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AVALIAÇÃO DA DISPOSIÇÃO A PAGAR DOS VISITANTES PARA MITIGAR IMPACTOS RECREATIVOS EM ECOSSISTEMAS LACUSTRES: UM ESTUDO COMPARATIVO ENTRE PORTUGAL E O NEPAL

ASSESSING VISITORS' WILLINGNESS TO PAY FOR MITIGATING RECREATIONAL IMPACTS ON LAKES ECOSYSTEMS: A COMPARATIVE STUDY BETWEEN PORTUGAL AND NEPAL

EVALUACIÓN DE LA DISPOSICIÓN PARA PAGAR DE LOS VISITANTES POR MITIGAR LOS IMPACTOS RECREATIVOS EN LOS ECOSISTEMAS LACUSTRES: UN ESTUDIO COMPARATIVO ENTRE PORTUGAL Y NEPAL

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RESUMO

Introdução: A crescente procura por atividades recreativas em áreas naturais resulta frequentemente na degradação ambiental, comprometendo a sustentabilidade desses ecossistemas. Compreender a disposição a pagar (DaP) dos visitantes com o intuito de mitigar esses impactos é fundamental para apoiar a gestão sustentável destes espaços
Objetivo: Este artigo compara a DaP dos visitantes para mitigar o impacto das atividades recreativas nas Praias da Albufeira do Azibo (Portugal) e no Complexo Lacustre de Ghodaghodi (Nepal).
Métodos: Foi realizado um inquérito presencial de natureza quantitativa nas Praias da Albufeira do Azibo (Portugal), com 573 respostas validadas (95,5%). Recorreu-se ao Método de Avaliação Contingente para estimar a DaP relativamente a bens públicos de uso e de não uso.
Resultados: Os inquiridos demonstraram uma DaP ligeiramente superior para a preservação ambiental (bens públicos de não uso), em comparação com infraestruturas e serviços (bens públicos de uso). A estimativa anual da DaP pelas Praias da Albufeira do Azibo revela uma valorização significativamente mais elevada — cerca de 3,4 vezes — do que a verificada no estudo comparativo realizado no Nepal.
Conclusão: Os resultados sublinham a importância de atribuir valor económico aos recursos naturais para melhorar decisões de política e de gestão. Contudo, a dependência exclusiva de inquéritos e as diferenças contextuais entre os locais constituem limitações. Estudos futuros devem integrar metodologias mais abrangentes e amostras mais representativas.

Palavras-chave: disposição a pagar; impactos recreativos; método de avaliação contingente; valoração ambiental; turismo sustentável

ABSTRACT

Introduction: The growing demand for recreational activities in natural areas often results in environmental degradation, jeopardising the sustainability of these ecosystems. Understanding visitors' willingness to pay (WTP) to mitigate these impacts is crucial for supporting the sustainable management of these areas.
Objective This paper compares users' WTP to mitigate the impact of recreational activities at the Azibo Reservoir Beaches (ARB) (Portugal) and the Ghodaghodi Lake Complex (Nepal).
Methods: A quantitative on-site survey was conducted at the ARB, with 573 validated responses (95.5%). The Contingent Valuation Method was used to estimate visitors' WTP for the use and non-use of public goods.
Results: Respondents showed a slightly higher WTP for environmental preservation (non-use public goods) compared to infrastructure and services (use public goods). The annual WTP estimation for the ARB suggests a significantly higher valuation — approximately 3.4 times — than the comparable study in Nepal.
Conclusion: The findings emphasise the significance of assigning economic value to natural resources for improved policy and management decisions. However, limitations include reliance on survey data and contextual differences among sites. Future research should adopt broader methodologies and representative samples to enhance comparability and robustness.

Keywords: willingness to pay; recreational impacts; contingent valuation method; environmental valuation; sustainable tourism

RESUMEN

Introducción: La creciente demanda de actividades recreativas en zonas naturales suele resultar en la degradación ambiental, comprometiendo la sostenibilidad de estos ecosistemas. Comprender la disposición a pagar (DaP) de los visitantes para mitigar estos impactos es fundamental para apoyar una gestión sostenible de estos espacios.
Objetivo: Este artículo compara la DAP de los visitantes para mitigar el impacto de las actividades recreativas en las Playas del Embalse de Azibo (Portugal) y en el Complejo Lacustre de Ghodaghodi (Nepal).
Métodos: Se realizó una encuesta presencial de carácter cuantitativo en las playas del embalse de Azibo (ARB), con 573 respuestas validadas (95,5%). Se utilizó el Método de Valoración Contingente para estimar la DAP de los visitantes por el uso y no uso de bienes públicos.
Resultados: Resultados: Los encuestados mostraron una DAP ligeramente superior para la preservación ambiental (bienes públicos de no uso), en comparación con infraestructuras y servicios (bienes públicos de uso). La estimación anual de la DAP para el ARB sugiere una valoración significativamente más elevada — aproximadamente 3,4 veces — que la observada en el estudio comparable realizado en Nepal.
Conclusión: Los resultados destacan la importancia de asignar valor económico a los recursos naturales para mejorar las decisiones políticas y de gestión. No obstante, la dependencia exclusiva de encuestas y las diferencias contextuales entre los lugares constituyen limitaciones. Futuros estudios deberían incorporar metodologías más amplias y muestras más representativas.

Palabras Clave: disposición a pagar; impactos recreativos; método de valoración contingente; valoración ambiental; turismo sostenible

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INTRODUCTION

In recent decades, tourism has become a significant global industry and a crucial contributor to the gross domestic product of many countries (Alves et al., 2015). Beach destinations play an essential role in regional socio-economic development, often serving as symbols of tourism and leisure (Liu et al., 2019).

The increasing interest in valuing natural assets has prompted researchers to utilise the CVM to estimate visitors' WTP for the enjoyment and preservation of public goods (Monty & Skidmore, 2003; Adamu et al., 2015). While much of this research has concentrated on private attributes, assessing public attributes—particularly in the context of non-market goods—is equally important. Despite its significance, the use of CVM to evaluate pure public goods remains underexplored, especially in the field of tourism economics.

Pure public goods are characterised by two main features: non-rivalry in consumption and non-exclusivity in access. Beaches, especially those along coasts, rivers, or freshwater lakes, often embody these characteristics. The enjoyment of a beach by one person does not diminish its availability for others, and access is typically open to everyone (Rigall-I-Torrent & Fluvià, 2011; Peng, 2018). This framework supports the classification of the ARB—our case study site in Macedo de Cavaleiros, Portugal—as pure public goods.

The ARB is an artificial freshwater lake that has grown in popularity as a tourist destination. Recent municipal data indicates that the site attracted between 350,000 and 400,000 visitors during the summer months of June, July, and August. This significant influx underscores the need for effective public policies to manage the pressures associated with tourism and to protect environmental quality (Rigall-I-Torrent & Fluvià, 2011; Alves et al., 2015).

This study builds on previous research (Almendra et al., 2021; Almendra et al., 2023) to evaluate visitors' willingness to pay (WTP) for both the use and non-use values associated with the beaches of the Azibo Reservoir. It addresses a relatively underexplored area within public tourism and sustainable development policies, offering valuable insights for local decision-makers to improve the management and protection of these public assets. Furthermore, this study includes a comparative aspect by analyzing and contrasting the findings from Portugal with those of a similar CVM-based study conducted by Lamsal et al. (2016) at the Ghodaghodi Lake Complex (GLC) in Nepal.

The remainder of this paper is structured as follows: Section 2 reviews the theoretical foundations of public goods valuation, focusing on non-market valuation and CVM. Section 3 outlines the methodology employed in the study. Section 4 presents and discusses the results, including visitor profiles, motivations, and WTP for both use and non-use values, comparing these findings to data from the Gallup Organisation (GLC). Finally, Section 5 concludes with the key findings and their implications.

1. LITERATURE REVIEW

THE VALORISATION OF FRESHWATER LAKE TOURISM RESOURCES AS PURE PUBLIC GOODS

According to Weimer and Vining (2017), economic theory suggests that a perfectly competitive market leads to an efficient allocation of resources, known as Pareto efficiency. In this ideal case, government intervention is unnecessary because any reallocation would harm at least one individual. However, economic reality is much more complex than this theoretical model. Market failures occur when resource allocation does not achieve Pareto efficiency, thereby harming society's well-being. In such situations, government plays a crucial role in addressing these failures (Varian, 2015). It helps safeguard societal welfare and ensures the proper functioning of the economy by regulating markets, promoting transparency, and sometimes directly providing essential public goods. Common market failures discussed in the literature include externalities, natural monopolies, information asymmetry, and public goods (Samuelson, 1954; Michael, 2006).

Externalities occur when an individual's actions impact third parties positively or negatively, and these third parties do not receive compensation or punishment via the market. For example, air pollution from a factory can adversely affect the health of nearby residents without compensating them. In such cases, government intervention may regulate pollutant emissions to address these externalities (Friedman, 2002; Alves & Moreira, 2004). Natural monopolies happen when a single firm can supply a good or service to the entire market at a lower cost than multiple competitors. This is common in public services where high fixed costs make competition impractical. Consequently, government regulation of these monopolies aims to ensure fair pricing and equal access (Dolan & Lindsey, 1987; Weimer & Vining, 2017). Information asymmetry occurs when one party has more knowledge than the other. In such cases, the government can intervene to ensure all parties can access sufficient information, enhancing market transparency and trust (Friedman, 2002; Weimer e Vining, 2017).

Lastly, pure public goods are non-rival in consumption and non-exclusive in access (these goods combine both features). This means multiple individuals can consume the good at the same time, and no one can be prevented from accessing it. National defence is an excellent example of a public good that the market cannot efficiently provide, so the government plays a crucial role in its supply (Smeral, 2006; Ostrom & Ostrom, 1999; Friedman, 2002). Tourism and recreational activities are closely linked to the market context. The scientific community recognises the vital role of national, regional, and local governments in developing tourism. It is widely accepted that governments should be involved in creating public tourism policies, whether through active or

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passive measures (Michael, 2001; Scott, 2011). This is because the tourism industry is more susceptible to market failures than other sectors, requiring government intervention. Michael (2001) argues that since tourism depends on goods and services from various industries to supply its products, public intervention is necessary to restore efficiency. The main market failures in tourism have been identified by multiple experts (Sinclair & Stabler, 1997; Gooroochurn & Sinclair, 2005; Blake & Sinclair, 2007). These include tourism public goods, externalities, natural monopolies, and asymmetries in tourism information. Additionally, not all public goods, including those in tourism, can be valued through market mechanisms, so understanding how to value tourist public goods that lack market prices is essential (Rigall-I-Torrent & Fluvià, 2011; Liu et al., 2019).

1.1 Valorisation of goods with no market

Some goods and services cannot be easily valued according to market rules because it is difficult to define their economic worth. Madureira et al. (2013) explain that economic value measures the well-being derived from consuming a good or service. This value can change depending on the level of consumption. Additionally, there is a concept called marginal value, which represents the economic value gained from consuming an extra unit of a good or service. Typically, this value decreases as more units are consumed. It is important to note that economic value is assessed based on one's WTP or willingness to be compensated for a positive change (Madureira et al., 2013; Oliveira, 2015). Economic value is subjective, being determined by each person's choices and preferences regarding goods, services, and environmental factors. This means that, for example, the value of a handbag might differ from the value of maintaining water quality in a lake. While market values can quantify the former, the latter depends on what someone is willing to sacrifice to obtain it. Some goods, such as cultural and environmental resources, cannot be accurately priced using market values. In these cases, economic valuation employs methods to assess goods outside of markets. When valuing non-market goods, several components contribute to their overall economic value: “These components include direct use value, indirect use value, option value, legacy value, altruism value, and existence value” (Madureira et al., 2013, p. 67).

Over time, these components have been developed to better understand losses and gains that are not covered by direct and indirect uses alone. Protecting assets for future generations or simply ensuring their preservation are also crucial parts of economic value. Even if using a non-market good does not directly enhance well-being, choosing to preserve its existence does (Madureira et al., 2013). To value goods without a market, these components are taken into account. The total economic value includes both use and non-use values, as defined by the literature (Oliveira, 2015). Use values relate to individuals' choices and opportunities to use or potentially use a specific good or service. Conversely, non-use values are strongly associated with conserving goods or resources for others to use now and in the future. It is important to highlight that in valuing non-market goods, both use and non-use values are essential in calculations. All these components are relevant to economic valuation methods, which fall into two main categories: revealed preference methods and stated preference methods (Madureira et al., 2013). Revealed preference methods depend on individuals' choices over time. Although these methods are often seen as reliable because they reflect real decision-making scenarios, collecting sufficient data can be both time-consuming and challenging.

As it is based on users' decisions in different circumstances, it is classified as an indirect method of obtaining information (Brandli & Heineck, 2005). According to the same authors (2005), the stated preferences method, or trade-off analysis, is a direct method. It involves presenting individuals with hypothetical scenarios and options, allowing them to indicate their preferences for specific attributes. Researchers can evaluate how individuals respond to changes or new alternatives through this method. However, because it is hypothetical, there is often criticism that the answers may not accurately reflect an individual's true preferences in real-world situations. Among the various methods used to determine preferences—such as the travel cost method, random utility model, and hedonic price method—the hedonic price method is the most popular due to its reliance on market prices, which makes it easier to use. However, this method may not be suitable for environmental goods, and alternative tools are required. The CVM is one such option, which is particularly relevant to this subject and will be discussed in detail below, alongside other stated preference methods such as choice experiments.

1.2 Contingent valuation method in tourism and recreational activities

In 1947, Ciriacy and Wantrup introduced the CVM to evaluate the adverse effects of soil erosion (Adamu et al., 2015). The CVM is based on the concepts of WTP and willingness to accept, which were mentioned previously. It is widely used to assign value to goods without a market (Adamu et al., 2015; Marzetti et al., 2015; Peng, 2018; Pedroso & Biu Kung'u, 2019). This method is important because it relies on expressed preferences, meaning individuals directly state their values based on hypothetical and specific scenarios (Pedroso & Biu Kung'u, 2019). The approach is not limited to actual choices, as it considers preferences in hypothetical situations. Several studies, including those by De Groot et al. (2002), Haab and McConnell (2002), and Freeman III et al. (2014), highlight the significance of CVM in social research surveys. The CVM entails creating hypothetical scenarios that present alternative options for respondents to evaluate. For example, to estimate a person's WTP for using a particular freshwater lake beach, individuals may be asked to express their WTP for improved water quality for leisure activities. This contrasts with revealed preference models (De Groot et al., 2002). According to Peng (2018), CVM is an effective approach for studying actual preferences in hypothetical contexts, aiding in the investigation of direct WTP for specific goods. Therefore, beyond collecting user data, CVM

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can also be used to assess the market potential and public perception of a product (Marzetti et al., 2015; Oliveira, 2015). It is important in CVM to recognise that people have diverse tastes and preferences, which is reflected in the different amounts they are WTP for particular goods. When a person purchases a product, it reveals their WTP, which CVM seeks to measure through surveys (Vieira & Barbosa, 2012). Creating a hypothetical market within these surveys that accurately reflects the available goods and services, selecting questions that reveal WTP, and analysing socio-economic variables that may influence individuals' perceptions of their WTP are essential (Faria & Nogueira, 1998). Exploring how CVM can be applied to the economic evaluation of the environment and ecosystems is vital. This will help demonstrate its effectiveness in valuing freshwater lake ARB.

Many people are attracted to ecotourism, which involves recreational activities in natural areas for relaxation, adventure, and entertainment (De Groot et al., 2002). However, the rise in visitors can damage the environment, contrary to the responsible use of these areas, which is fundamental to ecotourism (Adamu et al., 2015; Oliveira, 2015). The issue is that many ecotourism sites require investment for maintenance and development, which can lead to severe environmental consequences such as overcrowding, litter accumulation, pollution, and wildlife disturbance. Sustainable development is essential in nature tourism to prevent environmental disasters. This involves implementing measures to reduce negative impacts, such as preventing pollution and using natural resources efficiently (Oliveira, 2015). Beaches are vital for tourism and the environment. Unfortunately, many of these areas suffer from degradation and damage caused by excessive tourism. Even though we focus on on-shore freshwater lakes and beaches in this study, the same principles apply. Several authors have studied the effect of recreational activities in freshwater lakes. Schafft et al. (2021) note that “Human presence at water bodies can have a range of ecological impacts, creating trade-offs between recreation as an ecosystem service and conservation” (p. 1).

Analysing several studies on the ecological impacts of aquatic recreational activities on freshwater ecosystems, the authors identified significant negative effects of boating and land use, such as hiking or biking, at various biological levels. They also found less consistent impacts related to fishing and swimming activities. Venohr et al. (2018) synthesised several examples of potential freshwater impacts on different organisational levels associated with recreational activities. The authors cited various studies indicating the negative effects of swimming activities on aquatic invertebrates, crustaceans, reptiles, and fish; of canoeing on fish and freshwater plant species richness; of hiking or biking along rivers or lakes on plant communities, plant morphology, and plant anatomy, as well as decreases in vegetation cover and impacts on duck wintering behaviour; and of fishing on the demography, abundance, health, and evolutionary trajectories of fish, changes in trophic cascades, and effects on aquatic ecosystems. These also include impacts related to camping, motor boating, or multiple recreational uses.

Both studies emphasised the importance of integrated ecosystem management, focusing on understanding the relationships between recreational quality, demand, and use, as well as the impacts of recreational activities on ecosystem state and function. They also stressed the need for improved conservation policies based on solid knowledge of these impacts and highlighted the importance of considering both ecological and social carrying capacities. On the other hand, tourists must recognise the importance of preserving these ecosystems and take responsibility for their protection and maintenance. Some potential solutions include implementing entrance fees, resource use charges, and payments for ecological services. By doing so, we can help ensure the long-term sustainability of these valuable natural resources (Liu et al., 2019). To achieve this, it is essential to have instruments that support sustainable development, including the economic valuation of these resources, which are often overlooked (Adamu et al., 2015; Oliveira, 2015).

The economic valuation of natural resources is a key goal of ecotourism. It relies on a comprehensive understanding of the values of environmental goods and services, which must be expressed in monetary terms, similar to goods often traded in the market (Adamu et al., 2015). In essence, it is important to determine whether tourists are willing to pay for the sustainability and upkeep of ecotourism destinations (de Araújo et al., 2022). When assessing the economic worth of an environmental resource, one must estimate the monetary value of other available goods and services. This includes evaluating whether the resource will improve or deteriorate based on changes in its quality and quantity. Environmental valuation also involves measuring how much people prefer a specific environmental resource, good, or service in response to observed changes in its quality or quantity.

This assessment is not necessarily based on the value of the resource but rather on estimating the values needed to prevent or recover damage or losses associated with the respective goods and services. (Liu et al., 2019; Oliveira, 2015). Policymakers depend on economic valuation to understand how different ecosystem goods or services contribute directly and indirectly to society. This understanding can assist in determining future benefits or losses linked to using environmental resources beyond current costs. It is important to note that economic valuation does not aim to set a price for the environment or its goods and services. Instead, it seeks to express the effects of small changes in the provision of environmental services relative to other valued items. One major cause of ecosystem issues is the inaccurate valuation of environmental goods and services in economic decision-making (Ring et al., 2010). When valuing natural resources without a market, the CVM is especially effective because it can account for all types of values, including use and non-use (Adamu et al., 2015; Oliveira, 2015; Pedroso & Biu Kung'u, 2019). Use values are easier to recognise, and thus, users are more inclined to pay fees for their direct or indirect use of environmental activities, goods, or services (Liu et al., 2019; Oliveira, 2015). Non-use values, however, are often overlooked because they relate to the existence, permanence, and future maintenance of goods or services for ensuing generations, which requires a certain level of altruism from

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users or visitors (Oliveira, 2015; Liu et al., 2019). While this method may not provide all solutions for environmental monitoring, hypothetical scenarios can offer valuable insights into the values of non-market goods for individuals (Adamu et al., 2015).
This approach is vital in shaping environmental public policy and is frequently used for protected areas, environmental services, endangered species, and biodiversity conservation. Moreover, in recent years, it has also been applied to analyse water quality, energy systems, environmental conservation, and ecotourism (Adamu et al., 2015). The CVM may require revision, but it effectively assesses environmental assets that other methods cannot measure (Fisher et al., 2009). For example, the monetary value of a forest in a protected area cannot be determined by the market prices of timber alone, as they have different levels of utility and well-being (Fisher et al., 2009). Therefore, it is justified for tourists to contribute to the preservation of the environment they visit, especially in the face of environmental degradation. This can be done by levying fees, which can be valued using the CVM (Adamu et al., 2015). Several recent studies reinforce the relevance of applying CVM in freshwater tourism contexts. For example, Meyerhoff et al. (2019) demonstrate how artificial lake ecosystems can generate significant recreational value for users, including implications for both ecosystem management and leisure policy. Similarly, Reynaud & Lanzanova (2017) provide a global meta-analysis of ecosystem service values associated with lakes, confirming the suitability of stated preference methods—such as CVM—in capturing non-market benefits. These findings support the application of CVM in this study as a robust method to assess both use and non-use values in a real-world lake tourism setting. Hence, it would be appropriate to use this method in this paper to assess the use and non-use value of the beaches of the Azibo Reservoir and the visitors willing to pay for the use and non-use of pure public goods. Based on all these arguments, we hypothesise that:
Hypothesis 1: Visitors to ARB are willing to pay for both the use and non-use of pure public goods.
Hypothesis 2: Visitors to ARB are more willing to pay for the use of pure public goods than for their non-use.
Hypothesis 3: Visitors to ARB are willing to pay more than GLC visitors for the non-use of pure public goods.

2. METHODS

2.1 Sample and Data Collection

This paper follows a case study approach to assess visitors' WTP for both use and non-use of pure public goods, specifically in the context of the ARB. Data collection was conducted on-site between 2 August and 6 September 2020, coinciding with the summer and peak tourist periods. This timeframe was selected to ensure a representative sample of visitors during periods of high recreational activity. The Ribeira and Fraga da Pegada beaches, both part of the ARB, were included as sampling locations. 600 visitors were approached, and 573 valid responses were obtained, resulting in a validation rate of 95.5%. Participants were selected randomly as they entered the recreational areas. Before participation, all respondents were informed about the study's objectives and assured of the anonymity and confidentiality of their responses. Participation was voluntary, and verbal informed consent was obtained from all respondents by ethical research standards.

2.2 Survey Design

The survey was developed based on prior applications of the CVM in tourism and environmental economics (e.g., De Groot et al., 2002; Haab & McConnell, 2002; Freeman III et al., 2014; Adamu et al., 2015; Marzetti et al., 2015; Peng, 2018; and Pedroso & Biu Kung'u, 2019). It consisted of 33 questions structured into four sections: (1) Visitor profile, (2) Travel and accommodation details, (3) Visitor perceptions of ARB features, and (4) WTP for the use (e.g., infrastructure and services) and non-use (e.g., landscape and environmental preservation) of the beaches as pure public goods. Most questions were closed-ended, with a strong emphasis on dichotomous (Yes/No) items to measure WTP intentions and support quantitative analysis. No formal pre-test or pilot study was conducted before data collection, primarily due to time constraints during the peak tourist season and the challenges posed by the pandemic context. However, the survey was developed based on previously validated instruments from established studies applying the CVM. These sources provided a reliable framework that helped ensure the relevance and clarity of the questions used in this study.

2.3 Valuation Approach and Statistical Analysis

The CVM was applied to estimate visitors' WTP for both use and non-use public goods. The valuation approach followed a stated preference design, presenting hypothetical scenarios to respondents. A Principal Component Analysis (PCA) was used to identify underlying components of visitor satisfaction and preferences regarding ARB features. This multivariate technique helped summarise patterns across several beach attributes, such as water quality, accessibility, and comfort. For statistical analysis, Stata software was used (Stata 12). A one-sample t-test was performed to assess whether the mean WTP differed significantly between use and non-use values. Additionally, comparative analysis was conducted using data from Lamsal et al. (2016), which evaluated WTP for conservation at the Ghodaghodi Lake Complex (GLC) in Nepal. The data were updated to 2020 values and converted to euros for comparability.

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Descriptive statistics were first compiled to characterise the sample. Subsequently, a one-sample t-test was performed using Stata software to test the research hypothesis concerning visitors' WTP. For comparative purposes, a search was carried out in the Environmental Value Reference Inventory (EVRI) database to identify similar valuation studies of natural resources. The results for ARB were compared with those obtained by Lamsal et al. (2016) for visitors to the GLC in Nepal, highlighting any differences in the valuation of comparable environmental assets.

3. RESULTS

The data collected examines the key factors that define visitors' profiles and motivations, including travel information, accommodation details, and the main features of the freshwater lake. It also assesses the use and non-use value, as well as visitors' WTP for both the use and non-use pure public goods of the ARB.

3.1. Visitors' sociodemographics

The largest age group of visitors to ARB is between 25 and 49 (62.8% of all visitors), followed by those aged 15 to 24 (25.7%). The remaining visitors are mainly between 50 and 79 years old, with a higher percentage of females (58.2%) than males (41.8%). During data collection, due to the pandemic-restricted mobility, 94.9% of participants were Portuguese, followed by 2.3% French and 1.2% Spanish. Respondents came from various countries, including Italy, Luxembourg, Bosnia, Moldova, Cape Verde, Brazil, and Venezuela. Among Portuguese respondents, the city of Macedo de Cavaleiros had the highest representation (10.2%), followed by Porto (6.3%), Vila Real (6.0%), Gondomar (5.8%), and Bragança (4.0%). Families with four members are the most common visitors (34.2%), followed by families with three (30.6%) and two members (17.2%). Single-person families make up 10.5%, while the rest come from families with 5 to 12 members. Regarding education, 39.7% completed secondary education, 27.3% hold a bachelor's degree, 19.4% finished the third cycle of primary education, and 10.5% have a master's degree. Smaller percentages hold a doctorate (1.6%) or completed the first cycle (1.4%). In terms of professional status, 66.3% work full-time (35 to 40 hours weekly), 4.6% work part-time (less than 35 hours), 1.9% work occasionally, 6.1% are unemployed, 18.8% are students, and 2.3% are retired. Regarding monthly income, 34.4% earn between €1,273 and €2,345, 29.1% between €636 and €1,272, and 13.7% between €2,346 and €3,518. A group of users (8.8%) earn up to €635. Smaller percentages earn between €3,519 and €4,691 (6.8%), €4,692 and €5,865 (2.7%), over €8,211 (2.7%), or between €5,866 and €7,038 (1.8%).

3.2. Visitors' travel information and accommodation

Based on the survey results concerning travel information and accommodation details, most individuals prefer driving to ARB, spending under €25 on travel costs. The average stay is approximately 3.79 nights, with many staying in their own homes. However, some opt for tourist accommodations such as campsites, hotels, or staying with friends and relatives, mainly in Macedo de Cavaleiros or nearby areas like Mirandela or Bragança. Typically, visitors spend €25 or less per day, which aligns with most visitors from Macedo de Cavaleiros. The data also indicates that most beach visitors arrive in groups of four or more people. This information could influence public policies related to beach use, possibly leading to different approaches for groups and individuals. Additionally, over two-thirds of those surveyed are repeat visitors to these beaches. This could also impact public policies, especially those aiming to promote user loyalty.

3.3. Characteristics of Azibo Reservoir beaches

Regarding beaches, visitors generally have different opinions on what they value most. Table 1 highlights these various perspectives. For 84.13% of visitors, water quality and the cleanliness of the sand are top priorities. This shows that people want to enjoy clear waters and well-maintained beaches for a pleasant and healthy experience. Over half of the visitors (51.15%) appreciate the natural landscape of the Azibo Reservoir, emphasising the importance of preserving the beauty and natural environment of beaches for an enriching experience. Visitors also prioritise their well-being, with 68.61% considering comfort and safety as essential factors. This indicates a desire to relax and enjoy the beach in a safe and secure environment. However, quality certification remains necessary but is less essential than the other features mentioned. This suggests that visitors trust the overall condition of the beach, even without formal certification. Less than half of visitors (37.04%) value the availability of support equipment such as sun loungers and toilets. This might imply that many prefer a more natural experience or to bring their own accessories. Surprisingly, environmental preservation and nature are less valued than other features. This could suggest that visitors have confidence in the area's environmental conservation, but there are different reasons for their visit. In summary, the beach experience focuses on water quality, natural beauty, and visitor safety. Quality certification, support facilities, and environmental preservation are also important, but they do not dominate visitors' preferences. This perspective emphasises the importance of balancing the provision of amenities and nature preservation while considering the diverse needs of visitors.

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Table 1 - Overall valued features of beaches

Features of beaches	Not at all important	Not very important	Important	Very important
Clean water and sand	0,18%	0,88%	14,46%	84,13%
Landscape	0,35%	4,41%	51,15%	43,39%
Comfort and safety for bathing and sun Exposure	0,35%	3,53%	26,28%	68,61%
Quiet and low number of visitors	4,06%	22,05%	46,56%	25,57%
Leisure facilities (sports areas, restaurants, among others)	3,17%	23,10%	45,86%	26,46%
Access infrastructures	0,88%	4,94%	44,62%	48,15%
Beach quality certification	1,06%	7,76%	30,34%	60,14%
Support facilities (sun loungers, toilets, among others)	2,29%	13,40%	46,21%	37,04%
Nature and environmental preservation	0,18%	1,76%	26,10%	71,08%

Source: Own elaboration

Considering 22 beach characteristics, visitors were asked to rate ARB on a Likert scale from 1 to 10, where 1 indicates a "Very Unfavourable" assessment and 10 indicates an "Extremely Favourable" assessment (Figure 1).

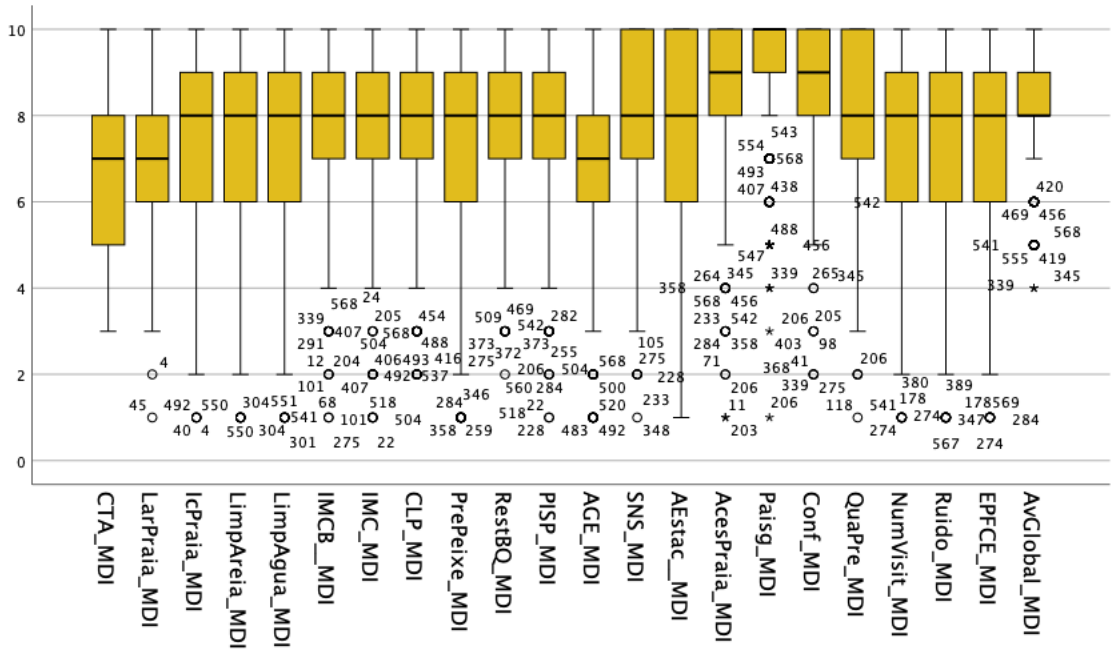

Figure 1 - Boxplot of studied variables

The colour and texture of the sand are especially appreciated, with many visitors rating it between 6 and 10. This demonstrates how important sand quality is for an enjoyable beach experience, with around 30.3% of participants scoring 9 or 10, showing high satisfaction. The width of the beach is also significant, with over 50% of participants rating it between 8 and 10. This indicates a preference for spacious beaches that offer greater comfort and space for visitors. The cleanliness of the beach and water is consistently rated positively, with many visitors assigning scores between 6 and 10. This focus on hygiene and environmental quality suggests that ARB maintains high conservation standards. Visitors also regard the facilities, such as toilets, showers, and garbage cans, as well-maintained and functional, with favourable ratings between 6 and 10. This shows that the support infrastructure meets the expectations of beachgoers. The natural landscape of ARB is highly valued, with most respondents scoring it between 8 and 10. This reflects an appreciation for the region's natural beauty, including stunning landscapes that enhance the overall experience. However, when visiting ARB, it is important to consider aspects that all visitors may not highly value. Despite positive ratings for certain features, the overall assessment of the beaches received lower scores from around 40.7% of participants. This suggests that although visitors may appreciate individual aspects, the overall experience might not meet all expectations. Although overall comfort was rated positively, some respondents gave low scores, indicating that improvements to beach comfort, such as rest areas or shading, might be needed for certain visitors. The relationship between the price paid and the quality of the beach experience also received negative evaluations from 38.9% of respondents, suggesting that some visitors feel the experience does not justify the costs involved. ARB is recognised for its natural features, well-maintained facilities, and

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cleanliness. However, visitors' overall experience may vary, and some might desire improvements in comfort and value for money. A PCA was conducted based on respondents' answers, resulting in four components being identified. These components are: Overall Experience, Comfort and Safety, Bathing Quality of Beaches and Car Parking, Accessibility and Cleanliness (Table 2).

Table 2 – Principal Components

Component 1 - Global Experience	**Factorial Load**	
Ruido_MDI	**0,698**	This component suggests representing the overall experience of visitors, by having associated variables related to attributes such as noise, quality/price ratio, comfort, landscape, number of visitors and overall evaluation.
QuaPre_MDI	**0,642**	
Conf_MDI	**0,637**	
Paisg_MDI	**0,634**	
NumVisit_MDI	**0,614**	
AvGlobal_MDI	**0,545**	
Component 2 - Confort and Safety	**Factorial Load**	This component suggests representing comfort and safety, by having associated variables related to attributes such as the availability of restaurants, bars and kiosks, or the possibility of renting umbrellas and sun loungers, existence of information points and beach signs, lifeguard service and also the availability and maintenance of showers.
RestBQ_MDI	**0,719**	
AGE_MDI	**0,693**	
PISP_MDI	**0,692**	
SNS_MDI	**0,639**	
IMC_MDI	**0,505**	
Component 3 - Beaches' Bathing Quality	**Factorial Load**	The third component seems to be associated with the bathing quality of the beaches, as it comprises variables such as the color and texture of the sand, water cleanliness and sand cleanliness.
LimpAreia_MDI	**0,787**	
CTA_MDI	**0,729**	
LimpAgua_MDI	**0,721**	
Component 4 - Parking, Acesibility and Cleaningless	**Factorial Load**	The last component suggests being associated with parking, accessibility and cleanliness, as it comprises variables such as parking areas, access to the beach, facilities and maintenance of bathrooms and also, despite having a weak association, the availability of garbage containers and litter bins.
Aestac_MDI	**0,814**	
AcesPraia_MDI	**0,652**	
IMCB_MDI	**0,509**	
CLP_MDI	**0,421***	

Source: Own elaboration | * Factorial Load < 0,5

These four principal components proved to be independent of each other, with no significant correlation or clustering patterns, indicating that individually, they contribute uniquely to explaining the variance in the data. The ARB visitors prioritise safety for people and property, with 80.4% of them considering safety as "very important," while 19.6% thought it was "important." These results emphasise the crucial role of safety measures in managing and governing this natural resource. Authorities and policymakers should prioritise and enhance safety measures to ensure a secure and enjoyable experience for all visitors.
ARB face a significant issue during the high season: insufficient parking space. 99.1% of visitors agree that parking lots are essential, with only five respondents disagreeing. According to Table 3, visitors highly value the surveillance of car parks, with 51.2% highlighting it as a top priority. Other essential features include shaded areas (45.9%) and paved parking lots (41.1%), as shown in Table 3. Concerns over parking space delineation and distance from the beach were also expressed. However, visitors showed less interest in information about parking lots and parking costs. The data collected in the survey can be used to improve the management and amenities of car parks in the ARB area and suggest that visitors are willing to pay for parking.

Table 3 - The most valued features of parking lots

Features of parking lots	**Not at all important**
Parking Surveillance	51.2%
Delimitation of parking spaces	31.0%
Paving Parking Lots	41.1%
Parking Information	16.9%
Parking Lot Capacity	18.9%
Shaded Area	45.9%
Distance to Beach	42.3%
Cost of Parking	20.4%

Source: Own elaboration

4.4. Use and non-use value and visitor's WTP for the use and non-use of ARB

To test our hypothesis, we include variables in the analysis related to the use and non-use value and visitors' WTP for both the use and non-use of ARB, measured by variables and indicators described in Table 4. Table 4 summarises the relevant descriptive statistics. Out of the 600 responses collected, we analysed 568, representing 94.7% of the surveyed population.

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Table 4 - Variable description

Variable	Description
Use value of Azibo Reservoir beaches (UseValueARB)	Dichotomous variable. 1 if visitors are WTP to improve support equipment and infrastructure (parking, sports gear, cleaning, changing rooms, among others) of Azibo Reservoir beaches; 0 if not.
WTP per person/visit/day for use Azibo Reservoir beaches (WTP.Use.ARB)	Amount in euros that visitors are WTP (per person/visit/day) to improve support equipment and infrastructure (parking, sports gear, cleaning, changing rooms, among others) of Azibo Reservoir beaches
Non-use value of Azibo Reservoir beaches (Non-UseValueARB)	Dichotomous variable. 1 if visitors are WTP for better environmental and landscape preservation and conservation of Azibo Reservoir beaches; 0 if not.
WTP per person/visit/day for non-use Azibo Reservoir beaches (WTP.Non-use.ARB)	Amount in euros that visitors are WTP (per person/visit/day) for better environmental and landscape preservation and conservation of Azibo Reservoir beaches.

Source: Own elaboration

As Table 5 demonstrates, the variables "UseValueARB" and "Non-UseValueARB" each have an average of 50%. This indicates that visitors' evaluations of the value of using and not using ARB are evenly distributed across the dataset. Consequently, Hypothesis 1: “Visitors to Azibo Reservoir beaches are willing to pay for the use rather than for the non-use of pure public goods” is supported. Regarding the other variables, "WTP.Use.ARB" and "WTP.Non-use.ARB", the data also shows a slight difference in their average WTP.

Table 5 - ARB Variable’s descriptive statistics

Variable	Obs	Mean	Standard deviation	Minimum	Maximum
UseValueARB	568	.5176056	.5001304	0	1
WTP.Use.ARB	568	1.714085	3.045923	0	30
Non-UseValueARB	568	.5	.5004407	0	1
WTP.Non-use.ARB	568	1.802993	5.165526	0	100

Source: Own elaboration

The results indicate an average WTP of €1.71 per person/day for infrastructure and equipment (use value), and a slightly higher WTP of €1.80 per person/day for environmental preservation (non-use value). This suggests a relatively balanced valuation of both aspects of the public good, with a modest preference for environmental conservation. These findings support Hypothesis 1, which posits that visitors are willing to pay for both the use and non-use of pure public goods. The WTP distribution also reflects heterogeneity among respondents, particularly in the non-use category, which ranged from €0 to €100, suggesting differing perceptions of ecological value. In accordance with these data, it is also clear, as shown in Table 6, that most visitors (84.0%) who appreciate the use of Azibo Reservoir's public beaches also value the non-use features of this public good. Similarly, most visitors (86.5%) who do not appreciate using Azibo Reservoir's public beaches also do not value the non-use aspects. A significant link exists between the variables UseValueARB and Non-UseValueARB, representing the value of use and non-use of Azibo Reservoir beaches. Hence, data indicate a significant association between valuing use and non-use; many visitors value both aspects equally. However, the relationship between these two forms of valuation is more complex, and visitors value both in notable proportions.

Table 6 - Contingency table, Use value versus Non-use value

UseValueARB	Non-UseValueARB		Total
	0	1	
0	237	37	274
	86,5%	13,5%	100%
1	47	246	294
	16,0%	84,0%	100%
Total	284	284	568
	50,0%	50,0%	100%

Source: Own elaboration

Hypothesis 2: Visitors to Azibo Reservoir beaches are more willing to pay for the use than for the non-use of pure public goods.

To evaluate our hypothesis, two variables were considered: "WTPUseARB" and "WTPNonuseARB". These variables represent the WTP for using and not using these goods. The main results are in Table 7.

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Table 7 - Paired t-test, visitor's WTP for the use and non-use of ARB

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
WTPUse~B	568	1.714085	.1278041	3.045923	1.463057	1.965112
WTPNon~B	568	1.802993	.2167406	5.165526	1.37728	2.228706
diff	568	-.0889085	.1885732	4.494217	-.4592957	.2814788
mean(diff) = mean (WTPUseARB - WTPNonuseARB)				t = -0.4715		
Ho: mean(diff) = 0				degrees of freedom = 567		
Ha: mean(diff) < 0		Ha: mean(diff)!= 0		Ha: mean(diff) > 0		
Pr(T < t) = 0.3187		Pr(|T| > |t|) = 0.6375		Pr(T > t) = 0.6813		

Source: Own elaboration

The average WTP for use ("WTPUseARB") is approximately €1.71, while the average WTP for non-use ("WTPNonuseARB") is around €1.80. The difference between these averages is €-0.09, which suggests that, on average, visitors are WTP slightly less for non-use of these pure public goods compared to using them (as we can see, the standard error indicates greater variability). The most important outcome of our analysis is the t-test value, which is -0.4715. This value helps determine if the difference between the two means is statistically significant. Based on the p-value associated with the t-test, which is 0.3187, there is no significant evidence to support our hypothesis at a 0.05 significance level. The test results do not prove that visitors to ARB are more WTP for using pure public goods than for non-use. This result does not support Hypothesis 2, though it highlights that environmental preservation is at least equally valued by visitors as the physical infrastructure of the site.
Finally, regarding Hypothesis 3: "Visitors to Azibo Reservoir beaches are willing to pay more than Ghoda Hodi Lake Complex visitors for the non-use of pure public goods", findings from Lamsal et al. (2016) were considered. In their study and considering CVM, the authors concluded that visitors to the GLC were willing to pay an entrance fee as a way of supporting conservation efforts, easing conservation budget constraints, which could generate additional revenue for the preservation of the ecosystem., i.e. visitors are WTP for the non-use of GLC. They also identified a moderate recreational potential for the GLC, with significant opportunities for enhancement through effective management.

Table 8 - GLC visitor's travel cost and WTP for non-use (USD 2007 current prices)

Variable	Mean	Standard deviation	Minimum	Maximum
Travel Cost GLC	US $7.71	5.371428	US $1.31	US $30.17
WTP Non-use GLC	US $0.48	0.242857	US $0.07	US $0.71

Source: Own elaboration based on Lamsal et al. (2016)

The authors also determined the average travel cost of GLC visitors, including food and other miscellaneous travel expenses and the opportunity cost of travel time. This was calculated to be US $7.71 per visitor per visit at current 2007 prices, indicating a recreational potential of the GLC of US$ 0.054 million (current 2007 prices) per year. To compare these estimates with the WTP of ARB visitors for conservation purposes, i.e. for non-use, the average value of the GLC was first determined at current prices for 2020 and then converted to Euros using the average USD-EUR exchange rate for 2020 (Table 9).

Table 9 - GLC visitors' travel cost and WTP for non-use (USD and EUR 2020, Mean current prices)

Variable	Mean 2007 current prices	Mean 2020 current prices	Mean 2020 current prices in EUR
Travel Cost GLC	US $7.71	US $9.62	EUR 8.44
WTP Non-use GLC	US $0.48	US $0.60	EUR 0.53

Source: Own elaboration based on Federal Reserve Bank of Minneapolis data and IRS - Internal Revenue Service, United States Government

Considering that ARB visitors are willing to pay €1.80 (per person/per day) for the non-use of public goods, and based on the results of Lamsal et al. (2016), the average 2020 current prices in euro of WTP non-use GLC estimated at €0.53, hypothesis 3: "Visitors to the beaches of the Azibo Reservoir are willing to pay more than visitors to the Ghoda Hodi Lake Complex, for the non-use of pure public goods" is accepted, as ARB visitors are willing to pay about 3.4 times more than GLC visitors. On this point, it is crucial to point out that on many levels, such as economic and social, the realities in Nepal and Portugal are very different; the GLC study was carried out in 2007, a time when sustainability and environmental protection were not as important as they are nowadays, and the ARB survey was carried out during the COVID-19 pandemic, a time when people were more sensible in choosing less crowded and natural destinations, and therefore probably more inclined to contribute to their conservation. Otherwise, Portugal also has a more established culture of environmental awareness and public service access, which may contribute to greater WTP for conservation efforts. These socio-economic and cultural disparities are essential to contextualise the quantitative

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difference and avoid overestimating the absolute value gap. The results reinforce that economic valuation must be interpreted within local realities, and they provide valuable insight for policymakers when designing tourism management and conservation funding mechanisms.

Finally, considering both the use and non-use value of ARB, it can be estimated that these freshwater lake beaches can be valued at a total of €3.51 per visitor per day, which calculates an estimated total maximum annual value of €1,404,000 for this public good with recreational/tourist potential.

CONCLUSION

This paper offers relevant and original contributions to the field of sustainable tourism, particularly in the valuation of freshwater lake beaches as pure public goods. By applying the CVM to estimate visitors' WTP for both use and non-use attributes of the ARB, the findings demonstrate that natural and environmental aspects are at least as valued as infrastructure. This reinforces the role of environmental preservation as a core element of tourism experiences in inland Portugal.

From a theoretical perspective, the study advances the application of CVM in recreational settings with high seasonal variation and public access. It highlights the utility of separating WTP into use and non-use dimensions, offering a more nuanced understanding of how visitors perceive and value ecological versus infrastructural components. Furthermore, by comparing the Portuguese case with Nepal's Ghodaghodi Lake Complex, the study illustrates the importance of socio-economic and cultural context in cross-national environmental valuation.

From a practical standpoint, the results provide actionable insights for local governments and tourism planners. The relatively high WTP for environmental conservation suggests a clear opportunity to implement eco-contributions or usage fees earmarked for habitat protection and sustainability initiatives. Such measures could be communicated transparently to the public as a means of reinforcing shared responsibility for resource preservation. In addition, the identification of key factors valued by visitors (e.g., water quality, landscape, safety) can inform infrastructure investment priorities and help enhance visitor satisfaction while preserving ecological integrity.

However, the study has several limitations. It relies exclusively on a cross-sectional survey with no longitudinal data, and the absence of a pre-test may limit the validation of certain questions. Moreover, while the comparative element is valuable, the Nepalese data used is from 2007, and economic and environmental awareness may have changed significantly since then.

Future research should adopt mixed methods approaches, including qualitative interviews with stakeholders and local authorities, to triangulate findings and explore value perceptions in greater depth. Expanding the geographic scope to other freshwater ecosystems and incorporating temporal comparisons would also help validate and generalise the conclusions. Finally, integrating behavioural measures (e.g., actual payment behaviour or donation data) could improve the predictive capacity of stated preferences.

In sum, this research contributes to the emerging literature on the economic valuation of non-market environmental goods and provides an empirical foundation for more sustainable, community-oriented tourism strategies.

AUTHORS' CONTRIBUTION

Conceptualization, M.A., E.P., C.S.C. and M.M.; data curation, M.A., E.P., C.S.C. and M.M.; formal analysis, M.A., E.P., C.S.C. and M.M.; investigation, M.A., E.P., C.S.C. and M.M.; methodology, M.A., E.P., C.S.C. and M.M.; project administration, M.A., E.P., C.S.C. and M.M.; resources, M.A., E.P., C.S.C. and M.M.; software, M.A., E.P., C.S.C. and M.M.; supervision, M.A., E.P., C.S.C. and M.M.; validation, M.A., E.P., C.S.C. and M.M.; visualization, M.A., E.P., C.S.C. and M.M.; writing – original draft, M.A., E.P., C.S.C. and M.M.; writing-review and editing, M.A., E.P., C.S.C. and M.M.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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