined by the Gas-Set, the activities indicated in the "Care data" section are those that seem to have the greatest impact on a positive evaluation of the communities functioning. These activities are related to the work of construction, sharing and transparency of therapeutic planning for individual users and for the regulation of community life. Conversely, a

greater commitment in the "intervention area" and "activities area" sections shows worse assessments. These results are more difficult to interpret: do the operators believe that the commitment to more areas of intervention and activities does not allow to sufficiently focus on their work? Is this true also on the relationship with the user? Could the awareness of the complexity and commitment for an adequate care intervention reduce the evaluation of the quality of one's work? The issue will require greater reflection and in-depth study.

4. Conclusion

As we have seen, the final results of this work appears to provide useful knowledge and insights into the community functioning as well as the model seems to have the potential for wider replication, even if some challenges remain. Based on empirical data, we have observed that advices received from health care professionals are better, primarily, when the community commitment is focusing on the implementation of customized therapeutic residential projects, shared therapeutic interventions, as well as when a democratic construction of the general regulation is adopted. It is also important the psychiatric drugs management system: promoting the user self-management and the taking in charge directly by the community and the involved services. The relationship with several auxiliary activities needs to be addressed further. Finally, to sum up, the use of a quantitative approach allows to identify specific, recognizable and in some way measurable actions, implicated in the functioning of these contexts, trying to connect "what is actually done" (Guarnaccia et al. 2019), with the evaluation of people living the experience and this could have a direct operational usefulness for the community stakeholders. Equally, conditions concerning the statistical model performance draw our attention to the need for a large sample, in order to put forward practical proposal for the improvement of the involved organizations under a framework based on significant variables to the understanding of the community therapeutic treatments.

References

Angelini A., Bruschetta S., De Crescente M., Gaburri L., Giannone F., Mingarelli L., Pismataro C.P., Vigorelli M. (2017). The “Visiting in Italy” project: origins, organisation and prospects. *Funzione Gamma*, **39**, pp. 1-18.

Bruschetta, S. (2014). GAS-Set Dispositivi terapeutici di sostegno all’abitare. In R. Barone, S. Bruschetta, and A. Frasca. *Gruppoanalisi e sostegno all’abitare*. Franco Angeli, Milano, pp.1-10.

Biaggini M., Bisanti R., De Crescente M., Gaburri L., Ghisotti N., Martini S., Moschetti S., Pismataro C., Vigorelli M. (2012). Visiting per la valutazione delle Comunità Terapeutiche. Manuale VIVACOM. In *Le Comunità Terapeutiche. Psicotici, borderline, adolescenti e minori*, eds A. Ferruta, G. Foresti, M. Vigorelli. Raffaello Cortina, Milano, pp. 551-564.

Giannone, F., Lo Verso, G. (2011). Epistemologia, Psicologia Clinica e Complessità. In *Gruppoanalisi Soggettuale*, eds G. Lo Verso, M. Di Blasi. Raffaello Cortina, Milano, pp. 17-57.

Guarnaccia, C., Ferraro, A.M., Lo Cascio, M., Bruschetta, S., Giannone, F. (2019). The SCIA Questionnaire: standards for communities for children and adolescents. A tool for the evaluation of good practices. *Therapeutic Communities: The International Journal of Therapeutic Communities*, (40), pp.1-15.

Verkulein, J., Smithson, M. (2012). Mixed and Misture regression Models for Continuous Bounded Responses Using the Beta Distribution. *Journal of Educational and Behavioural Statistics*, **37**(1), pp.82-113.

ISBN: 978-88-5495-135-8

A pre-post sensory experiment on the effect of a seminar on olive oil preferences of Italian consumers

Eugenio Pomarici[a], Alfonso Piscitelli[b], Luigi Fabbris[c], Raffaele Sacchi[d]
[a] Department of Land, Environment, Agriculture and Forestry, University of Padua, Italy.
[b] Department of Political Sciences, Federico II University of Naples, Naples, Italy.
[c] Department of Statistical Sciences, University of Padua, Padua, Italy.
[d] Department of Agricultural Sciences, Federico II University of Naples, Naples, Italy.

1. Introduction

The relative importance of different attributes of olive oil helps consumers to determine their preference for a hypothetical product (Van der Lans *et al.*, 2001; Krystallis and Ness, 2005; Mtimet *et al.*, 2013). Physical characteristics such as colour, taste, and flavour play an important role in consumers' perception (Grunert, 1997).

The purpose of this study was to measure the effect of information on taste and other sensory aspects of olive oils on a sample of Italian consumers. This paper describes the design and the results of a pre-post experiment aimed at evaluating the possible effects of a brief seminar on sensory perceptions of olive oil. The experiment was designed in such a way as to control the effects of both the selection of the sample of consumers treated with the seminar (namely, 'treated' vs 'control' samples) and the possible spontaneous maturation of treated consumers due to a pre-seminar measurement of their preferences for the same evaluated olive oils (namely, 'post' vs 'pre' measurement). The experimental design and the types of assessed olive oils are described in detail in Section 2.

The seminar, lasting about one hour, was held after a first tasting session and aimed to inform participants about the commercial classification of olive oils, their olfactory and flavour characteristics and problems, their aftertaste, and how to identify qualified and/or fresh oil. Olfactory sensations referred to fruity olive as well as tomato, artichoke, apple, eucalyptus, and other flavours. Tasting properties referred to a significant but not extreme sour and spicy sensation. The participants were involved in the topical issue of the seminar as if they were expert judges able to sensorily evaluate the chemical and physical qualities of oils. The participants showed interest in the seminar issues, asking questions and generally interacting with the experts giving the seminar.

Three categories of olive oils were included in the experiment: virgin, extra virgin, and crystal clear. Of these, the extra virgin one is considered the best. Some extra virgin productions can be protected either by a designation of origin (PDO) or by a "100% Italian" label. Crystal clear oils, though belonging to the general category of virgin oils, possess chemical and physical as well as organoleptic characteristics that make them unsuitable for human consumption. For this reason, they are refined and possibly mixed with other virgin oils and then commercialised as "olive oils".

In this paper, we present a synthesis of the results of the experiment (Section 3) and the conclusions drawn thereupon (Section 4).

2. Data and methods

A pre-post sensory evaluation experiment was conducted on five olive oils, four extra-virgin olive oils (EVOOs) and one olive oil. For the first tasting session, 246 assessors were randomly assigned either to the treated (n = 117) or to the control group (n = 129). After one week, the second tasting session involved 99 assessors who had in the meantime participated in the seminar and 106 who had not participated. The data analysis included only people who participated in both tasting sessions.

For each oil tasted, the assessors were asked to express a preferential judgment by stating a

ISBN: 978-88-5495-135-8