

Rethinking Crime Rates in the Context of the Floating Population: the Case of Ibiza

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ABSTRACT: Crime rates are calculated using data on the registered population in a territory. However, this methodology excludes a significant proportion of the population in certain territories experiencing demographic increases or fluctuations due to various circumstances. This is particularly striking in the case of Ibiza. Due to its characteristics and its tourism-based economic model, especially at certain times of the year, the island experiences significant demographic changes. During the summer months, large numbers of tourists, unregistered workers and other personnel arrive, which has a significant impact on crime rate calculations. This can pose serious problems for the management of public safety policies and affect perceptions of insecurity in these areas. Accurate data is essential for analysing the situation and implementing effective public security policies. However, the current situation and published figures offer a distorted view of crime incidence, as they do not take into account the actual population present, known as the 'floating population'. This research first analyses the evolution of crime on Ibiza between 2019 and 2024. Secondly, it employs two innovative methods to estimate the actual population in each municipality. The first method uses tourist accommodation as a basis, while the second uses the amount of solid waste produced in the different municipalities as a quantifiable factor to estimate human pressure.

KEY WORDS: Crime rates, floating population, tourism and crime, urban criminology, security planning.

REPENSANDO LAS TASAS DE CRIMINALIDAD EN EL CONTEXTO DE LA POBLACIÓN FLOTANTE: EL CASO DE IBIZA

RESUMEN: Las tasas de delincuencia se calculan utilizando datos sobre la población registrada en un territorio. Sin embargo, esta metodología excluye una proporción significativa de la población en determinados territorios que experimentan aumentos o fluctuaciones demográficas debido a diversas circunstancias. Esto es especialmente llamativo en el caso de Ibiza. Debido a sus características y a su modelo económico basado en el turismo, especialmente en determinadas épocas del año, la isla experimenta importantes cambios demográficos. Durante los meses de verano, llegan grandes cantidades de turistas, trabajadores no registrados y otro tipo de personal, lo que tiene un impacto significativo en el cálculo de la tasa de delincuencia. Esto puede plantear graves problemas para la gestión de las políticas de seguridad pública y afectar a la percepción de inseguridad en estas zonas. Disponer de datos precisos es fundamental para analizar la situación y aplicar políticas de seguridad pública eficaces. Sin embargo, la situación actual y las cifras publicadas ofrecen una visión distorsionada de la incidencia de la delincuencia, ya que no tienen en cuenta la población real presente, conocida como «población flotante». Esta investigación analiza en primer lugar la evolución de la delincuencia en Ibiza entre 2019 y 2024. En segundo lugar, emplea dos métodos innovadores para estimar la población real en cada municipio. El primer método utiliza el alojamiento turístico como base, mientras que el segundo utiliza la cantidad de residuos sólidos producidos en los diferentes municipios como factor cuantificable para estimar la presión humana.

PALABRAS CLAVE: Tasas de criminalidad, población flotante, turismo y delincuencia, criminología urbana, planificación de la seguridad.

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SUMMARY: 1. *Introduction*, 2. *Evolution of criminality in Ibiza: 2019-2024*, 2.1. *Population analysis on the island of Ibiza*, 2.2. *Evolution of criminality: crime rate*, 2.3 *Criminal dynamics: criminal typologies*. 3. *Methods of estimating the floating population*, 3.1 *Floating population via Municipal Solid Waste (MSW) production*, 4. *Conclusions*

1. Introduction

The Balearic Islands are one of the most popular tourist destinations in the world, and the island of Ibiza is one of the most outstanding in this territory. It is known as the white island and is distinguished, among other things, by the quality of its waters, as well as the leisure offer that attracts millions of visitors each year, who tend to concentrate in specific periods, such as the summer months. This high population density, which incorporates seasonal fluctuation, influences, among other things, the island's crime dynamics, altering recorded crime rates and even affecting the perception of insecurity among residents and tourists alike. This is because official crime statistics are calculated based on the registered population, which leads to a distorted representation of the criminological reality, especially in regions like this, where high demographic pressure is detected at certain times of the year (García España et al., 2010; Aebi & Linde, 2010). At this point, it is worth defining a segment of the population, known as the floating population. This includes not only tourists, but also seasonal workers, but also public service professionals temporarily assigned during the high season (e.g. police forces, health personnel), as well as other professionals and even students or residents with second homes. This heterogeneity makes it essential to apply estimation models that can account for these different groups beyond those recorded in the official statistics.

Tourist destinations such as Ibiza, characterised by an excessive influx of visitors, present crime patterns that can be differentiated from other areas such as urban environments or even rural populations (Ryan, 1993; Pelfrey, 1998). There is a unique feature linked to the islands' tourism model, which is that the economic activity is linked to the nightlife industry. These activities are sometimes associated with the prevalence of certain crimes, such as theft, robbery, assault and drug trafficking (Brunt, Mawby, & Hambly, 2000; Barker, Page & Meyer, 2002). Furthermore, the large number of people that may gather in certain areas may also influence the perception of insecurity due to factors such as the large number of visitors and alcohol and drug consumption, which may interfere with the subjective assessment of being a victim of crime (de Albuquerque & McElroy, 1999; Morelle-Hungria & Fernández Hernández, 2021).

In Spain, the Ministry of Interior's Crime Statistics Portal provides absolute data (for municipalities with a registered population of more than 20.000 inhabitants) on crime that allow for the calculation of crime rates. However, as mentioned above, this methodology does not consider the presence of the floating population and this can provide a biased view by overestimating the incidence of crime, especially in municipalities that experience high tourist pressure. We believe that in tourist destinations, crime rates can fluctuate significantly depending on the actual size of the population, so the current measurement model does not accurately reflect the incidence of crime (Barker & Page, 2002; Mawby, 2017). To correct this distortion, this study introduces two alternative and complementary methodologies aimed at adjusting the total island population and thus recalculating crime rates more accurately in relation to the demographic reality of Ibiza.

The first method, used at the quantitative level, estimates the floating population using tourist data (official and unofficial tourist sites) on accommodation in these areas. This first method uses data published by the Balearic Islands Institute of Statistics (IBESTAT, 2025) and the estimate of the percentage of illegal supply based on research on unregistered accommodation (Jover-Báez & Berraquero-Díaz, 2020). The second method calculates the total population from the production of urban solid waste, a technique used in other urban studies, for example to assess population burden (Generalitat Valenciana, 2020). This approach, although indirect, provides an integrative estimate of effective population burden through observable urban activity, especially useful when official data on housing are incomplete. This method allows the incorporation of all the real population of a territory through its environmental footprint. The incorporation of the floating population is important for tourist destinations, especially Ibiza, where population variability influences crime dynamics and even the perception of (in)security (Pizam, 1982; Morelle-Hungria & Fernandez Hernandez, 2023).

The main objective of this study is to develop a more precise methodology to estimate crime rates in areas with a large floating population. For this purpose, the following specific objectives have been established:

1. To analyse the evolution of crime in Ibiza from 2019 to 2024.
2. To evaluate crime patterns on the island during this period based on official data from the Ministry of Interior.
3. To identify discrepancies between objective crime data and citizen perception, exploring the correlations between statistical figures and perceived levels of safety.

In this context, and in the research proposed, two working hypotheses are formulated:

- H1. The traditional calculation of crime rates in Ibiza overestimates the risk of crime by not considering the floating population.
- H2. Tourism and the presence of a temporary population influence both the actual crime dynamics and the perception of insecurity, especially during the high season period.

Given the possible difference between the statistical data analysed on crime and the perception of insecurity that can be inferred from previous studies (Morelle-Hungría & Fernández-Hernández, 2023), it also outlines the basis for a forthcoming local survey on the perception of public safety in Ibiza. This future step aims to complement quantitative indicators with qualitative data and improve understanding of fear of crime and subjective risk in tourist environments.

The dataset used in this study has been published in open access in Zenodo: Crime Metrics Ibiza (2019-2024) (Morelle-Hungría, 2025). It can be accessed at <https://doi.org/10.5281/zenodo.14988871>. Statistics must be based on precise calculations, so computing the total population of a territory is essential for the development of quality public policies. In this sense, the calculation of crime rates should be as accurate as possible, as it should consider the total population present in the area. The application of more accurate methodologies will provide effective tools for the planning of police resources and crime prevention strategies adapted to the social and touristic reality of Ibiza (Mawby, 2015). Decisions made in the construction of a public safety policy and its management must take into account the perception of safety (Jackson et al., 2011), as well as official statistical data, especially in destinations with a high tourist influx.

2. Evolution of criminality in Ibiza: 2019-2024

The Balearic Islands welcomed more than 15 million visitors in 2024 (IBESTAT, 2025), surpassing previous years' figures. This anthropogenic pressure particularly affects public services in all municipalities. Ibiza presents characteristics that make it a particularly good example for analysing behaviour or problems of interest to Criminology. There are two particularities of Ibiza that are considered key to our study: (1) its population structure and distribution, as it is divided into five municipalities, four of which have more than 20.000 inhabitants, and; (2) seasonal demographic fluctuation, since, during periods of maximum tourist influx, the floating population can exceed the resident population in some areas. This encourages distortions

in both the measurement of crime and perceptions of safety, especially when only census-based denominators are used.

The theory of the ecology of crime (Shaw & McKay, 1942) states that the structure and composition of a territory influences the distribution of crime. Ibiza's seasonal population dynamics, population density and tourism-related economic activity make it a textbook case: social disorganisation, nightlife concentration and lack of residential stability. In Ibiza, the combination of tourism-oriented growth and the seasonality of the population can generate specific crime patterns, especially in certain leisure areas, tourist centres or even densely populated areas. Routine activity theory (Cohen & Felson, 1979) shows that the convergence of three elements can lead to criminality: a motivated offender, a vulnerable target and the absence of a capable guardian. The large influx of visitors and the concentration of people in the peak season in Ibiza, increase vulnerability, especially to certain types of crime or deviant behaviour. Finally, the theory of social disorganisation (Sampson & Groves, 1989), explains that constant changes in the composition of the population can affect social cohesion and, in turn, weaken the informal mechanisms of social control. In places like Ibiza, where the high amounts of tourists (floating population) mix with local residents, it becomes harder for the community to keep control over public spaces. This creates conditions where crime is more likely to occur. This can occur in several municipalities on the island, where seasonal economic activity and the mobility of visitors can disrupt surveillance and generate a greater perception of insecurity (Morelle-Hungría & Fernández Hernández, 2023).

This research first analyses the evolution of crime in Ibiza between 2019 and 2024, focusing on three dimensions: (1) the crime rate and its annual progression; (2) The way crime is spread across different areas helps us see how it varies between municipalities and how it is linked to tourism. With a special focus on the city of Ibiza, because it is the administrative centre and sees a large seasonal influx of people, making it a key case for detailed analysis; and (3) the types of crime that are most frequently recorded.

2.1. Population analysis on the island of Ibiza

In areas with high tourist numbers, this analysis is not only relevant for interpreting crime, but also essential for measuring it correctly. This issue is considered important because population dynamics directly influence crime patterns, as we will demonstrate, including the perception of safety and public policy planning.

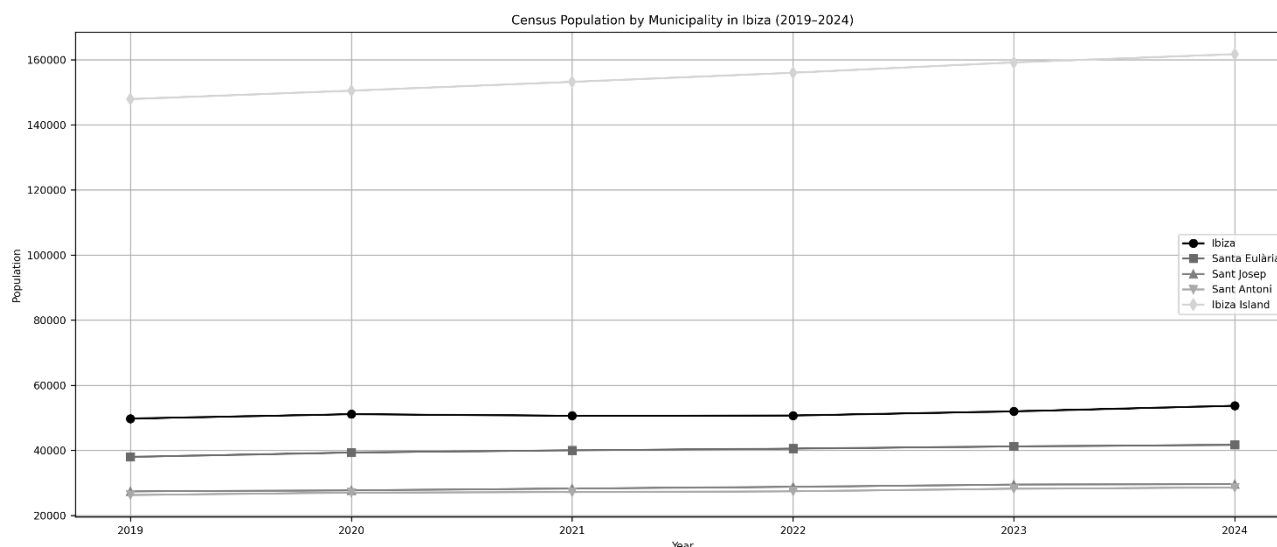
In the period analysed, 2019 to 2024, there is a sustained growth of the registered population on the island (see Table 1), with an increase of more than 13.700 inhabitants. However, this census growth does not take into consideration the significant floating population that characterises the demographic reality of Ibiza during high seasons (INE, 2024).

Table 1. Census population on the island of Ibiza by municipality with more than 20,000 inhabitants.

Census population (INE)	2024	2023	2022	2021	2020	2019
Ibiza	53.717	51.996	50.715	50.643	51.128	49.783
Santa Eulària	41.706	41.228	40.548	40.038	39.358	38.015
Sant Josep	29.664	29.506	28.813	28.299	27.732	27.413
Sant Antoni	28.609	28.237	27.431	27.205	27.033	26.306
Ibiza island	161.705	159.180	156.000	153.200	150.500	147.914

Source: Own elaboration based on INE (2025).

Fig. 1. Evolution of the census population on the island of Ibiza, including municipalities.



Source: Own elaboration based on INE (2025). Chart generated using JupyterLab.

From a total population of 147.914 inhabitants in 2019, it increased to 161.705 in 2024, an increase of 9,3% in this period. However, this growth has not been uniform in all the municipalities. For example, in Ibiza Town, the most populated municipality, the population has increased from 49.783 inhabitants in 2019 to 53.717 in 2024, an increase of 7,9%. This growth can be explained by the fact that Ibiza Town is the centre of the island's main administrative activity, where commercial and service sector activities are also concentrated. The municipality of Santa Eulària des Riu registered an increase of 3.691 inhabitants during the same period, reaching a relative growth of 9,7%, which is possibly due to residential expansion, as it is a municipality that has implemented a tourist model away from nightlife. The municipality of Sant Josep de sa Talaia experienced

an increase of 8,2%, from 27.413 to 29.664 inhabitants, with a demographic development influenced by the combination of nightlife areas and the expansion of residential areas, especially along the coast. The population of Sant Antoni de Portmany is grew by 8,7%, reaching 28.609 inhabitants in 2024. This may be due to the town's importance as a tourist destination and the expansion of services in the municipality. A similar situation can be observed in the rest of the island, where sustained population growth is characterised by key socio-economic factors: the expansion of tourism, real estate development and the influx of seasonal workers. These registered-residence metrics do not consider the floating population, which is essential for reporting crime metrics.

2.2. Evolution of criminality: crime rate

By analysing crime rate data, we can identify some guidelines for establishing patterns. These include a fluctuating trend, marked by population mobility during certain periods and other factors, such as the 2020 covid crisis. These fluctuations also highlight the

limitations of using static population figures to assess dynamic social phenomena such as crime. According to data from the Ministry of the Interior (2025), official crime rates (calculated from the registered population) are as follows:

Table 2. Crime rates per 1.000 inhabitants in Ibiza.

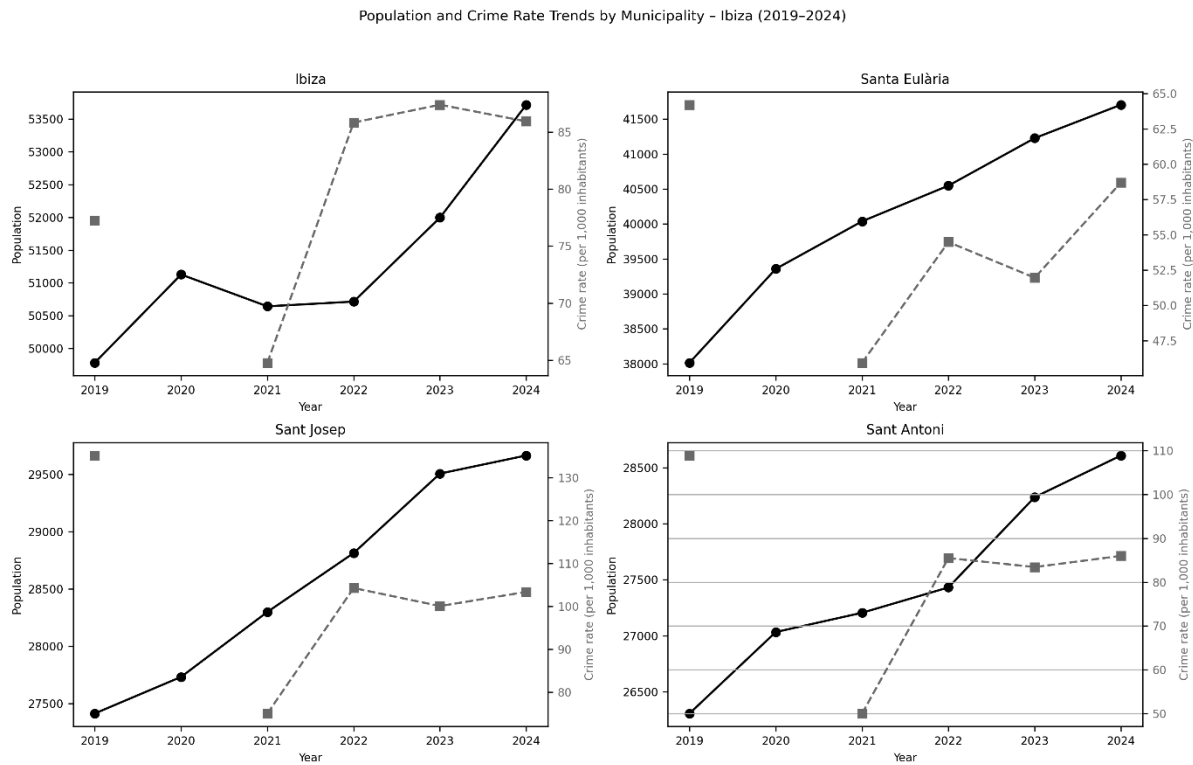
Crime rate (for every 1,000 inhabitants)	2024	2023	2022	2021	2020	2019
Ibiza	85,93	87,39	85,83	64,77	NC	77,24
Santa Eulària	58,7	51,95	54,48	45,93	NC	64,21
Sant Josep	103,4	100,1	104,3	75,06	NC	135,2
Sant Antoni	85,99	83,44	85,49	50,03	NC	108,9

Produced by the author based on data from the Ministry of the Interior (2025).

In this period, crime in most of the municipalities of Ibiza has shown variations. In 2019, crime rates, based on registered population figures, were very high in the whole country. For example, the municipality of Sant Josep de sa Talaia registered the highest official crime rate of the series (135,2 crimes per-1.000 inhabitants), followed by Sant Antoni de Portmany (108,9). In contrast, Ibiza town (77,24) and the municipality of Santa Eulària des Riu (64,21) had lower crime rates, however, the numbers are still considered high incidence rates. As a limitation of the data analysis, it should be noted that complete data for 2020 is not available due to the global health crisis. In 2021 there is a certain downward trend, with a significant reduction in crime, especially in some municipalities, Sant Antoni (50,03) and Ibiza (64,77). From 2022 onwards, with the revival of tourism and the lifting of mobility restrictions adopted to deal with COVID, crime rates rose again, returning to the levels reached in 2019. Subsequently, a certain stabilization in crime is detected in 2023 and

2024, with Sant Josep (103,4) and the city of Ibiza (85,93) recording the highest crime rates, followed by Sant Antoni (85,99). In contrast, the municipality of Santa Eulària (58,7) remains the municipality with the lowest crime rate.

The following graphs (in Figure 2) shows the relationship between reported crimes and official crime rates per-1.000 inhabitants. The data show a sharp decline during the years of the health crisis (2020-2021), followed by a recovery when tourism resumed. This also highlights the link between itinerant mobility and crime, reinforcing the need to review crime rate estimates in light of demographic fluctuations. A sharp decline is observed in 2020-2021, followed by an increase in the so-called 'post-pandemic era'. A slight decline is also observed in 2023 compared to the previous year, followed by a further increase in 2024.

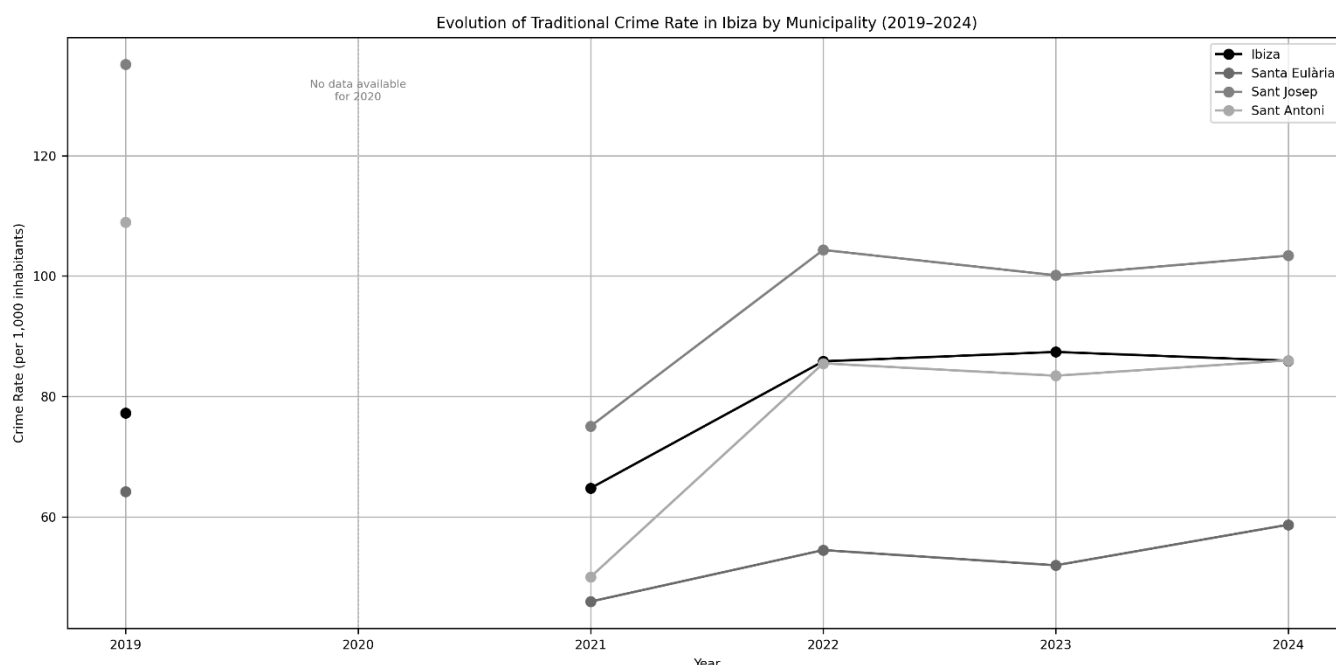
Fig. 2. Comparison of total infractions and traditional crime rate in Ibiza's municipalities (2019–2024).

Source: Own elaboration based on INE (2025). Chart generated using JupyterLab.

Looking at Figure 2, there is a sharp decrease in both the crime rate and the total number of crimes recorded between 2019 and 2020. Once again, the impact of the pandemic and the restrictions adopted can be seen, showing a similar trend to the previous graphs. A slight increase in the data can be detected from 2020 to 2021, but it will not be considered significant until after that year. In 2024, the level of crime recorded before the pandemic is exceeded. Despite this, crime rates, as explained above, are calculated from the registered resident population, without taking into account the floating population. This omission provides a biased view of reality, as it leads to an underestimation of the actual population exposed to crime and an overestimation of crime rates. This mismatch can lead

to public security resources being allocated erroneously. To address this problem, the following sections present two alternative methodologies for estimating the actual population present in Ibiza, one based on tourist accommodation capacity and the other on urban waste generation, which allows for more accurate and context-sensitive crime rate estimates.

We now turn to an analysis of municipal crime rates in Ibiza, focusing on those municipalities with more than 20,000 inhabitants, as defined in the official crime statistics of the Ministry of Interior. These rates are contrasted with the adjusted indicators developed in this study.

Fig. 3. Evolution of the crime rate in Ibiza Island by municipalities: 2019–2024.

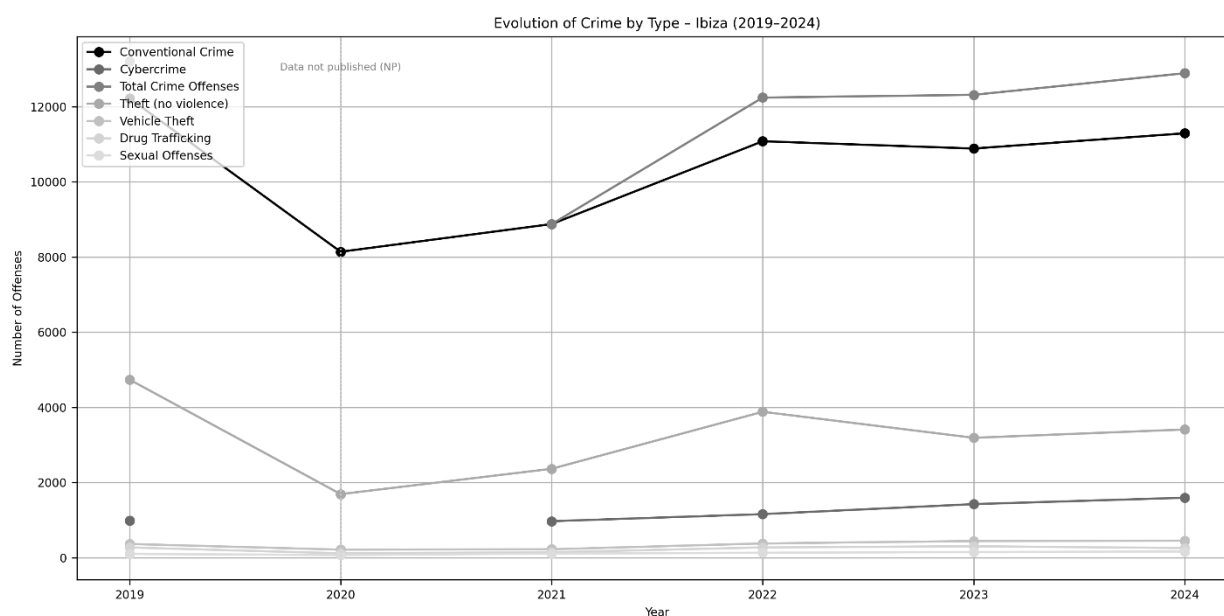
Source: Own elaboration based on data from the Ministry of the Interior (2025). Chart generated using JupyterLab.

An analysis of the evolution of the official crime rate by municipality, based on the registered population, shows a similar pattern to that for the island as a whole. Once again, we see the same pattern as in the previous graphs analysed (Figure 1). The mobility restrictions imposed had a direct effect on crime rates in 2020 until the end of 2021. If we analyse the municipalities separately, the one with the highest crime rates is Sant Josep, standing out from the other municipalities. This may be because it is one of the island's most popular tourist destinations, offering the widest range of nightlife on the island, which is likely to lead to an underestimation of the actual population present. The

city of Ibiza and Sant Antoni show a similar trend, with a steady increase from 2021 to the present. The municipality with the lowest rates is Santa Eulària, which also shows a certain stability in the trend, although there has been a slight increase compared to pre-pandemic levels.

2.3. Criminal dynamics: criminal typologies

Next, we look at the types of crime registered in Ibiza, observing a certain sustained growth in the types of crime.

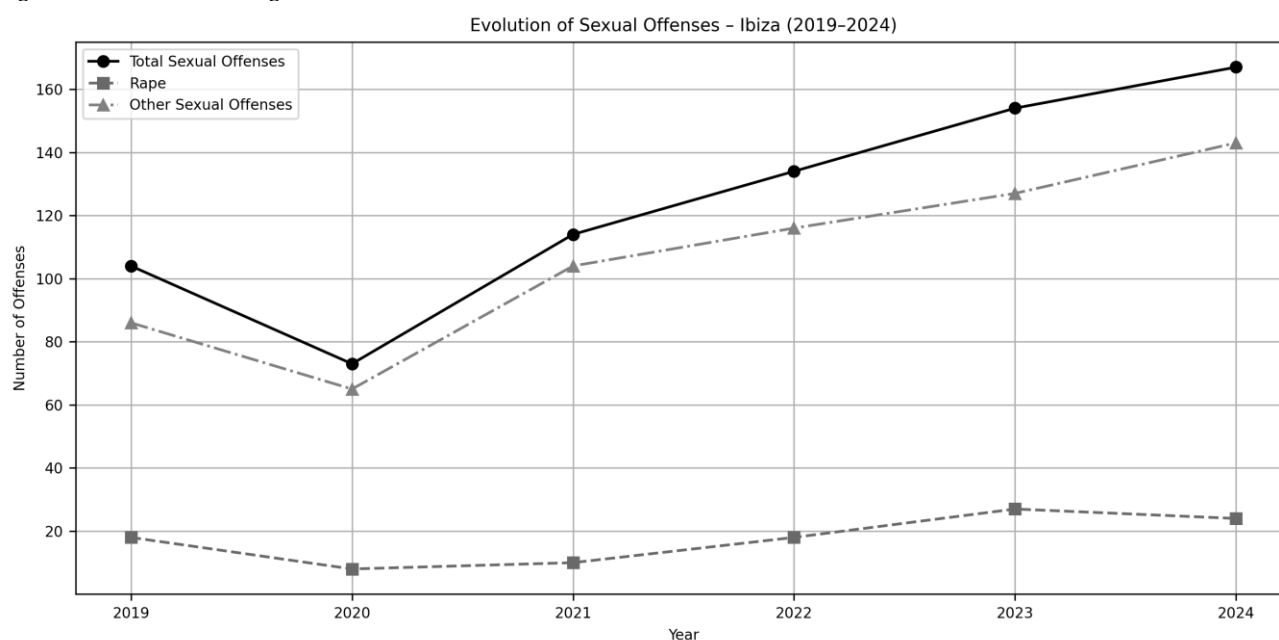
Fig. 4. Evolution of crime types in Ibiza: 2019–2024.

Source: Own elaboration based on data from the Ministry of the Interior (2025). Chart generated using JupyterLab.

Absolute data show that the most frequent crime committed on the island is theft, and this sharp drop in crime is also observed in this analysis due to the pandemic situation. It also coincides with the rapid increase as soon as the measures adopted to deal with COVID-19 were lifted and population mobility, especially due to tourism, resumed. Another type of behaviour that stands out for its upward trend and growth, is cybercrime, which reflects shift of traditional criminal activity into cyberspace (Clarke, 1997). However, it is a topic that requires an in-depth analysis with a specific theoretical framework (Miró-Llinares,

2021). On the other hand, we can also observe the evolution of crimes of sexual offences between 2019 and 2024, which saw an increase in the first years of the analysed period (Figure 5). Although this section has focused on trends in specific categories of crime, it is important to note that their interpretation is also conditioned by the underlying population figures. In later sections, crime rates adjusted for seasonal population changes will enable a more nuanced reading of these patterns.

Fig. 5. Evolution of crimes against sexual freedom in Ibiza Island: 2019–2024



. Source: Own elaboration based on data from the Ministry of Interior (2025). Chart generated using JupyterLab

3. Methods of estimating the floating population

The demographic burden in Ibiza is altered by the large influx of tourists, especially at certain times of the year. This directly affects calculations of true crime rates. The variations detected can lead to biases in crime statistics and misinterpretation of public safety data (Felson, 2002). To address this issue, this research applies a dual-method strategy to estimate the actual population present, based on a model using tourist occupancy data.

This first method integrates official records with empirical adjustments to better approximate the real number of people present in each municipality. The following variables are considered:

- Official tourism accommodation capacity. Data published by the Balearic Islands Statistics Institute (IBESTAT) on registered hotel and tourist accommodation capacity. This data is

available monthly on an island level. However, they are not broken down by municipality, which introduces a methodological limitation. In this study a proportional distribution by municipality has been applied to approximate the local tourist presence.

- Unregistered tourism accommodation. Previous studies (e.g. Gómez Martín et al., 2019) have documented the presence of illegal or unregistered tourist accommodation. This analysis assumes an additional 20% over the official capacity to reflect this hidden supply, which includes flats, shared accommodation and other unregistered accommodation.
- Temporary population linked to tourism. A 5% adjustment is applied to the census population to consider seasonal workers, temporary residents, daily commuters and other people not formally registered but actively contributing to the social and economic dynamics of the island. This estimate is

conservative and is based on comparable analyses in tourism-dependent areas. However, the literature suggests that in certain municipalities with high service sector intensity, this percentage could range from 5% to 10%. Future research based on empirical fieldwork will be able to further refine this adjustment factor.

- Population census. Data provided by the National Institute of Statistics (INE) on the number of registered residents per municipality.

Based on these parameters, the floating population is estimated monthly and annually, applying proportionality among municipalities.

The following formula is used:

$$\text{Floating population} = (\text{Tourist Places} \times 1,2) + (\text{Census Population} \times 1,05)$$

In view of the above, two variables have been applied to estimate the floating population:

- 1,2 represents the 20% adjustment to include unregistered tourists.
- 1,05 reflects the 5% adjustment for temporary, non-resident workers and seasonal inhabitants.

It is important to note that while this method provides a valuable approximation of tourism-related population change, it does not capture all the forms of population fluctuation, in particular those not linked to accommodation statistics. For this reason, it is complemented in this study by a second independent estimation model based on municipal solid waste production, which is presented in the next section.

As indicated above, tourist accommodation data have been obtained from official sources (IBESTAT), which provide monthly figures per year for the island as a whole. Since only official accommodation data are available for the island as a whole, a proportional estimation has been applied to distribute these figures among the municipalities. This distribution is based on the relative weight of the registered population of each municipality within the island as a whole. Although this approach introduces an approximation rather than direct observation, it serves as a practical solution in the absence of disaggregated data. It is important to recognise this methodological limitation, which reinforces the need for triangulation with other estimation methods, such as that based on municipal waste presented in the following section.

Table 3. Estimated official tourist accommodation places per municipality and year.

Estimated number of tourists	2024	2023	2022	2021	2020	2019
Ibiza	127.671	118.597	117.933	79.209	31.850	122.060
Santa Eulària	99.124	94.037	94.290	62.622	24.518	93.207
Sant Josep	70.504	67.300	67.002	44.262	17.275	67.213
Sant Antoni	67.996	64.405	63.788	42.551	16.840	64.498
Ibiza island	384.331	363.072	362.762	239.616	93.752	362.663

Source: own elaboration based on IBESTAT data (2025).

Based on these values, the established formula is applied to calculate the adjusted floating population in each municipality and year:

Table 4. Estimated floating population by municipality and year

Estimated floating population	2024	2023	2022	2021	2020	2019
Ibiza	209.609	196.912	194.770	148.226	91.904	198.745
Santa Eulària	162.741	156.133	155.724	117.187	70.747	151.764
Sant Josep	115.752	111.741	110.656	82.828	49.849	109.439
Sant Antoni	111.635	106.935	105.348	79.626	48.592	105.019
Ibiza island	630.987	602.825	599.114	448.399	270.527	590.505

. Source: own elaboration based on IBESTAT data (2025).

To know the real population load of each municipality, once the estimate of the floating population has been obtained, we calculate the total population taking into account the resident census population.

$$\text{Total Adjusted Population} = \text{Floating Population} + \text{Census Population}$$

Table 5. Total adjusted population by municipality and year

Total adjusted population	2024	2023	2022	2021	2020	2019
Ibiza	263.326	248.908	245.485	198.869	143.032	248.528
Santa Eulària	204.447	197.361	196.272	157.225	110.105	189.779
Sant Josep	145.416	141.247	139.469	111.127	77.581	136.852
Sant Antoni	140.244	135.172	132.779	106.831	75.625	131.325

Source: Own elaboration.

After determining the total population adjusted to estimates that include the floating population, we adjust the crime rate (Table 6).

$$\text{Adjusted Crime Rate} = (\text{Registered Crimes} / \text{Total Population}) \times 1000$$

Table 6. Crime rate including calculations with an estimate of the floating population based on tourist accommodation.

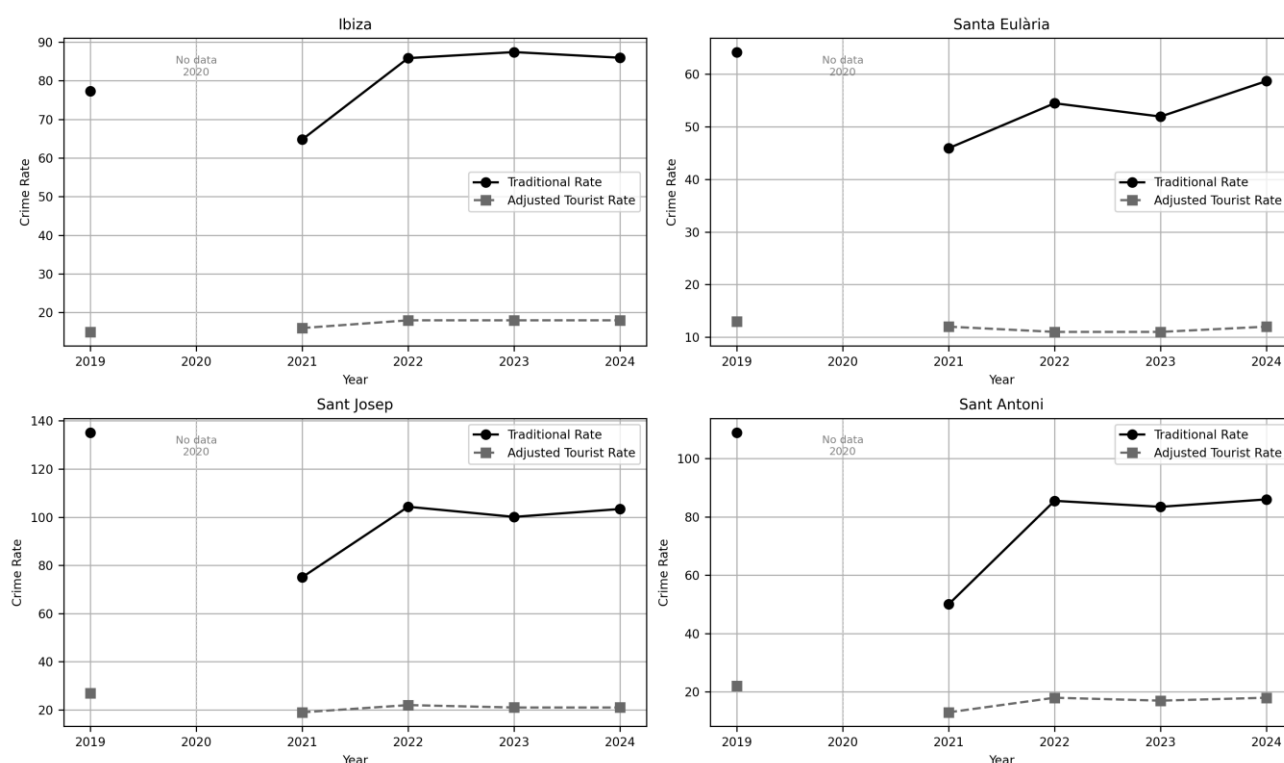
Adjusted Crime Rate	2024	2023	2022	2021	2020	2019
Ibiza	18	18	18	16	NC	15
Santa Eulària	12	11	11	12	NC	13
Sant Josep	21	21	22	19	NC	27
Sant Antoni	18	17	18	13	NC	22

Source: own elaboration based on IBESTAT data (2025).

Although the incorporation of this method provides a somewhat more accurate picture of population representation, it has important limitations. As can be seen (in Figure 6) from the comparisons between the adjusted and traditional rates, the large differences show that this would not be an applicable result.

Fig. 6. Comparison between the original crime rate and the adjusted rate.

Comparison of Traditional vs. Tourist-Adjusted Crime Rates by Municipality - Ibiza (2019-2024)



Source: Own elaboration. Chart generated using JupyterLab.

A comparison between official crime rates (based solely on the registered population) and rates adjusted using tourism-based estimates reveals significant differences in the measurement of the incidence of crime in Ibiza. These differences are consistent with previous studies that have highlighted the need to revise crime indicators in tourist areas to better reflect their sociodemographic reality (Stoldt et al., 2020; Ryan, 1993).

On the island of Ibiza, the crime rate is high in all the municipalities presented, however, the adjusted rates show a notable decrease when the floating population is incorporated. This suggests that the number of crimes per capita is substantially lower than what the official figures. These findings support the idea that perceptions of insecurity may be partly influenced by overestimated crime rates derived from static population figures (Pizam, 1982).

From a methodological perspective, adjusting crime rates by tourism supply improves the accuracy of the incidence measurement by introducing a correction for seasonal population load. However, there are clear limitations to this approach:

- Underestimation of the actual floating population due to the lack of disaggregated

and comprehensive data. The official IBESTAT figures (2025) only provide monthly data at island level, with no breakdown by municipality or type of visitor. Although a correction factor (20%) was applied to approximate unregulated tourist accommodation, it remains an estimate.

- The method does not incorporate variables unrelated to accommodation, such as nightlife density, labour mobility or variations in crime linked to specific visitor profiles.

The largest discrepancies between official and adjusted crime rates are observed in Sant Antoni and Sant Josep, probably due to their high tourist intensity and the concentration of some variables related to nightlife. Other towns such as Santa Eulària show a smaller difference, suggesting that crime in this town may be more related to the structural characteristics of the resident population.

Applying more realistic crime rate calculation methods based on empirical evidence allows for the development of more effective public safety strategies. It allows for a more equitable distribution of police resources and promotes the development of crime prevention policies that reflect the real demographic and functional dynamics of each municipality. In

territories shaped by seasonal population flows and tourism-driven economies, traditional static indicators fall short as planning and evaluation tools (Hall, Timothy, & Duval, 2003). To complement this tourism-based model, the following section introduces an alternative approach based on environmental indicators, specifically, the analysis of municipal solid waste, as a proxy for estimating effective population burden.

3.2. Floating population via Municipal Solid Waste (MSW) production

The second method applied in this study uses municipal solid waste (MSW) production as a variable for estimating the effective population load of each municipality. This technique has been widely used in urban and environmental studies; for instance, Batlle-Bayer et al. (2021) developed a waste-based population model to estimate the environmental footprint of tourism in Spain. Since waste generation is directly correlated with human presence and daily activity, it serves as an indirect but robust indicator of population pressure, capturing not only tourists, but also seasonal workers, commuters and non-registered residents.

Unlike accommodation capacity-based models, this approach does not rely on assumptions about the distribution of accommodation or tourist behaviour. Instead, it reflects a more inclusive approach to human activity through the volume of waste generated over time.

To estimate the population load, the following formula is applied:

$$\text{Estimated population} = \text{Total annual municipal solid waste (kg)} / (\text{MSW production per capita (kg/inhabitant/year)}).$$

The parameters considered in this method of calculation are the following:

- Municipal solid waste generated (kg). Based on annual data provided by the Consell d'Eivissa (2025), which includes waste production figures broken down by municipality and month. The analysis incorporates multiple waste streams: solid urban waste, paper/cardboard, glass, packaging and, from 2021, organic matter. This comprehensive approach allows for a more accurate approximation of human activity throughout the year.
- Average municipal waste generation per inhabitant per day. This value varies depending on the profile and behaviour of the population (e.g. permanent residents, tourists, seasonal workers). In Spain, the national average of municipal waste generation ranges between 1,3 and 1,5 kg/inhabitant/day. For this study, an average value of 1,4 kg/person/day has been selected as a balanced estimate, in line with previous environmental studies and applications of this method in tourist contexts (Batlle-Bayer et al., 2021).
- Annual resident population: Official figures published by the National Statistics Institute (INE, 2025) have been used to differentiate between the permanent registered population and the estimated effective population derived from waste generation. The difference between these two figures provides an indirect estimation of the floating population for each municipality.

This method provides a consistent, indirect measure of population pressure, especially in areas with significant demographic variability and high tourist turnover, such as the municipalities of Ibiza. It complements the accommodation-based model and supports a multi-method approach to better estimate the population effectively exposed to crime phenomena.

Table 7. Total Municipal Solid Waste (MSW) production per municipality (t).

Total Municipal Solid Waste (t)	2024	2023	2022	2021	2020	2019
Ibiza	31.356,26	32.020,70	32.198,89	28.480,67	25.174,23	32.532,60
Santa Eulària	29.473,19	29.424,68	29.481,62	26.509,00	22.603,77	30.826,34
Sant Josep	28.491,92	28.498,95	28.379,70	24.268,05	19.737,92	29.864,51
Sant Antoni	19.484,28	19.399,13	18.967,81	15.601,52	14.426,26	20.335,67

Source: Own preparation based on data from the Consell d'Eivissa (2025).

From this data, we have estimated the total population taking into account the production of waste in each municipality, following the formula explained above.

Table 8. Estimated total population based on MSW.

Estimated population	2024	2023	2022	2021	2020	2019
Ibiza	61.363	62.663	63.012	55.735	49.265	63.665
Santa Eulària	57.677	57.583	57.694	51.877	44.234	60.326
Sant Josep	55.757	55.771	55.538	47.491	38.626	58.443
Sant Antoni	38.130	37.963	37.119	30.531	28.231	39.796

Source: Own elaboration based on data from the Consell d'Eivissa (2025).

Using this estimated total population data, the crime rates per municipality have been recalculated.

$$\text{Adjusted Crime Rate} = (\text{Registered Crimes} / \text{Total MSW Population}) \times 1000$$

Table 9. Adjusted crime rates by municipality

Adjusted Crime Rate	2024	2023	2022	2021	2020	2019
Ibiza	75,23	72,52	69,08	58,85	NC	60,39
Santa Eulària	42,44	37,20	38,29	35,45	NC	40,46
Sant Josep	55,01	52,97	54,13	44,72	NC	63,39
Sant Antoni	64,52	62,06	63,18	44,58	NC	71,99

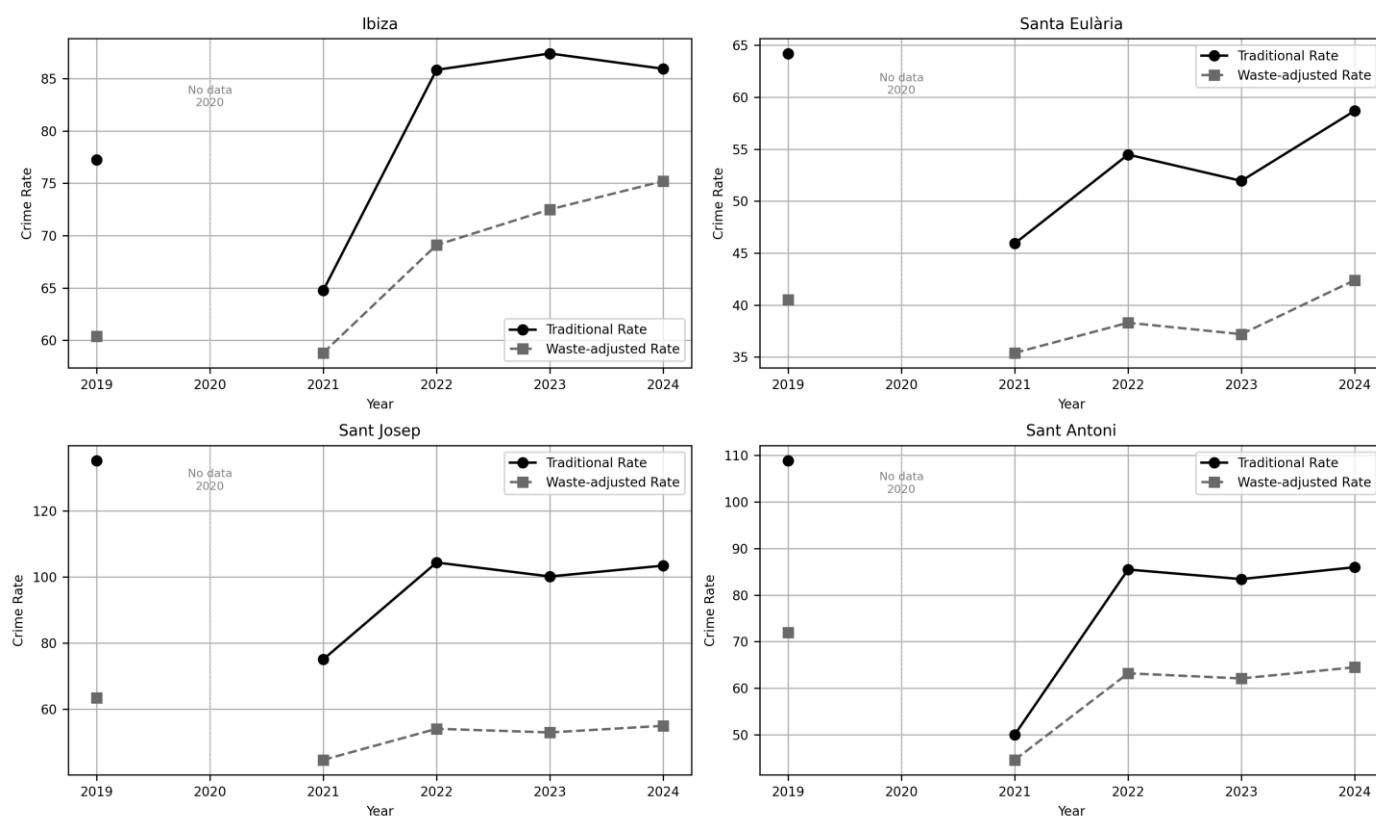
. Source: Own elaboration based on data from the Consell d'Eivissa (2025).

The methodology incorporated by considering variables that allow addressing the reality of the population load of the territory, including the floating population described above, can be a more reliable method. The production of solid urban waste is directly related to the activity of people in a territory and this factor can be incorporated into the population estimates, allowing the crime rate to be calculated with greater precision.

The measures adopted almost unanimously across the globe to tackle the global health crisis had an impact on crime, and this readjustment is also evident. The trend recorded between 2019 and 2021 is in line with previous patterns, as is the increase from 2022 onwards, coinciding with the recovery of the tourism sector following the end of the mobility restrictions. This is also reflected in the floating population, as the measures caused a decline in tourism during the health crisis, which also affected crime.

Fig. 7. Comparison between conventional and adjusted crime rate based on Municipal Solid Waste (MSW).

Comparison of Traditional vs. Waste-adjusted Crime Rates by Municipality - Ibiza (2019-2024)



Source: Own elaboration. Chart generated using JupyterLab.

If we look at the comparison between the crime rates of the municipalities of the island of Ibiza in the period analysed, 2019 to 2024 (Fig. 7), we can see that the traditionally calculated crime rates are higher than the adjusted rates. These have incorporated an estimate of the total population calculated from the production of municipal solid waste. This reinforces the idea that census data used to calculate crime rates can provide a distorted view because they do not incorporate actual data.

There are two areas of interest in this study, the municipalities of Sant Josep and Sant Antoni, as they show the most evident changes between traditional crime rates and those adjusted to the proposed estimate. In these municipalities there are areas characterised by a high concentration of people linked to tourism or even areas with significant nightlife activity. In these cases, the floating population may be the variable that explains this increase in crime rates. With these proposed research methods, and especially with the calculation of the actual population based on waste production, we are offered a more realistic perspective, reducing distortions caused by seasonal

fluctuations in the population. Furthermore, it provides us with a more reliable basis for the formulation of policies and law enforcement strategies.

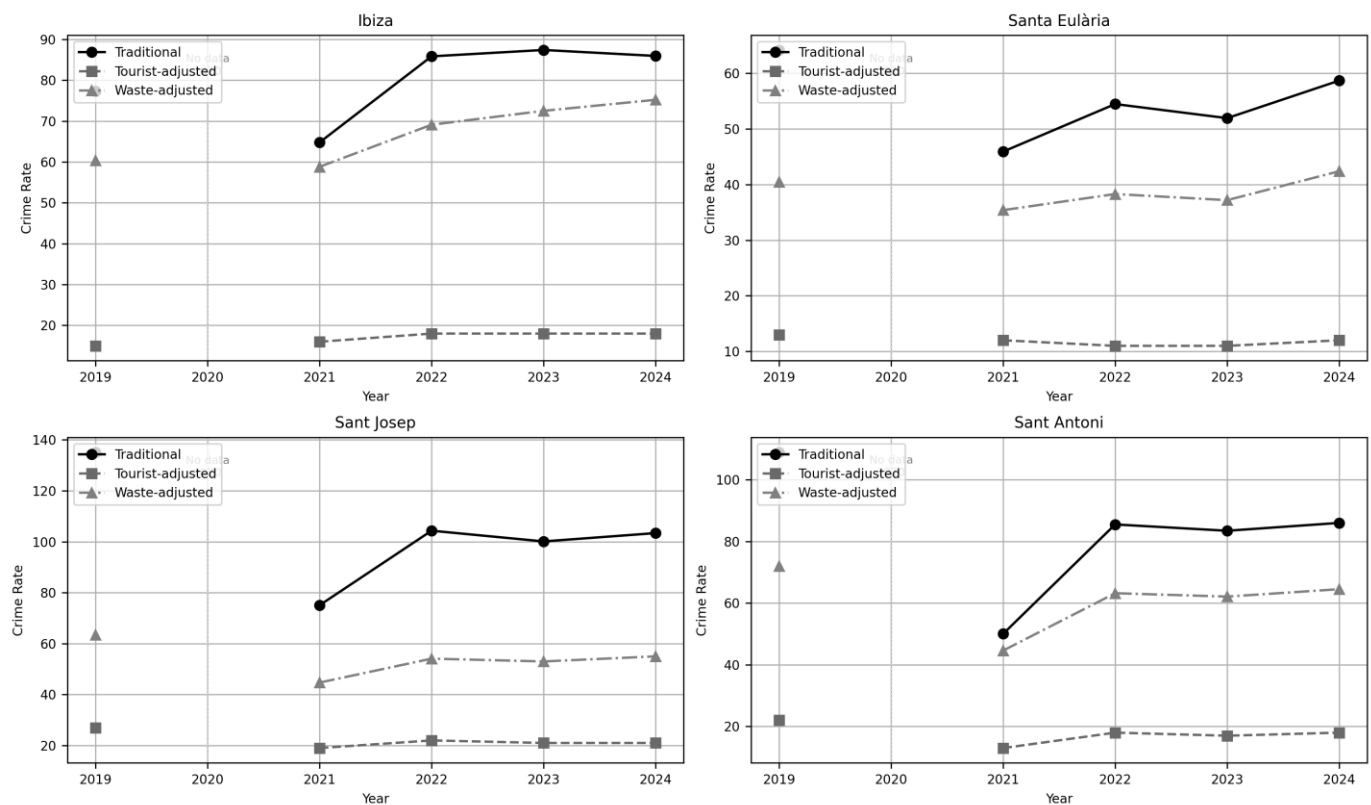
In this regard, the crime rate calculated using traditional methods shows greater year-on-year variation. However, the rate adjusted using the methodologies implemented in this report shows a trend towards greater stability in the medium to long term. This suggests that the adjustment for municipal residuals provides a more accurate estimate of crime incidence, as it better reflects population fluctuations, allowing for a more consistent and less distorted interpretation of crime trends (Morelle-Hungría & Carceller-Stella, 2024).

A comparison between the traditional crime rate and the two alternative models implemented in this study is shown below:

- Tax adjusted to the tourist offer.
- Rate adjusted to the production of municipal solid waste (MSW).

Fig. 8. Comparison of traditional versus adjusted crime rates in the two models used (tourist capacity and waste generation).

Comparison of Crime Rate Models by Municipality – Ibiza (2019–2024)



Source: Own elaboration. Chart generated using JupyterLab..

4. Conclusions

Criminological perspective

Criminology has an essential role to play in the implementation of more effective investigation methods. Especially because this will lead to improvements in public policy in the field of public safety. It also allows us to improve the methods of calculating crime rates. Therefore, this contribution allows the inclusion of the real population present in a given territory, not only the registered residents, but also the floating population, including tourists, seasonal workers, second home residents and temporary visitors. Estimating the actual population more accurately is essential for understanding the incidence of crime and designing effective public safety strategies.

Different criminological theories have highlighted this issue, for example, in the ecology of crime theory (Shaw & McKay, 1942) or routine activity theory (Cohen & Felson, 1979). These theories explain how territorial structure; population flows and economic intensity - especially in sectors such as nightlife and tourism - shape opportunities for criminal behaviour. These

dynamics are observed with greater incidence in urban areas or, especially, in those municipalities with a greater nightlife offer in Ibiza. Furthermore, the theory of social disorganisation (Sampson & Groves, 1989) postulates that high residential turnover and weak social cohesion reduce informal social control, creating environments where crime is more prevalent. In the case of Ibiza, the seasonal influx of non-resident populations can disrupt established ties within communities and neighbourhoods. This alters surveillance capacity, contributing not only to variations in crime but also to perceptions of insecurity.

This theoretical framework reinforces the need to incorporate floating populations into any criminological analysis of tourist areas. The exclusion of these populations leads to statistical distortions and weakens the capacity of public institutions to respond effectively to local security challenges.

Hypothesis evaluation

The results confirm the first hypothesis (H1): the traditional methodology of calculating crime rates - based exclusively on the registered population - overestimates the incidence of crime in Ibiza. In all the

municipalities analysed, the adjusted crime rates were lower when the floating population was included. Although the degree of overestimation varies by municipality, the pattern is consistently observed. Moreover, this distortion is greater in municipalities with a higher tourist influx, such as Sant Josep and Sant Antoni. Excluding the floating population from statistical models leads to inflated crime indicators and, potentially, wrong decisions in public security planning and resource allocation.

Regarding the second hypothesis (H2), which hints that tourism and seasonal labour dynamics influence perceptions of insecurity, the results provide partial but relevant support. Although this study does not yet include original data on public perception, criminological literature indicates a strong link between high population mobility, temporary social disorganisation and increased subjective risk. The fact that there was no proportional increase in crime during peak seasons, coupled with a probable increase in the perception of insecurity, suggests that tourism increases fear of crime, or at least may be a variable to consider in future research. This reinforces the importance of conducting perception-based surveys at the municipal level to inform and strengthen public safety policies.

Furthermore, combining different methods to estimate the actual population provides a functional approximation that incorporates actual tourist pressure. These complementary models allow for the construction of more accurate and context-sensitive crime indices, especially in environments with high population volatility.

Methodological and practical implications

The methodology used in this study allows for realistic estimates based on empirical data in municipalities and territories with high crime rates recorded using traditional methods. This proposal allows for the incorporation of much more accurate mechanisms in territories with high tourist pressure and significant demographic variability. By integrating tourism and environmental indicators, this research contributes to a more accurate and contextualised measurement of crime, especially in dependent areas such as Ibiza.

The results obtained suggest the need for institutions to reform and incorporate new statistical models based on empirical data. This is particularly necessary in this type of territory, where the floating population and demographic changes pose a problem for the provision of public services. If these dynamics are ignored, there is a risk of producing misleading indicators that distort the understanding of crime and hinder the development of effective policies. From a

criminological perspective, this study opens new avenues for methodological innovation and invites further research, particularly including perception-based data, to deepen our understanding of crime and insecurity in complex and dynamic environments.

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