

11th Scientific Meeting of the SIS Group  
"Statistics for the Evaluation and Quality in Services"

# BOOK OF **SHORT PAPERS**

## Editors

Andrea Bucci

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**STATISTICAL METHODS  
FOR EVALUATION AND QUALITY:  
TECHNIQUES, TECHNOLOGIES AND TRENDS (T<sup>3</sup>)**

**IES 2023 - Statistical Methods for Evaluation and Quality:  
Techniques, Technologies and Trends (T<sup>3</sup>)**

## **BOOK OF SHORT PAPERS**

Editors: Andrea Bucci, Alfredo Cartone, Adelia Evangelista and Andrea Marletta

Book of Short papers  
11th International Conference **IES 2023**  
Statistical Methods for Evaluation and Quality: Techniques, Technologies and  
Trends (T<sup>3</sup>)

University 'G. d'Annunzio' of Chieti-Pescara



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# Preface

Statistical thinking, design and analysis play a crucial role in social life and are useful to society at large. Besides, promoting advanced methodological research is useful to facilitate the dissemination of ideas related to various fields of interest. For this purpose, experts in statistics, data analysis, data mining, statistical methods for decision making, machine learning and related methods come together to understand and analyse phenomena through data.

In line with this objective, the Statistics Group for the Evaluation and Quality of Services (SVQS; [www.svqs.it](http://www.svqs.it)) of the Italian Statistical Society (SIS) has been organizing the Innovation and Society (IeS) conference biennially since 2009, focusing on new developments and ideas in statistics applied to the evaluation and quality of public and private services, attracting national and international statisticians and data scientists. The meeting contributes to spot light on the main statistical approaches and methodologies for the evaluation of public services currently in use in different contexts, as well as to facilitate discussion on the impact of innovative statistical evaluation systems for these services, involving various economic and social policy actors.

The conference “Statistical Methods for Evaluation and Quality: Techniques, Technologies and Trends (T<sup>3</sup>)” recorded valuable contributions that are reported in this volume. The papers underscore how the growing availability of data has tasked social and economic actors, organizations, and researchers with the management and analysis of large volumes of unstructured and heterogeneous data. In recent years, many tools for both qualitative and quantitative models have been developed to better describe and understand complex systems and their underlying behaviors, and the papers reported in this volume bear witness to this.

Techniques, technologies and trends: the study of data complexity presents the potential to provide analyses with increased frequency and timeliness, accuracy and objectivity, and to define sustainable models. Traditional quantitative methods for capturing socioeconomic data have often shown limitations in their ability to examine underlying systems, and with the three ‘T’ just mentioned, the outlines of future developments are starting to emerge.

The volume reports 127 contributions in the following areas:

- Advanced statistical methods for pattern recognition
- Advances in statistical learning from high-dimensional data
- Data analysis for web sources
- Distance and depth-based statistical learning methods for robust data analysis

- Economics and environment
- Education and labour
- Inequalities in the labour market
- Innovations and challenges in official statistics
- Labour market: trends, perspectives and new challenges
- Methodological and applicative contributions for evaluating sustainable development
- Methodological developments and applications for the assessment of student competencies
- Networks data analysis: new perspectives and applications
- New advanced statistical methods for data science
- Recent advances in statistical learning and data analysis
- Statistical analysis and modeling of environmental pollution data
- Statistical methods and complexity for evaluation in finance
- Statistical methods and composite indicators for healthcare
- Statistical methods and models for land monitoring with spatio-temporal data
- Statistical methods for environmental monitoring and sustainability
- Statistical methods for the analysis of university student choices and academic performance
- Statistical methods for the assessment of transport services and sustainable emissions
- Statistical methods for education and educational services
- Statistics in sports
- Tourism and territory.

The Conference event attracted many contributions as well as numerous Authors, not just from Italy but also from abroad. Over the three-day meeting, the Community has the opportunity to witness some of the state-of-the arts, new trajectories, and methodological challenges in 24 solicited sessions, 7 sessions of free contributes, two round tables - organized by Maurizio Vichi and Matilde Bini respectively - and three keynotes sessions with Ron S. Kennet of Samuel Neaman Institute of Israel, Luigi D'Ambra of Federico II University of Naples, and the former Minister Enrico Giovannini from University of Tor Vergata.

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# Naples and tourism sustainability: A survey of citizens' perceptions

## *Napoli e la sostenibilità del turismo: Un'indagine sulla percezione dei cittadini*

Massimo Aria, Francesca Pagliara, Luca D'Aniello and Valentina Della Corte

**Abstract** Tourism development can significantly affect local communities, including their economic, social, cultural, environmental, and political aspects. This study examines residents' perceptions of tourism development in Naples, Italy, across ten municipalities. Using a questionnaire, we investigate how residents perceive tourism's impact on economic, environmental, cultural, social, and political factors. Our findings offer insights for developers and policymakers to address any negative impacts of tourism development on local communities.

**Abstract** *Lo sviluppo turistico può avere un impatto significativo sulle comunità locali, inclusi i loro aspetti economici, sociali, culturali, ambientali e politici. Questo studio esamina le percezioni dei residenti sullo sviluppo turistico a Napoli, Italia, in dieci comuni. Utilizzando un questionario, abbiamo indagato su come i residenti percepiscano l'impatto del turismo su fattori economici, ambientali, culturali, sociali e politici. I nostri risultati offrono spunti per gli sviluppatori e i responsabili delle*

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*politiche per affrontare eventuali impatti negativi dello sviluppo turistico sulle comunità locali.*

**Key words:** Tourism development, Tourism impact, Citizens' perceptions

## 1 Introduction

Tourism is a rapidly growing and massive industry that contributes significantly to the global GDP [11, 4]. Previous studies have explored the attitudes of local residents toward tourism development, revealing their awareness of both the positive and negative impacts of tourism [16]. While tourism can bring about increased income, job opportunities, better infrastructure, and the promotion of local culture, it can also result in higher living costs, increased property prices, congestion, crime, and drug abuse [3, 9]. Residents' perceptions of tourism development are critical, as they influence their support or opposition to it and numerous factors influence them, including economic gain, economic involvement, community attachment, environmental attitudes, level of involvement in the planning process, and demographic factors, which have been extensively studied in the literature [1, 12].

Naples is a popular destination for Italian and foreign tourists, drawn to the city's unique blend of art and everyday life. Despite the pandemic's impact on the tourism industry, Naples was recently recognized by CNN as one of the 22 dream destinations for 2022, emphasizing the importance of understanding residents' perspectives on tourism development in the city. As tourism plays a significant role in the city's economy, examining the impacts of this industry on residents is critical for policymakers and developers.

This study aims to explore the perceptions of Naples residents on the impacts of tourism development on their community, with a focus on economic, social, cultural, environmental, social, and political aspects.

## 2 Tourism in Campania: Impact and Forecast

Tourism in Campania is expected to surpass pre-pandemic levels in 2023, with the most notable case being Pompeii, where the total number of visitors at the archaeological site has already exceeded 2019 levels in the first two months of the current year. The overall success of tourism is predicted to see a further increase in tourist flows in 2023, in line with the national trend. According to the Demoskopika Institute's "Tourism Forecast 2023" report, Italy is expected to reach a record-high of 442 million accommodations, with Campania estimated to receive 5.7 million visitors. As tourism remains the region's primary source of income, signs of recovery for the sector are recorded on the incoming side. Demoskopika estimates nearly 6 million arrivals for the current year, representing an increase of 13.1% compared to last year. Currently, Naples is the primary attractor of regional tourist flows. In December, for

instance, 1.5 million tourists visited the city, occupying 80% of available hotels and *b&b* rooms in the first half of the month and 98% during the Christmas period [8].

The main objective of this study is to examine the impact of tourism in Naples, with a particular emphasis on the perceptions of the city's residents towards this significant influx of visitors and its effects on five critical factors: economic, environmental, cultural, social, and political. These factors were investigated through a survey by administering a questionnaire to the citizens of Naples.

### 3 Questionnaire design

A structured questionnaire was utilized for conducting the survey. It was submitted to the Naples' citizens between December 2022 and January 2023 through mixed modes of administration (CAWI and CAPI).

The questionnaire was organized into two sections. In the first one, several questions were provided aiming at investigating the factors that influence the respondent's perception of tourist development in the city of Naples. This section focused on five important factors, including economic, social, environmental, political, and cultural ones. Participants were asked to rate their agreement with statements using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The second section, on the other hand, pertained to the socio-demographic characteristics of the residents. In addition to the typical socio-demographic information, such as gender, age, and education level, respondents were also asked to indicate their municipality of residence in Naples. Although municipalities are not tourism-specific institutions, they are responsible for the planning and development of tourism in the Campania region [13]. This additional question aims to provide further insights into the respondents' perspectives and experiences, allowing for a more nuanced analysis of the data collected. Two questions were asked at the beginning of the questionnaire to filter respondents between those who reside in the city of Naples from those who do not. Out of 3017 distributed questionnaires, 2563 were valid ones (85% of the response rate), by considering only residents, i.e., people who live, work, or study in the city.

### 4 Data description

#### *Sample profile*

The sample analyzed in this study included 2563 residents of Naples, with 47.6% women, 50.41% men, and 1.99% who preferred not to answer about their gender. Regarding age, most of the respondents fell between 18-44 years old (57.63%), while only 0.55% were over 85 years old. Education-wise, 25.32% of participants held a degree, while 22.32% completed middle school. In terms of occupational status, the largest percentage of respondents (33.63%) were employed, followed by students

(15.33%), and retirees (7.84%). Only 14.05% of the participants worked in the tourism industry, while the remaining 85.95% did not.

To assess the general perception of tourism in Naples, participants were asked whether they perceived it as a cost or a benefit. The findings revealed that a substantial majority (95.67%) of respondents viewed tourism in Naples as a benefit.

#### *Distribution of responses among municipalities*

Asking respondents which of the 10 municipalities they resided in was used to investigate potential differences in perceptions of tourism development across different areas of Naples. By examining the questionnaire response rate in each district, it was found that approximately 10% of residents in each area responded, indicating a balanced distribution of responses across the city.

The results of a questionnaire-based study investigating how residents of the ten municipalities in the city of Naples perceive tourism and its impact on five different factors are displayed in Figure 1.

Questions about the impact of tourism has on the economy include issues related to the economic benefits and costs of tourism, such as the impact on employment, income, and local businesses. The median score for this factor ranged from 3 to 4, indicating a moderate level of agreement among participants. The environmental factor covers topics related to the impact of tourism on the natural environment, including pollution, waste management, the deterioration of water quality in the port area, and the loss of green spaces in the city. The median score for this factor ranged from 2 to 4, with a higher level of variability in participants' responses. The cultural factor reflects the perceived effects of tourism on the preservation and promotion of local culture and heritage. Questions explore whether tourism has increased residents' cultural pride, helps maintain local culture and identity, positively impacts residents' lives, and contributes to the preservation of historical sites and artistic events in the city. The median score for this factor ranged from 4 to 4.7, indicating a relatively high level of agreement among participants.

The questions relating to the political aspect aim to measure the role of local authorities in regulating and managing tourism activities. It is asked whether the policy cares for the interests of the community, manages the relationship between citizens' needs and tourism development, and takes into account citizens' voices in tourism-related choices. The goal is to evaluate whether tourism policy is active and responsive to citizens' needs and whether it can balance tourism development with the community's well-being. The median score for this factor ranged from 4 to 4.5, indicating a relatively high level of agreement among participants. The social factor covers topics related to the impact of tourism on the local community, including social cohesion, cultural exchange, and quality of life. The questions aim to measure the impact of tourism on the social aspect, concerning vandalism, crime rates, public transportation, and quality of public services. The median score for this factor ranged from 2.86 to 4, indicating a moderate to a high level of agreement among participants.

Overall, the results suggest that residents of the ten municipalities in Naples have varying perceptions of the impact of tourism on different factors, with higher levels of agreement observed for the cultural and political factors.

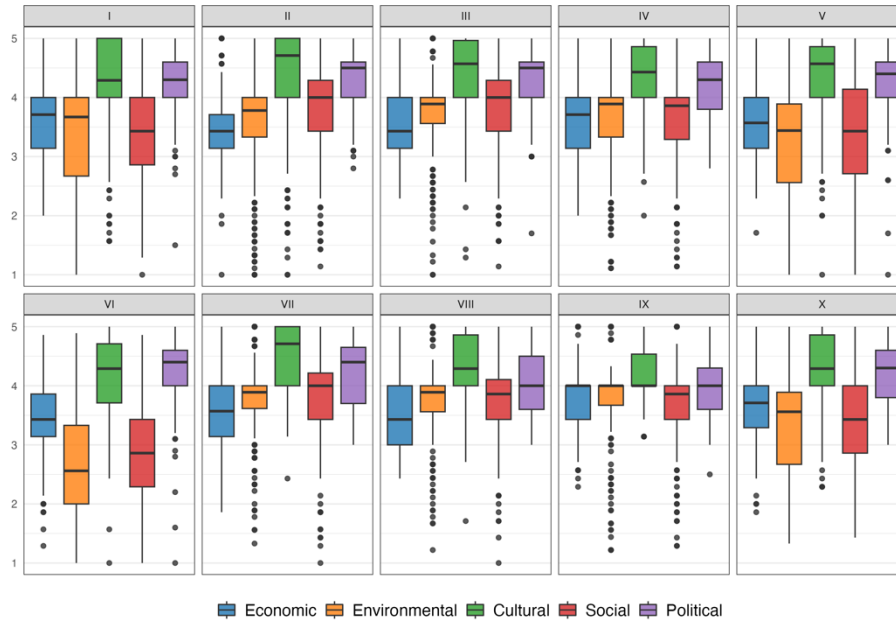


Fig. 1 Boxplot of responses about the five factors of tourism impact among ten municipalities.

## 5 Findings and future developments

The preliminary findings of this study suggest that residents perceive tourism as a positive force for the city's economic growth, cultural life, and identity. The presence of tourists from around the world is also seen as a positive experience, contributing to a sense of pride in their community. The findings of this study can provide valuable insights for policymakers and tourism stakeholders in developing strategies that can mitigate negative impacts and enhance positive ones, ultimately leading to more sustainable and responsible tourism practices.

To test the relationships among the theoretical models hypothesized in this study, future research will focus on testing these relations using the Structural Equation Modeling (SEM) statistical approach. This will allow for a more comprehensive understanding of the complex relationships between residents' perceptions of tourism development and its impacts on the economic, social, cultural, environmental, and political aspects of the community. This will provide a valuable contribution to the existing literature on the topic and inform policymakers and developers to promote sustainable tourism practices in a way that benefits both residents and tourists.

## References

1. Andereck, K.L., Nyaupane, G.P.: Exploring the nature of tourism and quality of life perceptions among residents. *Journal of Travel Research*, 50(3), 248–260 (2011)
2. Broy, M.: Software engineering --- from auxiliary to key technologies. In: Broy, M., Dener, E. (eds.) *Software Pioneers*, pp. 10-13. Springer, Heidelberg (2002)
3. Deery, M., Jago, L., Fredline, L.: Rethinking social impacts of tourism research: A new research agenda. *Tourism Management*, 33(1), 64–73 (2012)
4. Dileep, M.R., Pagliara, F.: *Transportation Systems for Tourism*. Springer (2023)
5. Dod, J.: Effective substances. In: *The Dictionary of Substances and Their Effects*. Royal Society of Chemistry. Available via DIALOG (1999)
6. Geddes, K.O., Czapor, S.R., Labahn, G.: *Algorithms for Computer Algebra*. Kluwer, Boston (1992)
7. Hamburger, C.: Quasimonotonicity, regularity and duality for nonlinear systems of partial differential equations. *Annali di Matematica Pura ed Applicata*, 169, 321-354 (1995)
8. Iuliano, V.: *Turismo, 2023 da record: In Campania previsto +12%*. [https://www.ilmattino.it/napoli/cronaca/turismo\\_campania\\_napoli\\_boom\\_stranieri-7263534.html#:~:text=Il%202023%20%C3%A8%20destinato%20a,campane%20sono%205%2C7%20milioni](https://www.ilmattino.it/napoli/cronaca/turismo_campania_napoli_boom_stranieri-7263534.html#:~:text=Il%202023%20%C3%A8%20destinato%20a,campane%20sono%205%2C7%20milioni). (2023)
9. Látková, P., Vogt, C.A.: Residents' attitudes toward existing and future tourism development in rural communities. *Journal of Travel Research*, 51(1), 50–67 (2012)
10. Leiper, N.: *Tourism Management*. Melbourne: RMIT Press (1995)
11. Morrison, A. M.: *Marketing and managing tourism destinations*, 2nd ed. London: Routledge (2019)
12. Nicholas, L.N., Thapa, B., Ko, Y.J.: Residents' perspectives of a world heritage site: The pitons management area. *Annals of Tourism Research*, 36(3), 390–412 (2009)
13. Pagliara, F., Aria, M., Russo, L., Della Corte, V., and Nunkoo, R.: Validating a theoretical model of citizens' trust in tourism development. *Socio-Economic Planning Sciences* 73, 100922. (2021)
14. Sharpley, R.: Host perceptions of tourism: A review of the research. *Tourism Management*, 42, 37–49 (2014)
15. Slifka, M.K., Whitton, J.L.: Clinical implications of dysregulated cytokine production. *J. Mol. Med.* doi: 10.1007/s001090000086. (2000)
16. Vareiro, L.M.D.C., Remoaldo, P.C., Cadima Ribeiro, J.A.: Residents' perceptions of tourism impacts in guimarães (Portugal): A cluster analysis. *Current Issues in Tourism*, 16(6), 535–551 (2013)