Valuation of Local Recreation Over Time Using the Extended Travel Cost Method (TCM) – the Case of the Dalsnuten-/Dale Area, Sandnes.

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Preface

Dear Reader,

This paper concludes our two-year MSc program in Business Administration at the University of Stavanger. With a focus on environmental valuation, the research aims to estimate the recreational value of the Dalsnuten-/Dale area and examine the effects of hypothetical quality changes. We also assess the temporal stability of recreational value by comparing our findings to a previous study by Marte Lohaugen and Greta Refsdal conducted in 2016.

Undertaking this paper has been a challenging and time-consuming task, yet it has provided us with a fascinating subject matter and a comprehensive understanding of the topic. We are immensely grateful for the valuable assistance and support we have received. First and foremost, special thanks to our supervisor, Gorm Kipperberg, for his guidance, dedication, and feedback, which was valuable and motivating to us during the writing process. We are also grateful to Bjørn Bråtveit, the chairman of Sandnes Turlag, for providing essential information about the Dalsnuten/Dale area. Lastly, we extend our thanks to the survey participants, whose active involvement proved invaluable in gathering the necessary data for our research and analysis.

Enjoy your reading!

Abstract

Research on recreational areas is vital for policymakers and stakeholders to evaluate their economic impact on local communities and the broader economy. However, existing literature on recreation valuation often overlooks the examination of value variations over time, focusing primarily on either revealed or stated preference methods. This study aims to address this gap by using the travel cost method (TCM) to estimate the non-market value of the Dalsnuten-/Dale area in Sandnes, Norway, and to compare it with the findings of a previous study conducted in 2016 by Marte Lohaugen and Greta Refsdal. By combining revealed and stated preference methods, the study assesses changes in value under various hypothetical scenarios. The results reveal a consumer surplus per trip of 169.06 NOK for the recreation area in 2023, indicating a decrease compared to the estimated 192.59 NOK in 2016. Additionally, the comparison between the two studies demonstrates an increase in demand for the area after seven years. However, COVID-19 and the presence of windmills were not factors impacting the demand. The findings underscore the need for further research to explore the underlying reasons behind consumer surplus and demand changes.

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1. Introduction

Non-market valuation has emerged as a prominent field in the literature, focusing on the valuation of goods and resources that are not traded directly in the market but have value for individuals and society. One notable aspect of non-market valuation is the assessment of recreational worth linked to natural areas, parks, and outdoor spaces. Among these, the Dalsnuten-/Dale outdoor area in Sandnes, Norway, stands out as a highly popular destination catering to various outdoor activities. With its diverse range of peaks and trails varying in duration and difficulty, the area attracts visitors of all skill levels, offering them an array of engaging experiences.

In the context of the valuation of non-market goods, the temporal stability of recreational values has received much attention in the literature in the last decades. By examining the stability of these values over time, researchers seek to uncover the long-term effects and dynamics of recreational activities. Most of the literature examines the temporal stability of WTP (Bliem et al., 2012; Czajkowski et al., 2016; Neher et al., 2017), but less attention has been paid to examining the stability of consumer surplus. There has also been increasing interest in combining travel cost method (TCM) with contingent behavior (CB) data (Rosenberger & Loomis, 1999; Alberini et al., 2007; Hynes & Greene, 2013; Huang, 2017). However, no comparative study has been conducted that examines the utilization of a combination of revealed and stated preference methods for the same recreation area.

In 2016, Marte Lohaugen and Greta Refsdal conducted a significant study aimed to estimate the value of the Dalsnuten recreation area. The primary focus of their study was to assess the recreational demand and consumer surplus of the Dalsnuten area by employing a robust single-site travel cost model. In order to enrich the analysis of actual visits and revealed preferences, the study also collected valuable contingent behavior (CB) data, providing insights into the estimation of values related to hypothetical changes in the quality of recreation sites. Building upon the 2016 research, the present study aims to gain further insights by conducting a similar value estimation using the travel cost method (TCM) and comparing the results with the previous findings.

The main research question of this paper is: **What is the value of local recreation of the Dalsnuten/Dale area, and how has it changed over time?**

In addition, the following questions are sought to be answered:

1. How has the recreational demand changed over time?
2. Has windmill park and COVID-19 impacted the demand of the Dalsnuten-/Dale area?
3. How would the closure of the most popular peak in the area - Dalsnuten - impact the demand and value of the area?
4. How would the improved bus accessibility impact the demand and value of the area?

This study makes a significant contribution to the existing literature by employing a comprehensive approach to value the Dalsnuten-/Dale area. Unlike previous research, which often focuses on either the revealed or stated preference methods, this study combines both methods, namely the travel cost method and contingent behavior, to provide a more comprehensive assessment of the area's recreational value. In addition to valuing the Dalsnuten-/Dale area, this study conducts a comparative analysis of temporal effects by referencing a previous study conducted by Marte Lohaugen and Greta Refsdal in 2016, who explored a similar local recreation area. This comparative analysis allows for a deeper understanding of how the recreational value of the Dalsnuten/Dale area may have evolved over time.

One notable aspect of this research is that it investigates the temporal stability of consumer surplus, a key indicator of economic welfare, within the context of non-market valuation of recreational values. Within the extensive empirical literature on recreational area valuation, no study has investigated the temporal stability of consumer surplus using combined revealed preference methods in the context of non-market valuation. The analyses will offer valuable insights for stakeholders, including policymakers, resource managers, and researchers.

2. The Dalsnuten-/Dale Recreation Area

Figure 1. *"7 peak-trip" map (DNT, 2023c)*

The Dalsnuten-/Dale recreation area, located in Sandnes, Norway, is a popular outdoor destination. The area offers a variety of peaks and trails with different durations and difficulty levels, attracting visitors of all skill levels. The two main starting points in the area are the Dale and Gramstad parking lots, with Gramstad being the preferred choice due to its central location within the recreation area (see Figure 1).

At the Gramstad parking lot, visitors can access amenities such as a rental cabin and a café owned by the Stavanger Trekking Association (DNT, 2023a; DNT, 2023b). The café offers a diverse menu, including soups, sandwiches, waffles, ice cream, and a selection of beverages (DNT, 2023b). It is open on Thursdays and Sundays from 12 to 15, and during Easter week, it remains open every day from 12 to 15, providing free activities for children (DNT, 2023, March 6). The Stavanger Trekking Association also organizes group trips and various activities in the area (Stavanger Turistforening, 2023). They host a trip café on Thursdays and offer group workouts for people aged 60 and above on Tuesdays.

Additionally, the association has installed a digital tracker along the trail leading to the Dalsnuten peak from Gramstad. In 2022, the tracker recorded approximately 200,000 visitors throughout the year, with an average of 593 individuals per day. The data from the tracker reveals that weekends see a higher influx of visitors from 11 am to 5 pm, while weekdays experience peak hours from 11 am to 12 pm and from 5 pm to 8 pm.

The most popular peak in the area is Dalsnuten, which stands at an elevation of 323 meters above sea level. The trip to this peak typically begins from the Gramstad parking lot and takes approximately 1.5 hours to complete the round trip, covering a distance of 4 kilometers. However, visitors have the option to extend their trip by exploring other peaks in the area, allowing them to spend several additional hours exploring different parts of the landscape.

Another popular peak that can be accessed from the Gramstad parking lot is Bjørndalsfjellet, located on the opposite side of Dalsnuten. The hike to Bjørndalsfjellet takes about 2 hours for the round trip, covering a distance of 6 kilometers. This allows visitors to enjoy a longer and more diverse hiking experience within the area. A notable addition to the landscape in 2020 was the construction of the Vardafjellet wind farm in Sandnes. As a result, visitors to the Dalsnuten-/Dale area can now observe the wind turbines from certain peaks, such as Mattirudlå and Bjørndalsfjellet.

Dale parking lot serves as an alternative starting point for hiking in the Dalsnuten-/Dale area, although it is not as popular as the Gramstad parking lot. One factor that may contribute to its lower usage is the parking fee of 50 NOK, which some hikers may perceive as expensive compared to the free parking available at Gramstad. Additionally, hiking trips starting from Dale may be considered more challenging as they involve navigating through forested areas, and the duration of these trips typically ranges from 2 to 5 hours for a round trip, covering distances of 4 to 9 kilometers to reach the nearest peaks.

Also, hikers can go through the whole Dalsnuten-/Dale area for the «7 peak-trip», which can be initiated or concluded at either the Gramstad or Dale parking lots (see Figure 1) (DNT, 2023c). The "7 peak-trip" spans a distance of 15.8 kilometers and typically takes an average of 6 to 8 hours to complete. It includes traversing the following peaks: Bjørndalsfjellet, Mattirudlå, Dalsnuten, Skjørestadfjellet, Jødestadfjellet, Sørafjellet, and Lifjell.

Despite the availability of parking lots in the area, no public transport goes right to those parking lots. The nearest bus stop to Gramstad is situated 1.6 kilometers away, requiring approximately 20-25 minutes to walk. This distance and duration of the walk, coupled with the incline of the road, can be challenging for many individuals. On the other hand, the path from the closest bus stop to the Dale parking lot is significantly shorter and easier than Gramstad, taking only about 5 minutes to walk. This accessibility advantage may make the Dale parking lot a more convenient option for those relying on public transportation to access the area.

3. Literature Review

Numerous empirical studies have focused on valuing various recreational areas, including beaches, parks, and forests, using the total travel cost method (TCM). These studies provide valuable insights into the consumer surplus associated with these areas. For instance, Alessandro et al. (2023) researched three different recreation areas and utilized the TCM to estimate consumer surplus per trip, ranging from €7.33 to €17.37. Hesseln et al. (2004) examined two national parks in Montana and Colorado and reported consumer surplus values of $11.54 per trip for Montana residents and $54.49 per trip for Colorado residents. Weiqi et al. (2004) assessed the recreation benefits at a beach in China using the TCM and found a consumer surplus of $16.9 per trip. In a study by Betz et al. (2003), the authors estimated recreation demand and value at a potential rail site in Georgia, revealing a consumer surplus per trip ranging from $18.46 to $29.23. These studies demonstrate the diverse range of consumer surplus estimates derived from the application of TCM across different recreational areas.

Indeed, there is a notable gap in the existing literature regarding the temporal stability of consumer surplus in relation to recreational values. While many studies have investigated changes in willingness to pay (WTP) over time using stated preference or revealed preference methods, limited attention has been given to examining the stability of consumer surplus estimates. Several studies have shown that WTP tends to remain stable over both short and long time periods (Czajkowski et al., 2016; Bliem et al., 2012; Neher et al., 2017; Bhattacharjee et al., 2009; Parsons & Stefanova, 2009). These findings suggest that individuals' value of recreational areas and willingness to pay for them stay mostly the same over time. Also, some researchers, such as Brouwer & Bateman (2005) and Boman et al. (2011), have observed decreases in real WTP values over longer time intervals. These studies indicate that certain factors or changes in the recreational context may influence individuals' valuation of the area, leading to a decline in their willingness to pay.

Indeed, there is a notable gap in the existing literature regarding the investigation of how consumer surplus for the same recreation area evolves over time, using a combination of revealed preference and stated preference methods. However, a significant contribution in this regard is the study conducted by Rolfe & Dyack (2019), which stands out for its comprehensive analysis of the temporal stability of recreational values. They employed the travel cost model

(TCM) and contingent valuation model (CVM) and conducted repeated experiments seven years apart within the Coorong region of Australia. The findings of Rolfe & Dyack (2019) indicate that stated preference values exhibit greater stability over time compared to revealed preference values for the same recreation area. The consumer surplus per adult, estimated by the TCM, increased by $136.06 over time, while the consumer surplus per adult, assessed using CVM, increased by $44.89 over the same period.

3.1 Variables Influencing Recreational Demand

Numerous articles have contributed to understanding the relationship between various factors and the number of trips to recreation areas. Shrestha et al. (2007) and Loomis et al. (2001) have highlighted travel costs' important role in shaping trip behavior. Their findings indicate a significant negative correlation between travel costs and the frequency of trips. In other words, as travel costs increase, the number of trips tends to decrease. This suggests that visitors are sensitive to the financial implications of accessing recreation areas, and higher costs may deter frequent visitation. These results align with the basic principles of economic theory, indicating a downward-sloping demand function for recreational trips. Additionally, Loomis et al. (2001) have demonstrated that the stated preference trip dummy, involving hypothetical scenarios, positively influences the number of trips compared to the number of revealed preference trips under similar circumstances. This suggests that individuals' stated preferences, as expressed in hypothetical scenarios, may play a role in shaping their trip behavior.

The relationship between the length of stay in a recreation area and the number of trips taken has been a subject of interest in several studies, including the works of Bell & Leeworthy (1990), Creel & Loomis (1990), Shrestha et al. (2002), and Shrestha et al. (2007). These studies consistently demonstrate a negative relationship between the duration of stay and the number of trips. Regarding socio-demographic variables, Voltaire et al. (2017) have highlighted a positive and significant association between age and the demand for recreation areas. This implies that older individuals tend to display a greater inclination towards engaging in recreational activities compared to younger individuals. Regarding gender, Loomis et al. (2001) have provided evidence indicating a significant and positive influence of gender on the number of trips to the recreation area, with men taking more trips than women. Similarly, Shrestha et al. (2007) found a positive influence of male respondents on demand for the recreation area, although the relationship is not significant. Additionally, Shrestha et al. (2007) note that education plays a significant role in recreational travel demand, suggesting that frequent visitors tend to have relatively lower levels of education.

Further, the relationship between income and the recreation area, as observed in various studies, yields mixed results. Some studies, such as Loomis (2003), Sohngen et al. (1999), Liston-Heyes & Heyes (1999), and Creel & Loomis (1990), have shown a negative or insignificant association between income and the recreation area. However, other studies, including Landry et al. (2012) and Voltaire et al. (2017), have reported a negative and significant relationship between income and the recreation area, but with minimal effects. This indicates that income has a limited or no influence on travel demand, or that the recreation area is an inferior good. In contrast, studies such as Du Preez & Lee (2016), Bin et al. (2005), and Martinez-Espineira et al. (2008) find a positive and significant income coefficient, indicating that the recreation area functions as a normal good.

3.2 Changes in Recreation Visitors and Their Demand Over Time

Although there is a lack of studies specifically focusing on the demographic changes of recreation visitors over time, some studies have made valuable observations regarding changes in respondent profiles. For instance, Voltaire et al. (2017) conducted a study on beach recreation demand and found that the average number of trips increased in 2012 compared to the previous year.

Further, the presentation of changes in socio-demographic data over time varies across different articles. In the study by Bliem et al. (2012), which focused on the perception of river quality, consistent patterns were observed in age groups, income levels, and gender distribution. Across both survey periods in 2007 and 2008, no significant variations were detected among age groups, with ages ranging from 40 to 49 having the highest representation compared to other age groups. Income levels remained stable over time, showing no significant changes. Similarly, the gender distribution remained consistent, with a slightly higher proportion of women than men in both periods. These findings align with the study conducted by Bhattacharjee et al. (2009), where the same individuals were surveyed in both periods.

Conversely, Brouwer & Bateman (2005) identified noteworthy shifts in respondents' demographics. A comparison between the 1996 and 1991 samples revealed significant differences. The 1996 sample had a higher number of visitors falling into the lower income category compared to the 1991 sample, indicating a change in the income composition of visitors over time. Furthermore, the 1996 sample showed a higher proportion of respondents who had visited the area previously, suggesting a higher level of repeat visitors. Also, there was a lower representation of individuals affiliated with environmental groups or organizations in the 1996 sample, indicating a shift in visitor profiles.

In contrast, Rolfe & Dyack (2019) discovered distinct trends in their study. They observed an increase in the average household income among visitors in 2013 compared to 2009. Additionally, there was a noticeable shift in the age distribution of visitors, with the proportion of older visitors increasing. The average age of visitors surpassed 50 in 2013, compared to under 50 in 2009, indicating a changing demographic composition of visitors. Similarly, Liebe et al. (2012) observed a higher participation rate of women in their survey compared to the previous one. Furthermore, they noted a slight increase in the average age of respondents over time, ranging from 46 to 50 years old, suggesting a gradual aging of the visitor population. Additionally, there were higher income levels reported in the more recent survey. However, they found minimal differences in terms of education and household size over time, indicating relative stability in these socio-demographic characteristics.

3.3 Other Factors Impacting Recreational Demand Over Time

The effects of Covid-19 on environmental surveys have received limited attention in the existing literature. Venter et al. (2021) observed a noteworthy shift during the five-week lockdown in Oslo, where residents engaged in 240% more outdoor activities than before the lockdown. This increase in outdoor activities resulted in an overall increase in the residents' Willingness to Pay (WTP). In contrast, Parsons et al. (2022) found a 7% decrease in average WTP due to the pandemic. The pandemic may also have other impacts directly related to outdoor recreation. Landry et al. (2021) assessed the impact of Covid-19 on outdoor recreational travel and its value using the travel cost method. Their findings indicate negative implications, including a 26% reduction in trips per participant and a 19% to 26% decrease in consumer surplus. These results suggest that the pandemic has led to a decline in the overall quantity and quality of the outdoor recreational experience, resulting in reduced consumer satisfaction and value.

The influence of wind turbines near recreation areas has been investigated in several articles, providing insights into people's preferences and perceptions. Voltaire et al. (2017) discovered that the installation of an offshore wind farm would significantly alter respondents' travel behavior and result in a loss of value for beach visitors in Catalonia. Similarly, Kipperberg et al. (2019), concluded that wind turbines would impact demand and recreation value negatively. However, most studies suggest that wind turbines would have little or no impact on recreation demand.

Frantàl & Kunc (2011) conducted a study in the Czech Republic comparing two recreational areas, one with a planned wind farm and the other with an existing wind farm. Most respondents in the area without wind turbines (90%) reported no impact on their future visits, indicating that the presence of wind turbines would not deter visitors. Likewise, the majority of respondents from the area with wind turbines (95%) also stated that the presence of wind turbines had no impact on their current and future visits. Additionally, some respondents believed that wind turbines could potentially have a positive impact by attracting more tourists to the area. However, it is important to note that a small proportion of individuals in both areas had negative perceptions of wind turbines, primarily due to concerns about landscape damage. Similarly, Hanley & Nevin (1999) found that none of their respondents wanted to avoid areas with wind farms, suggesting that wind farms would not affect their future trips. These findings align with the conclusion that wind farms have no statistically significant impact, as Landry et al. (2012) reported.

4. Environmental and Recreation Valuation: Theory and Methods

4.1 Recreation Demand

In economics, an individual's welfare is typically represented by their utility function, which is used to describe their consumer preferences (Varian, 2014). Each individual has unique preferences for different bundles of goods and services, and they aim to reach the highest possible utility level by purchasing the bundle that provides them with the most satisfaction. The utility function of two goods x_1 and x_2 is originally presented as:

(1) $$U = U(x_1, x_2)$$

When it comes to recreational activities, the entrance fee to the area is typically zero (Freeman et al., 2014). Therefore, the travel cost to the area is used as the price for accessing the area. This travel cost includes both direct expenses such as gasoline prices and road tolls, as well as the opportunity cost of time spent traveling and enjoying recreational activities. Additionally, the quality of the recreation area may also influence the travel cost. Travel cost to the same area varies between individuals, and the utility function for recreation area can be expressed as:

(2) $$U = U(x, r, q, L)$$

Where x is the consumption of market goods, r represents recreation activity in the number of visits, q denotes the quality of the recreation site, and L represents all other leisure activities besides recreation (Freeman et al., 2014). Since consumers have limited time and money, their utility function must consider both monetary budget (*M*) and time constraints (*T*):

(3) $$M = w \cdot t_w = x + c_r \cdot r$$

Where w is the wage rate and t_w is time worked, and c_r and r denote the full price of a recreation visit and price for other leisure activities respectfully (Freeman et al., 2014). The time constraint consists of time worked (t_w), round-trip travel time (t_1), time spent on site (t_2), as well as time spent for other leisure activities (t_l):

(4) $$T = t_w + (t_1 + t_2) \cdot r + t_l$$

Further, the time constraint can be substituted into the monetary budget constraint:

(5) $$M + w \cdot T = x + [c_r + w \cdot (t_1 + t_2)] \cdot r + w \cdot t_l$$

The equation in square brackets represents the price an individual pays for visiting the recreation area (travel cost), which can be rewritten as:

(6) $$p_r = c + w \cdot (t_1 + t_2)$$

This brings a shorter equation for combined time and money constraints:

(7) $$M + w \cdot T = x + p_r \cdot r + w \cdot t_l$$

Further, to increase personal satisfaction, individuals seek to maximize their utility and choose the number of trips to recreation according to their utility preferences and budget constraints (Freeman et al., 2014). The utility maximization problem leads to the individual's demand function for visits:

(8) $$r = r(p_x, p_r, M, T, q)$$

Where the visitation rate r is a function of price for market goods (p_x), which we assume is equal to 1, travel cost to a given recreation site (p_r), non-labor income (M), time (T), and recreation quality (q). In order to calculate recreation demand, the total value of the recreation site should be calculated (Freeman et al., 2014). The demand curve is further used to calculate consumer surplus for the given site.

4.2 Consumer Surplus

Welfare economics posits that an individual's well-being is not solely determined by their consumption of goods and services but also by the amount and quality of non-market goods and services they receive from the resource-environmental systems (Freeman et al., 2014). To measure changes in an individual's welfare, there are three commonly used measures: compensating variation (CV), equivalent variation (EV), and change in consumer surplus (CS). CV represents the amount of money an individual needs to gain/lose in order to restore his original utility when a change in price takes place. While EV represents the amount that will lead to changed utility given that price stays unchanged. Still, it is more common to use consumer surplus to measure changes in consumer welfare instead of CV and EV.

Consumer surplus is defined as the monetary value that represents the excess willingness of consumers to pay for a product or service compared to the actual market price they pay (Varian, 2014). This surplus represents the net benefit that consumers receive from participating in a recreational activity (Freeman et al., 2014). Consumers often demonstrate a willingness to pay above the market price for goods or services, creating a positive disparity between their maximum willingness to pay and the actual price in the market. This difference generates a net benefit for consumers. Figure 2 provides a graphical representation of consumer surplus, where the gray area represents the amount of consumer surplus, with "p" denoting the travel cost to the recreational site and "r" indicating the number of trips made to the site.

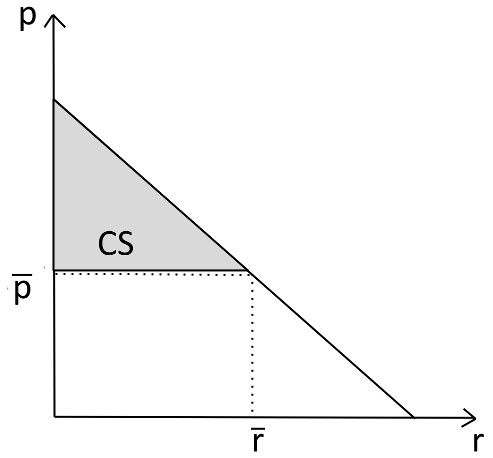

Figure 2. *Demand curve and consumer surplus.*

4.2.1 Consumer Surplus for Changing q

Changes in the quality of the environment (q) at a given recreational site can have an impact on both the individual's utility and the demand functions (Freeman et al., 2014). A decline in environmental quality can decrease the enjoyment and benefits individuals derive from recreational activities, resulting in a decrease in their willingness to participate in such activities and a decrease in their overall utility. Consequently, the demand for the given recreation site may also decline. Conversely, improvements in environmental quality can increase the satisfaction derived from recreational activities, leading to increased demand for the site. However, if an individual is unaware of environmental changes, neither their utility nor their demand for the given recreation site may change.

Therefore, a change in the environmental quality (q) will shift the demand curve for recreation (Freeman et al., 2014). As shown in Figure 3, a decrease in environmental quality will cause the demand curve for recreation to shift inwards. This means that for the same price as before the change, individuals are now willing to make fewer trips to the site. As a result, consumer surplus is also reduced, and it is possible to calculate the change in consumer surplus by subtracting the new consumer surplus from the previous one.

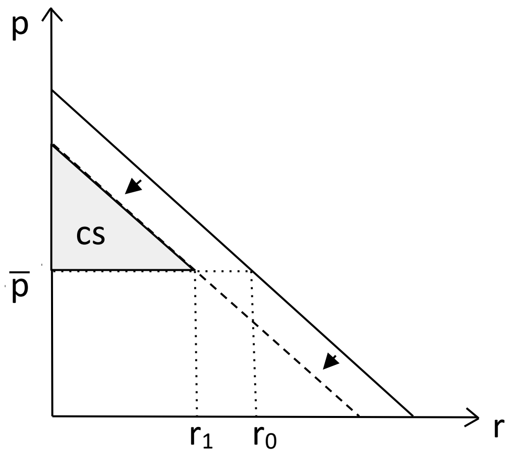

Figure 3. *Shift in the demand for recreation for reduced q, and reduced CS.*

4.3 Non-Market Valuation

The valuation of environmental goods is traditionally carried out within the framework of non-market valuation methods. These methods involve the valuation of environmental goods and services that are not traded in the marketplace. Non-market valuation has gained prominence in various policy and decision-making contexts. Its main purpose is to facilitate informed decision-making processes. However, as there are not necessarily market prices for environmental goods and services, market sales cannot capture these choices and preferences (Segerons, 2017). There is an obvious need for accurate valuation of environmental values. In contrast, there is a mix of values regarding changes in a person's well-being or utility. Therefore, it is common to use the term total economic value to refer to the different types of values that natural resources and the environment give us (Pendleton, 2009).

4.3.1 Total Economic Value

The concept of total economic value (TEV) of an ecosystem is used to describe the overall utility values derived from that ecosystem. It serves as a valuable tool for identifying the different types of benefits associated with an ecosystem. The general approach to total economic value includes various values categorized according to the services provided by the environmental goods, as shown in Figure 4. The components that make up the TEV can be further divided into main groups and subgroups. According to this classification, the TEV consists of two main components: use values and non-use values (Perman et al., 2011). However, it is worth noting that certain economies recognize option values as a third principal component in addition to the previous principal components (Merlo & Briales, 2000). For the purposes of this paper, however, the classification focuses on use values and non-use values as the principal groups.

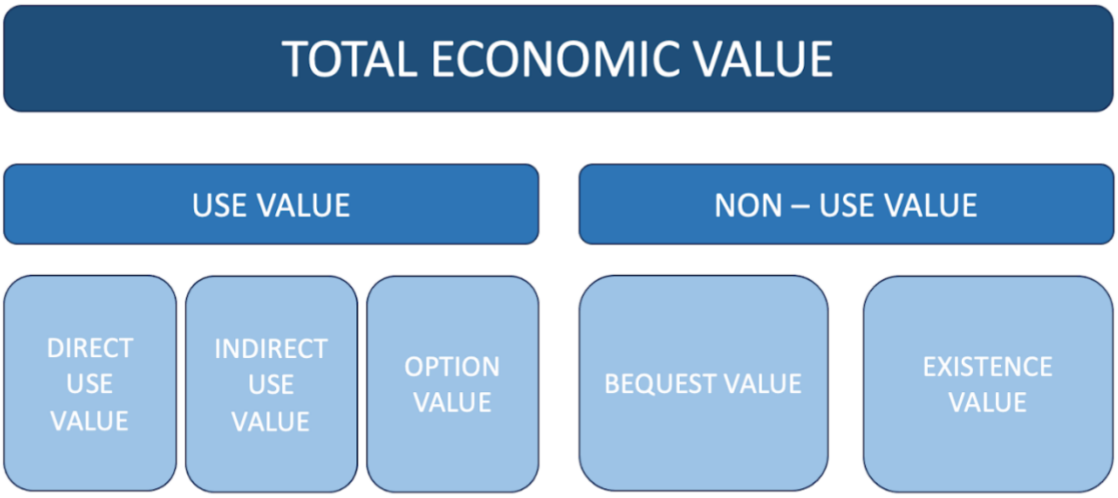

Figure 4. *Total Economic Value*

The use value refers to the benefit derived from the actual utilization of the resource. It can be divided into three categories: direct use value, which results from on-site resource extraction such as fishing or non-consumptive activities like recreation; indirect use value, which results from off-side services associated with the resource, such as climate regulation or coastal protection; and option value, which represents the value people place on preserving the possibility of using an ecosystem resource in the future. Non-use value, on the other hand, is the value that is not directly associated with current use. This value can be classified into two groups: bequest values, which individuals derive from the knowledge that others may use the resource in the future, and existence values, which are perceived environmental values not linked to current or future use but simply because they exist (Perman et al., 2011). Based on Figure 3, it is important to understand that in the context of total economic value (TEV), the term "total" refers to the identification of all value components rather than the sum of all values derived from a resource. Total economic value is a comprehensive measure instead of a partial measure of value. Consequently, however, many TEV estimates of marginal changes in the supply of ecosystem services are "total" in the sense that they take a holistic view of the sources of value (Marlo & Briales, 2000).

This has led to the development of non-market methods, which have become an important activity for environmental economists. These methods aim to measure and assign economic value to the invaluable services and goods offered by the natural environment, thus capturing the essence of total economic value (TEV). Significant variation exists in the literature regarding the classification of non-market valuation methods, as it depends on the measured values. However, the most general categorization comprises direct methods, such as Stated Preference (SP), and indirect methods, such as Revealed Preference (RP) (Freeman et al., 2014).

4.4 Stated Preference Methods

The Stated Preference (SP) method serves as a means to measure both the value of use and the value of non-use (Eom & Larson, 2006). By utilizing survey data, this method estimates values through hypothetical questions posed to respondents regarding their preferences or values (Brown, 2003). The advantage lies in having control over the circumstances of the questions and the alternatives presented, enabling the estimation of likely responses from individuals (Carson et al., 2004). These methods are particularly advantageous as they do not rely on observable data, making them applicable for measuring used and unused values (Freeman et al., 2014). Within the category of the SP model, three commonly used methods extract values and preferences from survey responses: contingent valuation (CV), discrete choice experiments (CE), and contingent behavior (CB) (Johnston et al., 2017). These methods offer valuable insights into quantifying and understanding the preferences and values associated with environmental resources.

The Contingent Valuation (CV) method involves respondents making a simple binary decision regarding a hypothetical change at a given cost. On the other hand, the Discrete Choice Experiments (CE) method allows respondents to select from multiple alternatives, each having various attributes and associated costs (Johnston et al., 2017). In the Contingent Behavior (CB) method, respondents specify their intended behavior regarding quantities or frequencies for a given hypothetical change. While CB may pose similar hypothetical changes as CV and CE, it differs by focusing specifically on intended behavior (Englin & Cameron, 1996). CV and CE primarily emphasize valuation, wherein respondents indicate their willingness to pay (WTP) or willingness to accept (WTA) in the survey, reflecting the maximum or minimum amount they are willing to pay or accept for the specified hypothetical change in the quantity or quality of environmental goods, services, or resources In contrast, the CB method concentrates on behavior, such as the number of trips the respondent is willing to take in response to the hypothetical changes presented (Johnston et al., 2017).

4.5 Revealed Preference Methods

Revealed-preference methods are used to identify utility characteristics and quantify use values. This approach uses primary or secondary market data to analyze how individuals' decisions and actions reveal their implicit preferences for changes in environmental quality or quantity (Freeman et al., 2014). It is based on observations of the choices and actions that people actually make. Within the revealed preferences method, four distinct approaches can be identified: the travel cost method, hedonic valuation, the defensive behavior method, and the damage cost method (Boyle, 2003).

The travel cost method is an indirect valuation technique commonly used to assess the value of recreational areas within the environment (Parsons, 2003). This method measures the willingness to pay for a recreation experience by examining household expenditure on travel costs associated with visiting a desired recreation area (Zandi et al., 2018). On the other hand, hedonic valuation models are mainly used for property valuation, aiming to determine households' willingness to pay off households for properties located near or in close proximity to environmental attraction. The defensive behavior and damage cost methods are generally utilized to determine the value of the health impacts of pollution. The difference between these methods is that the defensive behavior method looks at the cost people are willing to pay to reduce exposure. In contrast, the damage cost method measures the resource costs caused by pollution (Boyle, 2003).

4.6 Combination of Revealed and Stated Preference Methods

Over the years, the combination of Revealed Preference (RP) and Stated Preference (SP) methods, also known as the “joint estimation paradigm,” has gained increasing attention in environmental valuation. This approach allows for examining aspects of individual responses or preference structures that cannot be observed directly. Combining the two methods makes it possible to capture both the actual and hypothetical behaviors of participants in situations where market conditions do not exist (Freeman et al., 2014; Cameron, 1992; Adamowicz et al., 1994).
Individually, each method has its limitations. RP methods measure use values but not non-use values due to the need for hypothetical factors. They are accurate and unbiased, relying on actual market decisions. In addition, RP methods can face challenges with multicollinearity, making it difficult to estimate variable effects on environmental value. (Freeman et al. 2014). RP methods also have difficulties measuring quality change, as environmental values are often used to estimate welfare changes due to environmental quality changes (Whitehead et al., 2000). On the other hand, SP methods have the disadvantage of hypothetical bias, where respondents may provide biased or exaggerated preferences in response to desired answers (Whitehead et al., 2012). However, SP methods can measure non-use values, making them particularly useful when assessing values associated with a wide range of changes in environmental attributes (Adamowicz et al., 1994).

By combining RP and SP methods, researchers can leverage the strengths of both approaches and overcome their respective limitations. This joint estimation paradigm offers a comprehensive approach to environmental valuation, allowing for a more accurate assessment of both use and non-use values and capturing preferences that may not be observable in market behavior. By integrating data from both RP and SP methods, it becomes possible to estimate use values based on actual RP data and derive estimates of non-use values by including SP data. This combination allows for addressing the concerns associated with hypothetical bias in SP methods. RP methods can be utilized to detect and mitigate hypothetical bias, as they are based on real decisions that can underpin the hypothetical choices in SP data, thereby improving measurement techniques and controlling for additional variables (Gschwandtner, 2018; Nyborg, 1996).

Moreover, SP data can help alleviate the issue of multicollinearity in RP methods by carefully designing SP questions. This approach reduces multicollinearity, enabling better identification of the impact of environmental characteristics and filtering out the influence of specific attributes (Von Haefen & Phaneuf, 2008; Adamowicz et al., 1994). The integration of RP and SP data allows for attributing quality changes to a specific site and estimating quality changes when hypothetical aspects are included. This comprehensive approach enhances the efficiency of estimates as it can detect changes in demand associated with quality improvements at the site (Whitehead et al., 2000). Overall, combining RP and SP methods provides a robust framework for capturing both use and non-use values, addressing methodological challenges, and improving the accuracy of environmental valuation.

4.7 Travel Cost Method

Harold Hotelling (1947) introduced a model in the late 1940s to fill the gaps in determining the underlying demand for recreation and the implicit value of the services provided by a recreation area (Freeman et al., 2014). This model was further developed by Clawson (1959) and Clawson & Kneysch (1966). This widely used non-market valuation method allows for estimating the value of recreational use and applies to various recreational sites. (Freeman et al., 2014; Loomis, 2006; Bateman et al., 1999). These sites typically include parks, forests, beaches, mountains, lakes, and other natural areas, where no market price is usually available (Parsons, 2003). By analyzing the travel costs incurred by individuals to visit these areas, the travel cost model provides insights into the value people place on the recreational experiences derived from non-market goods.

The travel cost model has undergone continuous development and refinement over the course of several decades, establishing its methodological robustness (Freeman et al., 2014). When properly applied, it can provide estimates that closely reflect individuals' willingness to pay

(Willig, 1976). The classic travel cost model assumes that there is an inverse relationship between the number of visitors to the recreation area and the associated travel cost. The variation between these variables can be used to predict the demand for recreation and then estimate the economic value of recreation by calculating consumer surplus (Loomis, 2006; Rosenthal et al., 1984).

In the field of travel cost modeling, the focus is often on assessing the value of a specific recreation area (Heagney et al., 2019). However, it is crucial to acknowledge that individuals have a range of options when selecting a recreational area to visit, and this aspect can influence their preferences. As a result, two distinct models have been developed within the travel cost literature: the single-site model and the multiple-site model. The single-site model is useful for estimating the value of a single recreation area. In contrast, the multiple-site model is better suited for analyzing changes in one or more recreation areas at the same time (Parsons, 2003). While the travel cost method has proven to be a valuable tool in environmental valuation, challenges can bias or distort the estimated value of the recreation area when modeling the demand curve for recreation areas. Two notable challenges are the inclusion of the value of time and accounting for multiple purposes of trips.

4.7.1 The Value of Time

Accurately calculating the value of time is important in estimating the value of the recreation area within the travel cost model. The time spent traveling to and from the recreation area represents a lost opportunity or opportunity cost that must be considered. Neglecting to accurately measure time costs in economic models of recreation demand can introduce bias into the resulting benefit estimates (Freeman et al., 2014; Parsons, 2003). Therefore, it is essential to consider both the travel time to the site and the duration of the visit as a lost time that could have been used for alternative activities. By properly incorporating the value of time into the analysis, researchers can mitigate potential biases and provide more robust and reliable estimates of the value of the recreation area.

The value of time is generally calculated based on a person’s wage. The relationship between the cost of time and wages can then provide a theoretical basis for determining the opportunity cost of leisure (Parsons, 2003). Using a person's wage to determine the cost of time can simplify the estimation but does not consider the fact that individuals do not always trade work for leisure or may even enjoy their work. The problem with this model is that it has difficulty including people who are not part of the labor force, such as students, housemakers, pensioners, and the unemployed, who may therefore have no observable wage. Therefore, such an approach is suitable for people who are free to divide their time between work and leisure (Bocksteal et al., 1987; Parsons, 2003). Alternative methods or adjustments may be necessary to accurately capture these groups' time value.

The person's wage is indeed a commonly used proxy for the value of time, although its extrapolation in the travel cost model can be challenging. Many studies calculate hourly wages using annual income divided by the number of hours worked, but this only applies to people with fixed hours. According to Smith et al. (1983), an individual's wage can also be calculated using a wage regression of the individuals in the data set who have an hourly wage. In this case, the wage is regressed on income and a vector of characteristics of the person, such as education and age, so that non-wage earners have the incentive to calculate the wage. Sometimes, a fraction of the entire hourly wage is used to value time, typically ranging from one-third to the total wage. This estimation method has been applied in recreational literature, including studies by Feather & Shaw (1999) and Cesario (1976).

4.7.2 Multiple Purpose Trips

When it comes to recreational trips, they can be classified as either single-purpose or multi-purpose. A single-purpose trip is focused solely on visiting a recreational area, encompassing the travel from home to the recreation area and back. In such cases, all travel costs incurred can be considered a measure of the price of the visit (Parsons, 2003). However, for multiple-purpose trips, individuals have additional objectives beyond visiting the recreation area, such as visiting family or friends along the way or visiting other recreation areas. The presence of multiple purposes complicates the use of travel costs as a valid proxy for the price of the recreational visit in the travel cost model (Parsons, 2003).

There are several approaches to address this issue. One approach assumes that respondents who spend time in the recreation area have a primary purpose with minimal objections. Incidental purposes, including visits to other sites during the journey, can be taken into consideration. Another approach is to exclude trips with multiple purposes from the analysis. This can be achieved by asking respondents to report single-purpose and multi-purpose trips separately or by considering only trips with a single purpose, thereby limiting the analysis to single-purpose trips (Parsons, 2003).

Modifications can also be made to the basic travel cost model to accommodate multi-purpose trips. For instance, the definition of a recreation area can be broadened to incorporate multiple purposes while maintaining the core logic of the travel cost model. This application is relevant to a multi-site model, where the other purposes refer to different recreation areas. However, the same reasoning can also be applied to a single-site model (Mendelsohn et al., 1992). In a single-site model that considers all trips, multi-purpose trips can be accounted for through a simple demand shift, and the value of access to recreation areas can capture the consumer surplus associated with the other purposes of the trip (Parsons & Wilson, 1997).

5. Data Collection

This research is an empirical study based on quantitative research methods and analysis. Data collection is done with an on-site survey targeting the actual visitors of the chosen recreation area.

5.1 Survey Design

The TCM survey for recreation areas in Norway was previously developed by Lohaugen & Refsland (2016) for the Dalsnuten area and further improved in two studies focusing on Jæren beaches by Bui & Sæland (2017) and Kleppe & Jensen (2018). Building upon these studies, the questionnaire was further adapted and refined to align with our study's specific research question and circumstances. The questionnaire was created using Qualtrics with the possibility of being conducted online or by phone. Since previous studies were conducted on paper, we have modified most of the questions for the digital version, employing multiple-choice answer options with the possibility to provide specific details when necessary. This was done to make it easier and faster for respondents to complete the survey. Additionally, the questionnaire was designed to accommodate respondents' flexibility in answering the questions, enabling them to provide feedback immediately after their visit, the following day, or even several days later if they had recently visited the area.

Before developing the stated preference section, we reached out to the Stavanger Trekking Association to get a professional view and opinions on challenges related to the area. This collaboration helped us to develop scenarios relevant to respondents and align with their own experiences with the area.

5.2 The Questionnaire

The survey (see Appendix 1) contains a total of 40 questions and is intended for Norwegian-speaking residents in Rogaland, Norway, who have visited the Dalsnuten-/Dale recreation area. The survey begins with a section providing general information about the study and reassurances regarding the confidentiality of all responses. At the outset, respondents are also asked to confirm their willingness to participate in the study.

The questionnaire is structured into three types of questions: revealed preference, stated preference, and demographic. Each of these question types will be elaborated upon in the following sections to provide a comprehensive understanding.

5.2.1 The Revealed Preference Section

The revealed preference section of the survey focuses on various aspects related to the respondent's visitation patterns and preferences. It begins by asking about the frequency of the respondent's visits to the Dalsnuten-/Dale area in the previous year, within the past 30 days, and their anticipated number of visits during the current year. While questions about the future technically do not fall under revealed preference, they have been included in this section for logical coherence within the survey design.

Additionally, individuals are requested to evaluate the importance of certain characteristics on a scale of 1 to 5, both concerning the Dalsnuten-/Dale area specifically and recreation areas in general. These characteristics encompass factors such as proximity to their home, availability of parking, trail quality, diversity of trails, level of crowdedness, presence of restroom facilities, suitability for children, availability of cafes or snack bars, and wildlife.

Lastly, questions ask about the respondents' most recent trip to the Dalsnuten-/Dale area. They are asked about their trip's starting and ending points, as well as the specific peaks they visited, followed by questions regarding the purpose of their hike, whether it was their sole purpose, main purpose, or part of a multi-destination trip. The next questions ask how and how long (time and distance) they have traveled to the area and how long and with whom they had stayed on the site. Moreover, respondents are asked to evaluate the total cost of their trip, including expenses such as fuel, road tolls, bus tickets, and any other relevant costs, followed by questions about alternative activities that were considered to do instead of hiking at the Dalsnuten-/Dale area.

5.2.2 The Stated Preference Section

The stated preference section consists of hypothetical scenarios and questions related to those scenarios. These scenarios include a doubled travel cost, doubled travel time to the area, the closure of the most visited Dalsnuten peak, and the availability of a bus service to and from the Dale and Gramstad parking lots. Participants are asked to indicate how these scenarios would impact the number of trips they would take to the Dalsnuten-/Dale area within a year.

Regarding the "closed Dalsnuten peak" scenario, respondents are also queried about their potential substitutes for that peak. They have the option to choose another peak within the same area, visit a different recreation area, or opt not to go for a trip at all. For the "bus to/from parking lots" scenario, respondents are additionally asked about their likelihood of taking the bus for future trips to the Dalsnuten-/Dale area.

Two additional questions, although technically revealed preference, are placed in this section for ease of comprehension. Respondents are asked whether the possibility of seeing windmills from some of the peaks in the Dalsnuten-/Dale area since 2020 has influenced their annual trip frequency. This question holds significance as the 2016 Dalsnuten study by Lohaugen & Refsland included windmills as a hypothetical scenario, allowing for a comparison of visitor behavior before and after the windmills were installed. Lastly, individuals are queried about their level of participation in outdoor activities compared to before the COVID-19 pandemic.

5.2.3 Demographic

The demographic section consists of questions about an individual's postcode, gender, age, education, employment status, household size and total income, and number of children. These questions aim to gather specific information about the respondents to define the focus group more precisely and analyze potential variations in their answers based on different demographic groups. Questions about postcode and income are also important for calculating the total travel cost. Finally, respondents are asked whether they are members of an organized hiking association or not, how many annual recreation trips they generally tend to have, and if they have something else to say related to the survey.

5.3 Data Collection

The data collection for the survey was conducted between April 1st and April 22nd. During this period, invitation cards containing the survey link, QR code, and general research information (see Appendix 2) were distributed to Dalsnuten-/Dale area visitors at both Gramstad and Dale parking lots. To assist with distributing the cards, two external individuals were hired. A total of nine visits were made to the Gramstad parking lot, while the Dale parking lot was visited five times throughout the data collection period. Approximately 1000 invitation cards were handed out to visitors during this time.

The primary data collection occurred during the Easter holidays when the weather was sunny and warm, and many individuals were engaged in outdoor activities during their time off from work and school. The days and times selected for data collection after Easter were chosen based on weather conditions and the assumption that many people would be inclined to go on a trip to the area on those days/times. The target group for data collection was Norwegian-speaking individuals aged 18 and above who were either ascending or descending from their hike in the Dalsnuten-/Dale area.

5.4 Data Processing

Prior to calculating travel costs, Google Maps was used to calculate the distance and time it takes to travel from the midpoint of each respondent's postcode to either the Gramstad or Dale parking lots. The chosen route was the fastest one according to Google Maps' recommendations. The travel time was calculated based on the specified mode of transportation for each individual. For those who mentioned taking the bus to the area, the travel time includes the bus ride itself and the time required for walking between the bus stop and the destination. Additionally, if an individual had to transfer between multiple buses, the waiting time was also considered.

5.4.1 Calculating Total Travel Cost

The total travel cost can be calculated by first estimating the cost of the trip to the site:

(9) $$TC = y \cdot d + 2 \cdot f + \alpha$$

Where y is the fuel cost per kilometer (based on the type of the vehicle), d is the round-trip distance in kilometers, f is the toll road fee for a one-way trip, and α is the additional cost connected to the use of the site (for example, parking fees). Fuel cost per km depends on which transport the individual used to come to the site. It was calculated that the average gasoline and diesel prices per kilometer in 2022 were 1.089 NOK and 1.086 NOK, respectively (Statistics Norway, 2023a). It is assumed that owners of hybrid cars prefer to use electricity first, and therefore the fuel price difference between hybrid and electric cars is minimal. It was calculated that, on average, in 2022, the electricity fuel price per kilometer is 0.41 NOK (Frydenlund & Lorentzen, 2022; Holstad, 2023). For the toll road fee (f), assuming every car owner has an Autopass, the fee will equal 20 NOK for a one-way trip (Ferde, 2023). Lastly, the only relevant additional cost (α) for the respondents was a parking fee of 50 NOK at Dale parking lot.

Further, an individual's opportunity cost of travel time per hour should be calculated:

(10) $$OCT = \frac{\frac{I}{H-K}}{1950} \cdot \frac{1}{3}$$

Where I is the average income for a household, H is the number of members in a household, and K denotes the number of kids under the age of 18 in the household. 1950 represents the number of hours worked in a year, while one-third is the value of leisure time or an opportunity cost of travel time (Statistics Norway, 2023b).

The total travel cost can be defined as:

(11) $$TTC = TC + OCT$$

5.5 Descriptive Statistics

In this survey, a total of 150 respondents completed the survey and provided responses. Among these respondents, 124 and 26 individuals started their hike at Gramstad and Dale parking lots, respectively. It is possible to conclude that the majority of the site users prefer to begin and end their hike at Gramstad. Additional descriptive summary statistical tables and figures were generated based on the available data to provide a more comprehensive overview of the respondents and their characteristics. These tables and figures include information such as demographic characteristics, frequency of visits, stated preferences, and other relevant variables captured in the survey.

5.5.1 Participant Profile

Table 1 on the next page provides a comprehensive overview of the survey respondents regarding their gender, age, education, and employment. Regarding gender distribution, the survey achieved a balanced representation, with women comprising 53% of the respondents and men accounting for 45%. Among the respondents from Gramstad, there was a slightly higher proportion of women, constituting 56% of the total, while for Dale, male respondents dominated with 62% of the total.

The survey encompassed a wide age range, with most participants falling between 18 and 65 years old. Moreover, the respondents predominantly possessed higher education qualifications and were employed full-time. At Gramstad, the age range of 36 to 50 was most prevalent, while at Dale, respondents were primarily concentrated within the age intervals of 18-25 and 61-65. Regarding educational level, only a small portion of the respondents at Gramstad had completed primary or secondary school education, and 13% had a high school education. Conversely, among the respondents from Dale, none had education levels below high school, but a significantly higher proportion (27%) possessed only a high school education. Furthermore, there were some differences in employment status between the two parking lots. Gramstad had a higher percentage of pensioners compared to Dale (10% and 4%, respectively). Additionally, the proportion of part-time employed individuals was higher at Dale (12%) than at Gramstad (5%).

Further filtering was applied to the sampled data to ensure the data's relevance and quality. Firstly, individuals who did not meet the criteria of the target group were excluded. This included two respondents who were under the age of 18, as accompanying adults likely influenced their hiking decisions. Their responses were considered to only partially represent the preferences of adult hikers. Additionally, individuals residing far away from the site were deemed unrepresentative of typical users, leading to the exclusion of five individuals living in Haugesund, Oslo, Ås, Slemenden, and Porsgrunn.

Table 1. *An overview of the survey respondents regarding their gender, age, education, and employment at Gramstad and Dale parking lots.*

	Whole area	**Gramstad**	**Dale**
Respondents	150	124 (83%)	26 (17%)
Gender			
Women	53%	56%	39%
Men	45%	43%	62%
Age			
Under 18	1.33%	0.82%	0.00%
18-25	10.67%	9.02%	19.23%
26-30	9.33%	9.84%	7.69%
31-35	7.33%	7.38%	7.69%
36-40	10.67%	13.11%	0.00%
41-45	13.33%	15.57%	3.85%
46-50	12.00%	12.30%	11.54%
51-55	10.00%	9.84%	11.54%
56-60	8.67%	7.38%	15.38%
61-65	9.33%	6.56%	19.23%
66-70	4.00%	4.10%	3.85%
Over 70	3.33%	4.10%	0.00%
Education			
Primary School	0.67%	0.82%	0.00%
Secondary School	2.00%	1.64%	0.00%
High School	15.33%	13.11%	26.92%
High level of education (1-4 years)	36.00%	36.07%	38.46%
High level of education (over 4 years)	45.33%	47.54%	34.62%
Employment			
Fully Employed	72.67%	73.77%	73.08%
Employed Part-Time	6.00%	4.92%	11.54%
Student without Job	2.67%	1.64%	3.85%
Student Part-Time Job	4.67%	4.92%	3.85%
Jobseekers	1.33%	0.82%	3.85%
Homemakers	2.00%	2.46%	0.00%
Pensioners	9.33%	9.84%	3.85%

Furthermore, respondents who indicated that their visit to the area was part of a multi-destination trip were excluded from the sample, amounting to a total of 19 individuals. This decision aimed to focus the analysis on individuals whose primary purpose was the specific recreational site rather than a broader itinerary. Lastly, one outlier with an extremely high trip count of 300 trips in 2022 was identified and excluded from the sample to maintain the data's integrity and prevent it from unduly influencing the analysis. After applying these filtering criteria, the final dataset consisted of 123 respondents, with 103 respondents from Gramstad and 20 respondents from Dale. This refined sample is expected to provide a more accurate representation of the target population for further analysis. The dispersion of the total travel costs and trip count in 2022 after exclusion is shown in Figure 5.

In the full sample, the reported trip counts for the year 2022 ranged from 0 to 126 trips, while total travel costs varied from 0 to 329 NOK. The average trip count for that year was 16, with a standard deviation of 24. The average total travel cost amounted to 136 NOK. Therefore, a restricted sample was created to ensure the sample's consistency and mitigate the potential influence of extreme values by excluding an additional 8 responses with trip counts exceeding 50 for 2022. This resulted in a restricted sample consisting of 115 respondents, with 99 respondents from Gramstad and 16 respondents from Dale.

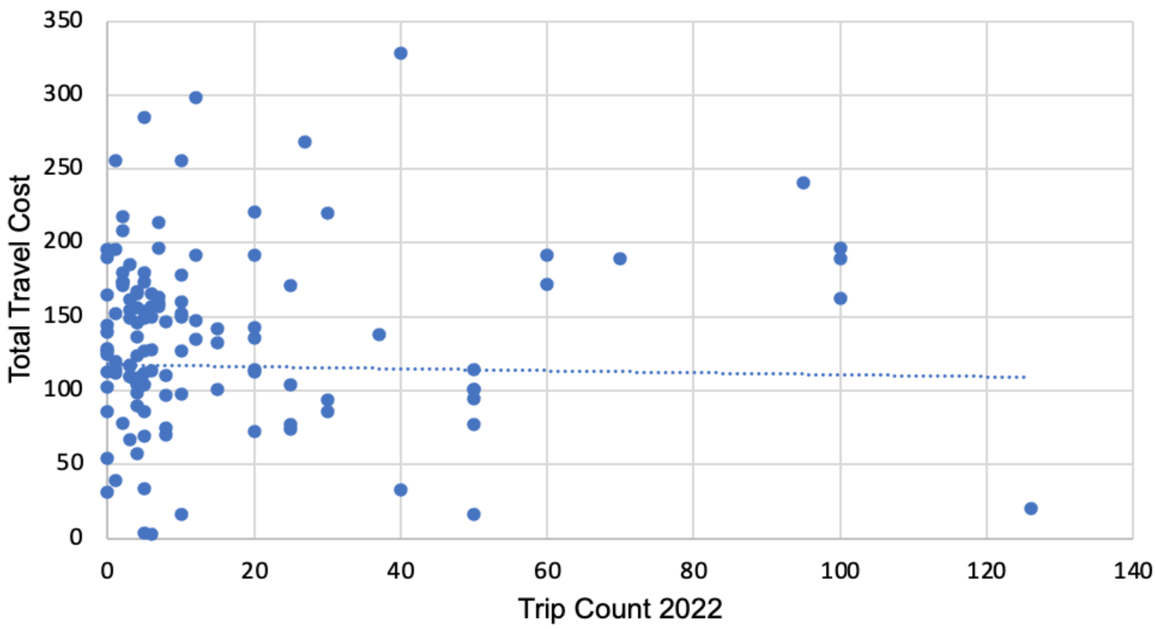

Figure 5. *Scatterplot of Total Travel Cost and Trip Count for 2022 with trendline*

Table 2 on the next page shows the characteristics of respondents in the full and restricted samples for the entire recreation area, as well as for individuals hiking from Gramstad and Dale separately. The data reveals that the average age of users in the Dalsnuten-/Dale area falls within the range of 44 to 47 years. Around 90% of visitors are employed either full-time or part-time, and they have an average of 16 years of education. The average household size of visitors ranges from 2 to 3 persons, and the average household income ranges between 931 and 1 114 thousand NOK for the full sample and from 844 and 1 092 thousand NOK for the restricted sample. Notably, the average household income for visitors from Gramstad is visibly higher than that of visitors from Dale.

Additionally, the respondents' household income was categorized into three groups: low income (earnings below 500,000 NOK), medium income (earnings between 500,000 and 1 million NOK), and high income (earnings over 1 million NOK). Overall, approximately 50% of visitors in the Dalsnuten-/Dale area fall into the high-income category. However, when comparing visitors from Gramstad and Dale separately, there is a higher percentage of visitors with high income at Gramstad. On the other hand, Dale has a higher percentage of visitors with medium income.

Furthermore, approximately 36-37% of the respondents in the overall sample reported being members of a tourist association. However, when examining Dale visitors separately, a higher percentage of respondents (55% and 50% for the full and restricted samples, respectively) identified as members of a tourist association. In terms of outdoor activities, the area visitors, on average, reported having 109-115 outdoor days per year for the full sample and 69-107 outdoor days per year for the restricted sample.

Table 2. *The overview of respondents' characteristics for full and restricted samples.*

	Full sample			Restricted sample		
	Both parking lots *123 respondents*	**Gramstad** *103 respondents*	**Dale** *20 respondents*	**Both parking lots** *115 respondents*	**Gramstad** *99 respondents*	**Dale** *16 respondents*
Age	45.02	44.62	47.10	44.43	44.43	44.38
Employed (%)	87%	86%	90%	87%	87%	88%
Female	0.55	0.59	0.35	0.58	0.62	0.25
Education (mean, years)	16.33	16.41	15.95	16.41	16.44	16.19
Household size (mean, pers)	2.76	2.83	2.45	2.73	2.78	2.44
Household income (mean, NOK)	1,084,429.82	1,114,077.67	931,250.00	1,057,608.70	1,092,171.72	843,750.00
Low income (%)	11%	10%	15%	11%	10%	19%
Medium income (%)	40%	39%	45%	41%	39%	50%
High income (%)	50%	51%	40%	48%	51%	31%
Member of a tourist association (%)	37%	33%	55%	36%	33%	50%
Outdoor days (mean, days)	110	109	115	106	107	96

Figures 6 and 7 provide an overview of the municipalities from which respondents in the full sample originate, specifically for the Gramstad and Dale parking lots, respectively. The majority of respondents are from either Stavanger or Sandnes for both Gramstad and Dale parking lots. For Gramstad, there is also a significant presence of respondents from Sola (10%), while for Dale, visitors from both Sola and Klepp municipalities make up a considerable portion (10% each). Additionally, some visitors at Gramstad are from other municipalities such as Time, Hå, Randaberg, and Gjesdal.

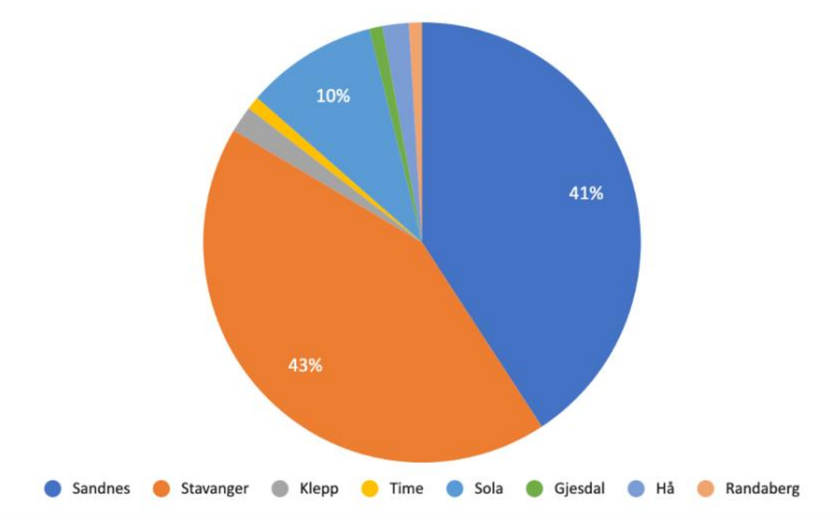

Figure 6. *Municipalities represented among the full sample respondents - Gramstad.*

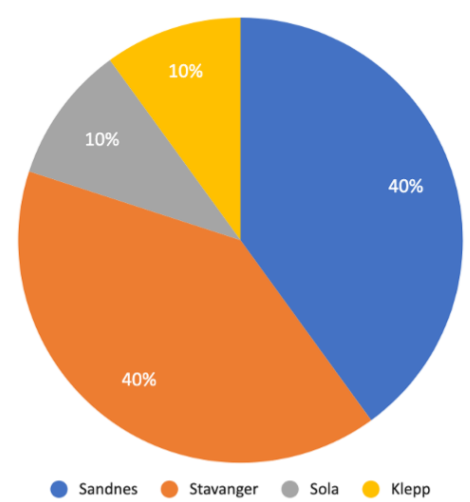

Figure 7. *Municipalities represented among the full sample respondents - Dale.*

Figure 8 displays the transportation modes respondents used to travel to/from Gramstad or Dale. The data indicates that the majority of respondents chose to drive, with diesel and electric cars being the most common modes of transportation; gasoline cars and hybrid vehicles were also utilized by many respondents. Only a small number of respondents from Gramstad reported using alternative modes of transportation, such as walking or taking the bus, with only two individuals opting for walking and one individual using the bus. Similarly, at Dale, only one respondent reported using the bus as their transportation mode, and none was walking.

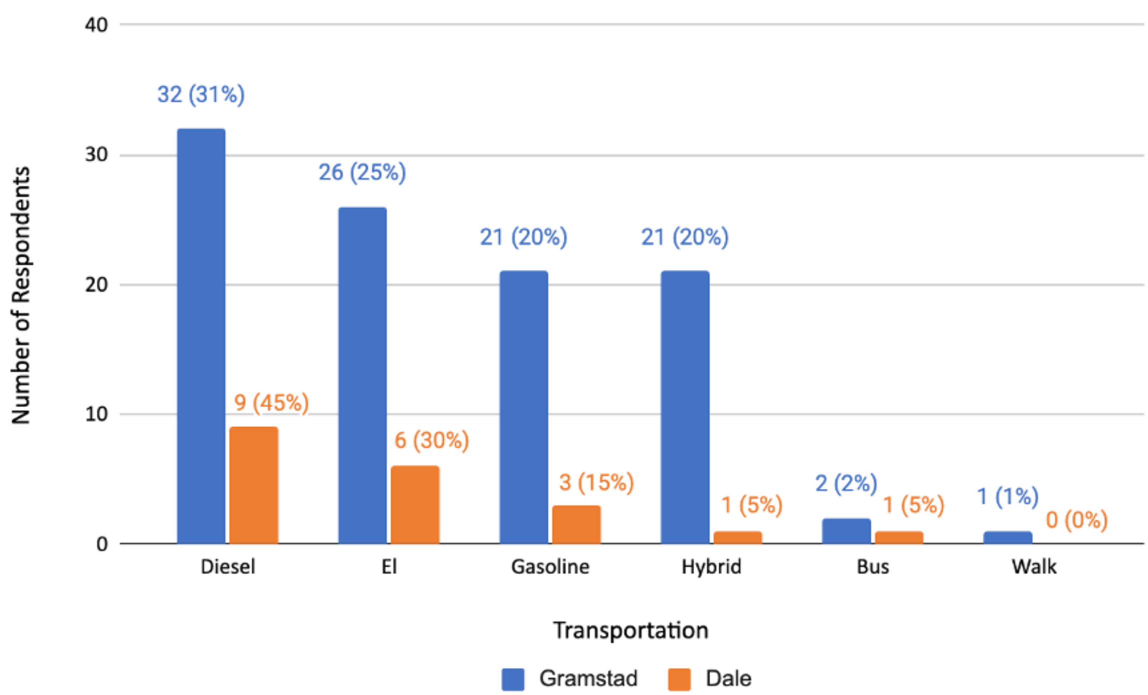

Figure 8. *Transportation modes among full sample respondents - Gramstad and Dale.*

5.5.2 Visit Profile

Table 3 provides an overview of visit statistics for the full and restricted samples, separately for both the Gramstad and Dale parking lots. In the subsequent text, the data from the table will be described using numbers from the full sample followed by the corresponding numbers in parentheses from the restricted sample. During March/April 2023, respondents visited Gramstad an average of 2.71 (2.58) times, while the average number of visits to Dale during the same period was 4.00 (1.94). The average number of visits to Gramstad in 2022 was 13.73 (10.69) times, while at Dale, it was 22.55 (9.75) times.

Table 3. *The overview of visits statistics for full and restricted samples for both parking lots, and Gramstad and Dale separately. The percentages in parentheses for hypothetical scenarios show the change in trip counts from 2023.*

	Both parking lots				**Gramstad**				**Dale**			
	Full sample *123 respondents*		**Restricted sample** *115 respondents*		**Full sample** *103 respondents*		**Restricted sample** *99 respondents*		**Full sample** *20 respondents*		**Restricted sample** *16 respondents*	
	Mean	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**
Travel												
Last month	2.92	3.24	2.49	2.71	2.71	2.91	2.58	2.87	4.00	4.50	1.94	1.24
Last year, 2022	15.65	23.71	10.56	12.88	13.73	20.54	10.69	13.08	25.55	34.96	9.75	11.94
This year, 2023	15.93	23.01	11.39	11.91	13.04	16.88	11.14	11.82	30.85	39.86	12.94	12.75
Hypothetical scenarios												
Double travel cost	9.28 (-42%)	18.11	6.36 (-44%)	8.52	7.41 (-43%)	10.74	6.39 (-43%)	8.37	18.90 (-39%)	37.04	6.13 (-53%)	9.69
Double travel time	7.50 (-53%)	13.75	5.81 (-49%)	7.48	6.95 (-47%)	12.02	5.67 (-49%)	7.16	10.35 (-66%)	20.66	6.69 (-48%)	9.45
Closed Dalsnuten peak	9.39 (-41%)	14.02	7.01 (-38%)	8.24	7.19 (-45%)	8.91	6.64 (-40%)	7.87	20.70 (-33%)	25.98	9.30 (-28%)	10.21
Bus Stop	17.88 (+12%)	24.37	13.28 (+17%)	14.19	15.09 (+16%)	18.73	13.17 (+18%)	14.34	32.25 (+5%)	40.87	13.94 (+8%)	13.65
Characteristics of today's trip												
One way trip (minutes)	23.93	13.25	23.94	13.53	23.39	12.65	23.29	12.72	26.70	16.09	27.94	17.70
One way distance (km)	17.07	8.16	17.01	8.15	17.04	8.52	16.91	8.46	17.25	6.14	17.60	6.05
Time spent on the site (hours)	2.39	1.01	2.40	1.03	2.32	1.01	2.32	1.02	2.73	0.95	2.91	0.95
Size of the group	3.10	2.19	3.17	2.18	3.25	2.25	3.31	2.26	2.30	1.69	2.25	1.34
Calculated travel cost (NOK)	136.03	59.76	133.65	58.97	127.51	57.72	126.69	56.82	179.91	51.26	176.73	55.06

In 2023, respondents expressed their intention to visit the area approximately 13.04 (11.14) times at Gramstad and 30.85 (12.94) times at Dale. Further, in the hypothetical section, respondents were asked to indicate how their number of trips per year would change under different scenarios. When the travel cost doubled, respondents, on average, would go on 5.63 (5.01) fewer trips at Gramstad and 11.95 (6.81) fewer trips at Dale. This represents a reduction of approximately 42% (44%) in trips for the entire area. In the scenario where travel time doubled, respondents showed a higher reduction in their willingness to visit the area. At Gramstad, respondents would go on average 6.09 (5.47) fewer trips, while at Dale, respondents would visit the area 20.5 (6.25) times less. On average, the reduction in trips taken due to doubled travel time is approximately 53% (49%) for the whole area.

Also, the hypothetical scenario involving the closure of the Dalsnuten peak had a negative effect on the frequency of stated visits compared to the trips individuals assume to take in 2023. At Gramstad, respondents would go on average 5.85 (4.50) fewer trips, while at Dale trip count would be reduced by 10.15 (3.64). This would result in a decreased willingness to visit the whole area by approximately 41% (38%). On the other hand, the hypothetical scenario involving access to a bus would positively affected visit frequency compared to the trips taken in 2023. For Gramstad, respondents indicated they would visit the area 2.05 (2.03) times more, while for Dale, the trip count would increase by 1.4 (1.0). This represents an overall increase in demand of approximately 12% (17%).

Overall, the findings suggest that respondents were most influenced by changes in travel time when determining their frequency of visits to the area. Doubling the travel time had the largest impact on their willingness to visit. On the other hand, the closure of the Dalsnuten peak had the least effect on respondents' demand, indicating that it had a relatively smaller impact on their decision-making process. In contrast, access to the bus at parking lots was the only scenario with a positive impact. Additionally, it is worth noting that respondents from the restricted sample of Dale exhibited greater sensitivity to doubled travel distance compared to other hypothetical scenarios.

Further, the respondents were asked to provide information about the characteristics of their current travel. The data shows that respondents had shorter travel times and distances to reach Gramstad compared to Dale, which is expected as Dale is located further away. On average, respondents who started at Gramstad had a travel time of approximately 23 minutes and covered a distance of around 17 kilometers to reach the parking lot. In contrast, respondents traveling to Dale had an average travel time of about 27-28 minutes and covered about the same distance of 17-18 kilometers. These travel time and distance figures are consistent for both the full sample and the restricted sample.

Regarding on-site characteristics, visitors at Gramstad spent an average of 2 - 2.5 hours at the site and hiked with 3 persons, while respondents from Dale spent an average of 2.5 - 3 hours on-site and hiked with 2 persons. This indicates that visitors at Dale tended to spend slightly more time on-site compared to those at Gramstad, although the difference is relatively small.

Regarding total travel costs, respondents who started at Gramstad had lower average travel costs than those who started at Dale. The average total travel cost to Gramstad was approximately 127.51 NOK (126.69 NOK), while the average total travel cost to Dale was around 179.91 NOK (176.76 NOK). This difference in travel cost is primarily due to the parking fees at Dale, which amount to 50 NOK per visit. It is worth noting that if parking fees were not considered, the travel costs to both parking lots would be approximately the same.

5.5.3 Features and Characteristics of The Dalsnuten-/Dale Area

Table 4 presents respondents' evaluation regarding the characteristics of recreation areas in general and the specific evaluation of the Dalsnuten-/Dale area. The evaluation scale ranged from 1 (not important/very poor) to 5 (very important/very good). Regarding general evaluation, respondents from Gramstad rated wildlife and the availability of parking spaces as the most important factors. On the other hand, respondents from Dale considered wildlife and varied distances as the most important factors. The availability of a cafe/snackbar was consistently rated as the least important factor for all respondents.

Regarding the evaluation of the Dalsnuten-/Dale area specifically, respondents rated available parking space as the highest, with an average score of 4.60. Varied distances and the quality of trails also received high ratings, with scores of 4.54 and 4.25, respectively. However, the characteristic "not crowded" scored the lowest, with an average rating of 2.55, indicating that the area is perceived as crowded. Other characteristics received scores ranging from 3 to 4.

Table 4. *Summary from the full sample of respondents rank various features and characteristics for respondents from Gramstad, Dale and both parking lots together.*

	Both parking lots				**Gramstad**				**Dale**			
	General importance		**Rating of the Dalsnuten-/Dale area**		**General importance**		**Rating of the Dalsnuten-/Dale area**		**General importance**		**Rating of the Dalsnuten-/Dale area**	
Characteristics	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**	**Mean**	**Std.dev**
Short travel distance	3.55	1.09	3.87	1.08	3.55	1.08	3.85	1.09	3.55	1.15	3.95	1.05
Available parking space	4.03	1.19	4.60	0.72	4.08	1.18	4.61	0.70	3.80	1.24	4.55	0.83
Quality of trails	3.34	1.17	4.28	0.76	3.46	1.17	4.27	0.78	2.75	0.97	4.35	0.67
Varied distances	3.76	1.24	4.54	0.73	3.71	1.27	4.53	0.75	4.00	1.08	4.55	0.60
Not crowded	3.18	1.02	2.55	0.99	3.17	1.00	2.49	0.95	3.25	1.12	2.90	1.17
Available toilets	2.49	1.31	3.16	1.16	2.67	1.30	3.27	1.10	1.55	0.89	2.60	1.31
Child-friendly	2.29	1.47	3.84	1.17	2.44	1.49	3.82	1.16	1.55	1.10	3.95	1.23
Cafe/snackbar	1.50	0.90	3.14	1.19	1.54	0.92	3.18	1.18	1.30	0.80	2.90	1.25
Wildlife	4.09	1.06	3.87	1.03	4.09	1.04	3.86	1.00	4.10	1.17	3.90	1.21

6. Analysis Methods and Model Application

When analyzing recreation demand data, count data models are often recommended due to their ability to accurately model and analyze the number of individuals participating in various recreational activities (Freeman et al., 2014; Hellerstein & Mendelsohn, 1993; Shonkwiler & Shaw, 1996; Peterson, 2003). Count data models are a type of statistical model specifically designed for analyzing data where the response variable represents a count of occurrences or events. These models are particularly useful when the response variable is non-negative, discrete, and exhibits variability in its counts. They are widely applied to examine and understand the factors influencing recreation demand. Among the count data models, the Poisson Model and the Negative Binomial model are commonly used for travel cost analysis. These models address certain issues associated with on-site data sampling, such as the inclusion of non-users of the site and the dependence of an individual's sampling probability on their visiting frequency (Hellerstein & Mendelsohn, 1993).

6.1 The Poisson Model

The Poisson model, initially proposed by Shaw (1988), assumes that the response variable follows a Poisson distribution, which is a probability distribution that describes the number of events occurring within a fixed interval of time or space, given a known average rate of occurrence (Englin & Shonkwiler, 1995; Haab & McConnell, 1996). The model is particularly suited for characterizing count data where lower values of the variable have the highest frequency and the mean and variance of the outcome variable are equal. This distribution is appropriate for scenarios where events occur independently and at a constant average rate throughout the observation period. The Poisson model can be written as:

(12) $$pr(Y_i = y_i) = \frac{e^{\lambda_i}\lambda_i^{y_i}}{y_i!}$$

The model describes the probability (*pr*) that an individual (*i*) makes y_i visits to the site (Arrow & Intriligator, 2015). Y_i denotes a numeric outcome and should be equal to nonnegative and whole numbers, and λ_i is the expected number of trips to the site, which can be specified as:

(13) $$\lambda_i = \exp\ (z_i\beta)$$

Where z_i is a vector of parameters that may affect the expected recreation demand, and β is a vector of unknown parameters (Arrow & Intriligator, 2015).

Additionally, using the Poisson regression model, consumer surplus per trip can be calculated using the following formula:

(14) $$CS = \frac{1}{-\beta_{TTC}}$$

Where β denotes the coefficient of an individual's total travel cost to the site 1 (Haab & McConnell, 2002; Freeman et al., 2014). Consequently, the Annual CS can be calculated by multiplying the CS per individual by the total annual trips taken to the site:

(15) $$Annual\ CS = E(TRIPS) \cdot \frac{1}{-\beta_{TTC}}$$

The Poisson model has several limitations (Cameron & Trivedi, 2013). Firstly, it assumes that the mean and variance of the data are equal, which may not hold true in many real-world scenarios. This assumption can lead to overdispersion, where the observed variance exceeds the mean, resulting in underestimated standard errors and potentially misleading inferences. Secondly, the Poisson model assumes that events occur independently of each other, which may not be realistic in some cases. In reality, the likelihood of taking subsequent trips can be influenced by various factors, rendering the assumption of independence unrealistic. Therefore, it is important to be aware of these limitations when interpreting the results of the Poisson model.

6.2 The Negative Binomial Model

The negative binomial model is a variant of the Poisson model that addresses the issue of overdispersion, where the variance of the response variable exceeds its mean (Englin& Shonkwiler, 1995; Haab & McConnell, 1996; Sellers et al., 2012). Like the Poisson model, the Negative Binomial model is designed for analyzing count data where the majority of observations are concentrated toward lower values of the variable. However, it introduces an additional parameter that captures the excess variance in the data, allowing for a better fit to situations where the variance is substantially higher than the mean. By incorporating this term, the negative binomial model provides a more flexible framework for modeling count data with overdispersion.

6.3 The Panel Data Model

Panel data, also known as longitudinal data, enables the observation of the same individuals over multiple time periods, providing valuable insights into individual behavior (Whitehead et al., 2000). These observations are usually collected individually or in groups, allowing for a deeper understanding of individual dynamics. Panel data combines the strengths of time series, which consist of observing a single subject at different time intervals, and cross-sectional data, which consists of the observation of many subjects at the same time. This gives advantages such as a large number of observations providing a more comprehensive and detailed picture of individual behavior over time, and the possibility of uncovering causal relationships that may not be visible with time series or cross-sectional data alone.

One of the primary advantages of panel data is the ability to analyze individual changes over time. While repeated cross-sectional data can capture broad changes over time, panel data is indispensable for understanding specific unit or individual changes and accounting for behavioral variations between individuals that cannot be explained solely by prices and income (Andreß et al., 2013; Whitehead et al., 2000). Nevertheless, it is important to be aware that models using panel data may still be affected by biases or flaws arising from omitted variables. However, panel data analysis allows for constructing more reliable models by assessing the constancy of unknown or omitted variables over time, thereby enhancing the credibility of the results (Andreß et al., 2013).

Panel data is a good model for conducting analyses that incorporate both revealed and stated preferences. It allows for examining variations in individual behavior and facilitates the establishment of correlations based on individuals' attitudes, characteristics, and preferences (Hynes & Greene, 2013). However, it is challenging to account for this correlation of responses from the same individual. Two common methods for estimating unobserved heterogeneity in panel data are utilized to address this challenge: fixed effects and random effects. Random effects models assume that individual-specific effects are not correlated with independent variables, while fixed effects models control for unobserved heterogeneity by focusing on changes within each unit. Conversely, omitted variables, which may remain constant over time, can contribute to observed heterogeneity (Hsiao, 2014). These methods offer ways to handle the complexities of panel data and enhance the accuracy of the analysis.

6.4 Correcting for On-Site Sampling

On-site sampling is a practical approach for analyzing recreational site demands as it enables researchers to observe and collect data from individuals at the site directly. This method provides more accurate information regarding the number of trips individuals take to the site and the associated costs while also allowing for a deeper understanding of their motivations and decision-making processes (Hindsley et al., 2011). This method samples individuals that are certain site users, which does not give any negative integers for the number of individual's trips to the site. Additionally, there are two other problems related to on-site sampling: endogenous stratification and truncation.

6.4.1 Endogenous Stratification

On-site sampling can be problematic due to endogenous stratification as it introduces, resulting in biased results, limited generalizability, and oversight of heterogeneity within subgroups (Hindsley et al., 2011; Duan et al., 2011; Shaw, 1988). When specific subgroups are selected based on inherent characteristics, it can lead to the exclusion of certain individuals, compromising the sample's representativeness. Consequently, there is a higher probability of collecting data from frequent users rather than infrequent visitors, potentially biasing research findings and limiting the ability to draw broader conclusions about the entire user population of the site.

6.4.2 Truncation

Another significant problem associated with on-site sampling techniques is truncation. In the context of recreational site demand research, truncation occurs when the sampling strategy only includes individuals present at the site during the sampling period, excluding those who may have visited the site at different times or were unable to participate during the specific sampling time frame (Hindsley et al., 2011; Hynes & Greene, 2013; Duan et al., 2011; Shaw, 1988). In essence, the focus is solely on current users, disregarding past users and non-users of the site. This limitation narrows the scope of data collection and overlooks valuable insights from individuals with different visitation patterns. This can lead to a biased representation of the overall population and limit the generalizability of the findings.

6.4.3 Methods of Correction

To avoid a biased estimation of the result, correction of the collected data should be applied. One of the correction methods is to exclude outliers from the sample (Englin & Shonkwiler, 1995; Martínez-Espiñeira & Amoako-Tuffour, 2009; Vesterinen et al., 2010; Gentner, 2007). Excluding outliers from the sample helps eliminate site users who deviate significantly from the typical behavior of the majority of visitors. These outliers can introduce distortions in correlation and regression analyses, potentially leading to misleading results. However, it is important to exercise caution when determining which observations should be considered outliers, as the criteria for defining an outlier can vary depending on the specific context and research objectives.

Another correction method employed in previous studies is a simple Poisson regression, subtracting one from every dependent variable and deleting responses where "-1" was generated after correction (Martínez-Espiñeira & Amoako-Tuffour, 2009). This approach is suitable when the overdispersion of dependent variables is not significant. However, in cases where overdispersion is present, employing a negative binomial model is preferable. The negative binomial model simultaneously corrects all the issues associated with on-site sampling and is particularly valuable when the collected data exhibit overdispersion. The negative binomial method allows greater flexibility in modeling. It yields reliable estimates for recreational site demand by considering the unique characteristics of data collected through on-site sampling.

6.5 Model Application and Specification

To prepare the data for regression analysis, the collected data was organized into six panels. Panel one and two contained information about the actual trips taken in 2022 and the expected number of trips for 2023, respectively. Panel three and four involved hypothetical scenarios where the travel cost and time were doubled, and the expected trip count and total travel cost (TTC) variables were adjusted accordingly. Panels five and six considered hypothetical scenarios of a closed Dalsnuten peak and the availability of bus stops. In these panels, the number of trips was adjusted to reflect the expected number under the given scenarios, and a dummy variable was created and set to one for the relevant scenarios. Additionally, a dummy for all stated preference responses was created and set to one for panels 2-6. This gave a total of 738 and 690 observations for full and restricted samples, respectively.

To estimate the demand for the Dalsnuten-/Dale area, a Multivariate Poisson-Gamma (MGP) model with panel data was utilized, incorporating both fixed and random effects. This modeling approach has been previously employed in similar studies conducted by Landry et al. (2012) and Kipperberg et al. (2019). Two distinct models were employed in each regression to examine the relationship between the independent variables and the demand for the area. The first one is a basic model:

(16)
$$\ln(TRIPS_{it}) = \beta_0 + \beta_1 TTC_{it} + \beta_2 STC_{it} + \beta_3 INCOMEDUM_{it} + \beta_4 ONSITETIME_{it} + \beta_5 HYPDUM_{it} + \beta_6 HYPDALSNUTEN_{it} + \beta_7 HYPBUS_{it} + \beta_8 DALEDUM_{it} + \beta_9 GENDER_{it} + \beta_{10} AGE_{it} + \beta_{11} EDUCATION_{it} + \beta_{12} MEMBER_{it} + \varepsilon_{it}$$

In the second model, a correction was applied to the trip count variable as recommended by Martínez-Espiñeira & Amoako-Tuffour (2009). This correction involved subtracting one from each TRIP variable, and any resulting negative values were subsequently removed from the analysis.

(17)
$$\ln(TRIPS\_C_{it}) = \beta_0 + \beta_1 TTC_{it} + \beta_2 STC_{it} + \beta_3 INCOMEDUM_{it} + \beta_4 ONSITETIME_{it} + \beta_5 HYPDUM_{it} + \beta_6 HYPDALSNUTEN_{it} + \beta_7 HYPBUS_{it} + \beta_8 DALEDUM_{it} + \beta_9 GENDER_{it} + \beta_{10} AGE_{it} + \beta_{11} EDUCATION_{it} + \beta_{12} MEMBER_{it} + \varepsilon_{it}$$

Trips count for the respondent (TRIPS) was modeled as the dependent variable for the first equation, and corrected trip count (TRIPS_C) was used as a dependent variable for the second equation. In total, 12 independent variables were included in the models to assess their impact on recreational demand. All variables are listed and described in Table 5 on the next page.

One of the independent variables, TTC (-), represents the total travel cost to the Dalsnuten-/Dale area. As the travel cost increases, the demand for recreational activities in the area is expected to decrease, following the downward-sloping demand function. This aligns with the law of demand, which states that higher prices or costs tend to reduce the quantity demanded.

To assess the potential impact of a substitute recreation area on demand and the value of the observable area, Hellestrø beach was chosen as the substitute. The STC (+) variable captures the total travel cost to the beach. It was assumed that individuals would use the same transportation mode for both sites, except for those who originally traveled to the area on foot. For those individuals, it was assumed that they would travel to the beach by diesel car, which was the most commonly used mode of transportation among respondents. Additionally, it was assumed that all individuals driving cars would be paying road tolls both ways. A positive impact of STC on demand is expected, which aligns with the law of demand for substitutes.

Further, dummies were created for the hypothetical scenarios. HYPDUM (-/+) is a dummy variable that distinguishes between revealed preference trip counts for 2022 (coded as 0) and other stated preference trip counts, including trips for 2023, doubling of travel cost/time, closed Dalsnuten peak, and bus availability (coded as 1). Similarly, HYPDALSNUTEN (-) and HYPBUS (+) are dummy variables coded as 1 for the closed Dalsnuten peak and available bus scenarios, respectively.

Table 5. *Regression variable description and expected sign.*

Variable	Description	Expected Sign
TRIPS	Trips taken by the respondent in 2022 and under stated preference scenarios	
TRIPS_C	Trips taken by the respondent in 2022 and under stated preference scenarios with correction for on-site issues: TRIPS minus 1 (negative numbers are excluded).	
TTC (β_1)	Total travel cost, herein round-trip time and travel cost including fuel, road toll and parking fee.	(-)
STC (β_2)	Travel cost to a substitute site, Hellestø beach, herein round-trip time and travel cost including fuel and road toll.	(+)
INCOMEDUM (β_3)	Dummy variable for income. Low income = 0 Medium income = 1 High income =2	(- / +)
ONSITETIME (β_4)	Time spent on site.	(+)
HYPDUM (β_5)	Dummy for stated preference trips with hypothetical scenarios. Revealed preference = 0 Stated preference = 1	(- / +)
HYPDALSNUTEN (β_6)	Dummy variable for hypothetical scenario where Dalsnuten - top is closed.	(-)
HYPBUS (β_7)	Dummy variable for hypothetical scenario where the bus is available.	(+)
DALEDUM (β_8)	Dummy for respondents from Dale Dale resp. = 1; Gramstad resp. = 0	(- / +)
GENDER (β_9)	Dummy variable for gender. Female = 1, Male = 0	(- / +)
AGE (β_{10})	Respondent`s age	(- / +)
EDUCATION (β_{11})	Respondent`s years of formal education Primary school = 7; Secondary school = 10; High school = 13; Higher education (1 - 4 years) = 16; Higher education over 4 years = 18	(- / +)
MEMBER (β_{12})	Dummy variable for members of the tourist association.	(+)

The closure of the popular Dalsnuten peak is expected to have a negative effect on the number of trips, as it is one of the most frequently visited peaks in the area. Its closure is likely to deter visitors and lead to a decrease in the overall demand for recreational activities in the Dalsnuten-/Dale area. Conversely, the availability of bus transportation is expected to have a positive effect, resulting in an upward shift in demand. Convenient access to buses will increase the likelihood of trips to the recreation area.

In addition to these variables, respondents' personal characteristics were included in the regression model. To account for the potential impact of different parking lots on trip counts, a dummy variable called DALEDUM (-/+) was created. This variable distinguishes between respondents from Gramstad and Dale, with respondents from Dale being coded as one and respondents from Gramstad as 0.

Personal variables such as age, gender, years of education, household income level (INCOMEDUM (-/+)), time spent on site (ONSITETIME (+)), and membership in a tourist association (MEMBER (+)) were also included to assess their influence on individual trip counts. It is expected that individuals who spend more time on the site and/or are members of a tourist association will take more trips, indicating a positive impact on demand. Previous research suggests that income may have different effects on demand, so both positive and negative impacts of INCOMEDUM are expected. A positive relationship would imply that the recreation area is a normal good.

7. Results and Analysis

The regression analysis examines the relationship between one dependent variable (trip counts) and several independent variables. Specifically, panel Poisson regression models were employed to examine the nature of this relationship. A total of eight regression models were run to analyze the impact of various variables on the dependent variable. The results obtained from these regression models are then utilized to estimate consumer surplus, providing valuable insights into the economic value and utility associated with recreational activities in the Dalsnuten-/Dale area.

7.1 Regression

Table 6 shows the regression results for models 1 - 4, which were run for the basic model (formula 16), while Table A3 in Appendix 3 shows the regression results for models 5 - 8, which were run for the corrected model (formula 17). These models were applied to both full (Models 1, 3, 5, 7) and restricted samples (Models 2, 4, 6, 8). For the basic model, a total of 738 observations were included in the full sample, while 690 observations were included in the restricted sample. In the case of the restricted model, 686 and 643 observations were used in the full and restricted samples, respectively.

In total, four models allow for random effects (Models 1 - 2 and 5 - 6), and four models allow for fixed effects (Models 3 - 4 and 7 - 8). Also, models were run for both full (Models 1, 3, 5, 7) and restricted samples (Models 2, 4, 6, 8). In addition to the regression results, the tables also provide information on the log-likelihood and the overdispersion parameter alpha, which can be found at the bottom of the tables. These measures are important for assessing the goodness of fit and the dispersion of the data in the models.

Table 6. *Basic model random and fixed Poisson regression results.*

	Random effects		Fixed effects	
	Full sample	**Restricted sample**	**Full sample**	**Restricted sample**
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	1.8448* (0.9295)	0.3670 (0.7529)	2.7631*** (0.0301)	2.7150*** (0.0369)
TTC	-0.0071*** (0.0004)	-0.0063*** (0.0005)	-0.0015*** (0.0002)	-0.00315*** (0.0002)
STC	0.0067** (0.0023)	0.0068*** (0.0020)		
INCOMEDUM	0.1662 (0.1487)	-0.1115 (0.1320)		
ONSITETIME	0.2364** (0.0894)	0.2516*** (0.0741)		
HYPDUM	-0.0716* (0.0308)	-0.0617 (0.0381)	-0.2926*** (0.0284)	-0.1762*** (0.0352)
HYPDALSNUTEN	-0.4392*** (0.0360)	-0.3479*** (0.0432)	-0.2182*** (0.0340)	-0.2334*** (0.0407)
HYPBUS	0.2047*** (0.0298)	0.2911*** (0.0358)	0.4257*** (0.0273)	0.4055*** (0.0327)
DALEDUM	0.9297*** (0.2688)	0.2598 (0.2569)	0.8755*** (0.0245)	0.2659*** (0.0371)
GENDER	-0.3697 (0.2032)	-0.0427 (0.1753)		
AGE	0.0153* (0.0078)	0.0122* (0.0061)		
EDUCATION	-0.0345 (0.0544)	0.0508 (0.0394)		
MEMBER	0.1356 (0.2175)	0.2189 (0.1817)		
Alpha	1.0255*** (0.1183)	1.3651*** (0.1698)		
Observation	738	690	738	690
Log likelihood	-2666.106	-2008.493	-7720.479	-4414.001

Note: Significance levels: 1%(***), 5%(**), 10%(*). Standard deviation is reported in parentheses.

Results in Table A3 show slightly lower estimates compared to Table 6, indicating some differences between the basic and corrected models. However, it can be concluded that the overall patterns and conclusions from both models are similar. Therefore, for the purpose of this chapter, the results from Table 6 will be described in detail, while the results from the corrected model in Table A3 can be found in the Appendix 3.

The regression results indicate that the estimated coefficient on TTC is consistently negative across all four models and statistically significant at a high significance level ($p < 0.01$). This finding supports the notion that as travel costs increase, the number of trips individuals take decreases. This observation aligns with the law of demand, which suggests that higher prices or costs tend to reduce the quantity demanded. Additionally, results suggest that individuals who live farther away from the Dalsnuten-/Dale area take fewer trips to the site. This can be attributed to the higher travel distance and time required for individuals living further away.

STC variable is positive and significant for all models, meaning that increased cost to the substitute site increases demand to the Dalsnuten-/Dale area, which consists of the law of demand. INCOMEDUM is positive for the full sample and negative for the restricted sample; however, it is insignificant for all models. It can be concluded that income does not directly impact the demand for the site, and the site is neither normal nor inferior good.

HYPDUM is negative and significant for almost all models. Therefore, it can be concluded that hypothetical scenarios impact recreational demand negatively. The negative coefficient indicates that including hypothetical scenarios in the analysis decreases the predicted number of trips. This could be attributed to various factors, such as respondents' uncertainty or bias in predicting their behavior in hypothetical situations.

HYPDALSNUTEN and HYPBUS are significant at level 0.01 and are negative and positive for all models. This confirms the assumption that the closure of Dalsnuten impacts demand negatively, while access to the bus has a positive impact.

DALEDUM shows a positive and significant coefficient at the 0.01 significance level for most models. The positive coefficient suggests that the trip's starting point influences the number of trips taken, with individuals from Dale showing a higher propensity for trips to the Dalsnuten-/Dale area. Also, the ONSITETIME variable is positive and significant for all models. This suggests that the amount of time spent on the site positively impacts recreational demand. Individuals who spend more time on the site tend to have more trips to the area.

Lastly, it can be concluded that demographic factors such as income, gender, education, and membership in tourist associations do not impact trip counts, as regression results on those variables are not statistically significant. However, the age of individuals does impact trip counts. The estimated coefficient on the AGE variable is positive and statistically significant at level 0.1, which means that older individuals tend to take more trips to the area compared to younger ones. The positive coefficient indicates a positive relationship between age and trip counts, implying that individuals are more likely to engage in recreational activities as they get older.

7.1.1 CS Estimates

To estimate consumer surplus per trip, the equation was used:

(14) $$CS = \frac{1}{-\beta_{TTC}}$$

Where $\beta_{TTC} = \beta_1$ from the basic model. The own-price elasticity for revealed preference was estimated using the formula:

(18) $$Own - price\ elasticity = \beta_{TTC} \cdot TTC$$

Where TTC is the average total travel cost for the models. Table 7 shows the average consumer surplus per trip calculated for all 8 models, including lower and upper significance intervals and own-price elasticity.

Table 7. Summary of CS(NOK) and elasticities for revealed preference.

		Model	CS/trips	Lower CS	Upper CS	Elasticity
Basic model	Random	**Model 1**	141.78	128.10	158.72	-0.96
		Model 2	158.34	137.31	186.99	-0.84
	Fixed	**Model 3**	649.62	543.28	807.72	-0.21
		Model 4	325.68	289.84	371.63	-0.41
		Average	**318.85**			
Corrected model	Random	**Model 5**	198.81	172.69	234.24	-0.68
		Model 6	169.06	145.48	201.77	-0.79
	Fixed	**Model 7**	790.70	638.40	1038.43	-0.17
		Model 8	349.63	308.66	403.14	-0.38
		Average	**377.05**			

Note: 95% confidence interval is reported.

The consumer surplus (CS) estimates in the regression models exhibit considerable variability and inconsistency across different models. Fixed effects models generally estimate higher CS per trip compared to random effects models. Specifically, models 3 and 7, which are based on full samples, yield extremely high CS estimates. The range of CS values across all models is from 141.78 NOK to 790.70 NOK.

The correction, applied by subtracting one from the number of trips, aims to address the issue of endogenous stratification, and produces higher CS values in the corrected models compared to the basic model. On average, the basic model estimates a CS of 318.85 NOK per trip, while the corrected model estimates it to be 377.05 NOK per trip.

The elasticity of demand, which measures trip counts' responsiveness to travel cost changes, varies from -0.96 to -0.17 across the eight models. The elasticity is negative in all cases, indicating a downward-sloping demand curve for the Dalsnuten-/Dale area. This aligns with the earlier conclusion that an increase in travel costs leads to a decrease in the number of trips, as individuals are less willing to engage in recreational activities when the costs are higher.

Based on the findings presented in Table 7, it can be observed that the models incorporating corrections for on-site sampling issues yield higher estimates of consumer surplus (CS) compared to the uncorrected models. This suggests that the uncorrected models may underestimate the true CS values. Furthermore, the models that include random effects for restricted samples exhibit the highest likelihood, indicating a better fit to the data. Among the models considered, Model 6, which accounts for on-site correction and has the lowest log-likelihood, can be considered the most appropriate for accurate CS estimation.

7.1.2 Economic Impact of Scenarios

To determine the impact of welfare changes in different hypothetical scenarios, the dummy coefficients (HYPDALSNUTEN and HYPBUS) allow us to analyze the effect on annual trips while holding other factors constant. Consequently, we can calculate the change in consumer surplus per trip for the Dalsnuten top and Bus scenarios by using the following formulas:

(19) $$\Delta\, Trips\ CS = \frac{\beta_{HYPDALSNUTEN}}{-\beta_{TTC}}$$

(20) $$\Delta\, Trips\ CS = \frac{\beta_{HYPBUS}}{-\beta_{TTC}}$$

Tables A4 and A5 in Appendices 4 and 5 provide detailed information on the calculated consumer surplus (CS) changes for various hypothetical scenarios for all eight models. Tables A6 and A7 in Appendices 6 and 7 show detailed information on annual CS and the corresponding changes for hypothetical scenarios. Table 8 presents the CS values for models with random effects as they do not overestimate CS values as fixed effect models. The table presents CS values and changes compared to CS for revealed preference according to two hypothetical scenarios: closed Dalsnuten peak and bus availability scenario. The annual consumer surplus was calculated by multiplying the CS per trip by the total number of annual visitors. According to the digital counter at Gramstad, approximately 200 000 individuals visit the area yearly.

Table 8. *Summary of CS (NOK) and the change in CS (NOK) for hypothetical scenarios.*

		Model 1	Model 2	Model 5	Model 6	Average
	CS/trip - RP	141.78	158.34	198.81	169.06	**167.00**
Dalsnuten scenario	**CS/trip - Dalsnuten**	79.51	103.25	119.25	119.52	**105.38**
	△ CS/trip - Dalsnuten	-62.27	-55.09	-79.56	-49.54	**-61.62**
	%△ CS	-43.92%	-34.79%	-40.02%	-29.30%	**-36.90%**
	Annual CS - Dalsnuten	15,901,521	20,650,857	23,850,386	23,903,963	**21,076,682**
Bus scenario	**CS/trip - bus**	170.80	204.43	238.24	215.64	**207.28**
	△ CS/trip - bus	29.02	46.09	39.43	46.57	**40.28**
	%△ CS - bus	20.47%	29.11%	19.83%	27.55%	**24.12%**
	Annual CS - bus	34,159,709	40,886,681	47,647,933	43,127,087	**41,455,352**

The closure of the Dalsnuten peak scenario has a negative impact on the overall consumer surplus, resulting in an average reduction of 36.90%. In contrast, the bus availability scenario has a positive impact, leading to an average increase in CS of 24.12%. Notably, the restricted models consistently yield higher estimates for changed CS compared to the basic models. For the Dalsnuten scenario, the random effect models estimate an average CS per trip of 105.38 NOK and an annual CS of 21,076,682 NOK. In the case of the bus availability scenario, the random models estimate an average CS per trip of 207.28 NOK and an annual CS of 41,455,352 NOK.

7.2 Recreational Demand Over Time

This section compares survey and regression results between two similar studies: the study by Lohaugen & Refsdal (2016) and the current study. Both studies aimed to analyze the recreational demand and value of the Dalsnuten-/Dale area. Lohaugen & Refsdal (2016) conducted their study using a similar survey methodology, including a mix of revealed preference (RP) and stated preference (SP) data. They also employed regression models to examine the impact of various independent variables on recreational demand. Comparing the survey results, both studies collected data on trip counts, travel costs, demographic variables, and other relevant factors that could influence recreational demand. However, there may be some differences in the specific survey questions or data collection methods employed.

7.2.1 Participant Profile

The study by Lohaugen & Refsdal (2016) was conducted only for Gramstad visitors, and the restricted sample was limited to individuals with a maximum of 50 trips for previous years. Therefore, for descriptive statistics comparison, only restricted samples with individuals from Gramstad are used.

Table 9 shows respondents' characteristics for the years 2016 and 2023. It can be noticed that, on average, in 2023, an average Dalsnuten area visitor is slightly older, is more educated, and has a higher household income compared to an average visitor from 2016. The employment rate for respondents has also increased by 6.87% in 7 years. The difference in gender distribution, household, and belongingness to tourist associations is insufficient between years.

Table 9. *Respondents' characteristics from restricted samples with individuals from Gramstad parking lot, from studies from 2016 and 2023 compared side by side, and the change between them (2023-2016).*

	2016	**2023**	**△Change**
	69 respondents	*99 respondents*	
Age	40.17	44.434	4.26
Employed (%)	80%	86.87%	6.87%
Female	61.18%	61.62%	0.44%
Education (mean, years)	14.54	16.444	1.90
Household size (mean, pers)	2.73	2.78	0.05
Household income (mean, NOK)	772,619	1,092,172	319,553
Member of a tourist association (%)	30.59%	33.33%	2.74%

7.2.2 Visit Profile

Table 10 shows visitation statistics for the years 2015/2016 and 2022/2023. It can be concluded that in 2022 respondents had, on average, more annual trips by 23% than in 2015. Interestingly, despite the increase in individual trip counts reported by the respondents, the digital visitor tracker installed between the Gramstad parking lot and Dalsnuten peak did not register significant difference in annual visitor counts between the two years. This could indicate that the increased trips reported by the respondents are not reflected in the overall visitor numbers captured by the tracker.

Furthermore, a significant majority of respondents (85%) stated that they maintain the same level of trips and hikes as before the COVID-19 pandemic. Only a minority of respondents (15%) reported an increase in hiking frequency. These findings suggest that while individual respondents are engaging in more trips and hikes in the Dalsnuten-/Dale area, there might not be a proportional increase in overall visitor counts, as observed by the digital tracker.

Table 10. *Statistics of visitation from restricted samples with individuals from Gramstad parking lot, from studies from 2016 and 2023 compared side by side, and the change between them (2023-2016).*

	2015/2016		**2022/2023**		**△ Difference in means (%)**
	69 respondents		*99 respondents*		
	Mean	**Std.dev**	**Mean**	**Std.dev**	
Travel					
Last month	1.81	1.55	2.58	2.87	0.77 (30%)
Last year, 2015/2022	8.26	10.31	10.69	13.08	2.43 (23%)
This year, 2016/2023	11.38	11.85	11.14	11.82	-0.24 (-2%)
Hypothetical scenarios					
Double travel cost	10.09 (-11%)	11.75	6.39 (-43%)	8.37	32%
Double travel time	7.87 (-31%)	10.1	5.67 (-49%)	7.16	18%
Windmills	6.78 (-47%)	9.98			
Characteristics of today's trip					
One way trip (minutes)	24.4	8.13	23.29	12.72	-1.11 (-5%)
One way distance (km)	16.65	7.26	16.91	8.46	0.26 (1.5%)
Time spent on the site (hours)	1.71	0.71	2.32	1.02	0.61 (26%)
Size of the group	2.56	1.6	3.31	2.26	0.75 (23%)
Calculated travel cost (NOK)	146.27	102.58	126.69	56.82	-19.58 (-15%)

Furthermore, the previous study indicated a significant expected decrease in demand by 47% following the installation of windmills in the area. However, a majority of respondents in this study (87%) reported that the presence of the windmill park had had no impact on their demand for the area. Only a minority (11%) acknowledged a slight reduction in their annual trips due to the presence of windmills.

The average time spent on the site increased by 26%. Also, people are now hiking in larger groups, with an average increase in group size by one individual. This suggests a shift towards more social or communal hiking experiences among respondents. Surprisingly, there has been almost no change in travel distance and time between the two studies; however, the total travel cost for this study's respondents is 15% lower compared to the previous study. This reduction in travel cost could be attributed to various factors, such as changes in transportation options, fuel prices, or other economic factors affecting travel expenses.

Furthermore, the impact of doubling travel cost and time on individuals' demand has changed between the two studies. In 2023, doubling of travel cost and time has a more negative impact on individuals' demand, with a 32% and 18% greater decrease compared to the 2016 study. This suggests that individuals are now more sensitive to changes in time and cost, indicating a higher level of price elasticity and time constraints in their decision-making process.

7.2.3 Features and Characteristics

In this study, the evaluation scale for survey responses was chosen to be between 1 and 5, which differs from the previous study conducted in 2016, which used a scale between 1 and 9. To facilitate a comparison between the two studies, the characteristic rates from the 2016 study were transformed to be equivalent to the 1-5 scale used in this study. Table 11 compares the features and characteristics between the two studies, where a score of 1 represents "not important/very bad," and a score of 5 represents "very important/very good."

Table 11. *Features and characteristics of individuals from Gramstad parking lot, from studies from 2016 and 2023 compared side by side.*

	General importance		**Rating of the Dalsnuten-/Dale area**	
	2016	**2023**	**2016**	**2023**
Characteristics				
Short travel distance	3.72	3.55	4.29	3.85
Available parking space	4.24	4.08	4.75	4.61
Quality of trails	3.13	3.46	4.38	4.27
Varied distances	3.74	3.71	4.28	4.53
Not crowded	3.15	3.17	2.86	2.49
Available toilets	1.66	2.67	1.69	3.27
Cafe/snackbar	1.11	1.54	1.64	3.18
Wildlife	4.56	4.09	4.28	3.86

Both the respondents from the 2016 and 2023 studies consider available parking space and wildlife to be the two most important factors in recreation areas. However, it is noteworthy that the respondents from the 2016 study gave a significantly higher score to wildlife, with a score of 4.56. On the other hand, the availability of a cafe/snackbar is perceived as the least important factor for both groups of respondents.

In this study, the respondents rate available parking space, quality of trails, and varied distances as the highest-ranking qualities for the recreation area, with scores above 4 points. Additionally, to these three qualities, the respondents from the 2016 study also rated short travel distance and wildlife with high scores. On the other hand, both available toilets and cafe/toilets received the lowest scores among the evaluated features. Interestingly, the respondents from the 2023 study rated these two features higher compared to the 2016 study.

7.2.4 Significant Regression Variables

Table 12 shows the panel Poisson models with random effects from both studies side by side. Model 3 (2016) and Model 1 (2023) are regressions with full sample, and Model 9 (2016) and Model 2 (2023) are regressions with restricted sample. In both studies, the TTC variable is negative and significant at level 0.01 for all models, which confirms that the demand curve for the Dalsnuten-/Dale area is downward sloping.

The ONSITETIME variable, however, has different effects on demand in the two studies. The 2016 study found that time spent on site has a negative effect on demand, suggesting that individuals who spend more time on the site take fewer trips. In contrast, the 2023 study reveals that respondents, who stay on-site longer, tend to go on more trips. Interestingly, the HYPDUM variable shows contrasting results between the two studies. In the 2016 study, HYPDUM is positive but insignificant, suggesting that hypothetical scenarios do not significantly impact demand. However, in the 2023 study, HYPDUM is negative and significant, indicating that hypothetical scenarios have a negative effect on demand.

Among the personal variables, only AGE is significant for the 2023 study, and it has a positive coefficient, implying that older individuals tend to take more trips to the area. In the 2016 study, GENDER is significant for the full sample model and has a positive coefficient, indicating that women take more trips than men in the full sample. For the restricted sample in 2016, GENDER, AGE, MEMBER, and INCOME variables are significant. Interestingly, the effect of gender in the restricted sample is opposite to that of the full sample, with men taking more trips than women. The impact of age on trip counts also differs from the 2023 study, as the 2016 restricted sample shows a negative coefficient, suggesting that younger respondents take more trips than older ones. Additionally, other variables such as membership in tourist associations (MEMBER) and income (INCOME) are significant for the restricted sample in 2016.

Table 12. *Regression results from studies from 2016 and 2023 compared side by side.*

Poisson Random Effects	**Full sample**		**Restricted sample**	
	Model 3 (2016)	**Model 1 (2023)**	**Model 9 (2016)**	**Model 2 (2023**
Variables 2016/2023				
Constant	1.099 (1.0183)	1.8448* (0.9295)	1.840 (0.4264)	0.3670 (0.7529)
TTC	-0.007*** (0.0003)	-0.0071*** (0.0004)	-0.006*** (0.0004)	-0.0063*** (0.0005)
STC		0.0067** (0.0023)		0.0068*** (0.0020)
SUBSDIST	0.015 (0.0088)		0.016*** (0.0030)	
INCOMEDUM		0.1662 (0.1487)		-0.1115 (0.1320)
INCOME	-0.044 (0.0390)		0.068*** (0.0158)	
ONSITETIME	-0.009* (0.0039)	0.2364** (0.0894)	-0.016*** (0.0014)	0.2516*** (0.0741)
HYPDUM	0.016 (0.0283)	0.2047*** (0.0298)	0.103 (0.0547)	0.2911*** (0.0358)
HYPDALSNUTEN		-0.4392*** (0.0360)		-0.3479*** (0.0432)
HYPBUS		0.2047*** (0.0298)		0.2911*** (0.0358)
HYPWIND	-0.117*** (0.0292)		-0.298*** (0.0582)	
HYPQUAL	0.083*** (0.0234)		0.104* (0.0440)	
TRAILVARIA	0.325*** (0.0916)		0.267*** (0.0315)	
DALEDUM		0.9297*** (0.2688)		0.2598 (0.2569)
GENDER	0.528* (0.2511)	-0.3697 (0.2032)	-0.524*** (0.1086)	-0.0427 (0.1753)
AGE	0.013 (0.0097)	0.0153* (0.0078)	-0.019*** (0.0039)	0.0122* (0.0061)
EDUCATION	0.017 (0.1308)	-0.0345 (0.0544)	0.086 (0.0039)	0.0508 (0.0394)
MEMBER	-0.015 (0.3041)	0.1356 (0.2175)	0.638*** (0.1004)	0.2189 (0.1817)
Alpha	1.174*** (0.1601)	1.0255*** (0.1183)	0.783*** (0.1272)	1.3651*** (0.1698)
Observation	660	738	524	690
Log likelihood	-3021.82	-2666.106	-1673.48	-2008.493

Indeed, the differences in regression results between the two studies suggest that different variables influence respondents' demand in different years. This variation may be attributed to various factors, including changes in societal, economic, and environmental conditions, as well as differences in the survey sample and methodology.

7.2.5 Consumer Surplus

Table 13 compares consumer surplus (CS) estimates between the 2016 and 2023 studies using Panel Poisson models with random effects. Two models from each study, representing the full and restricted samples, are included in the analysis. For the full sample models, the CS per trip was 134.05 NOK in the 2016 study and 141.78 NOK in the 2023 study. These figures indicate an increase in CS per trip over the seven years. This suggests that, on average, individuals in the 2023 study are willing to pay more for each trip than those in the 2016 study.

Table 13. Consumer surplus estimates from studies from 2016 and 2023 for random Poisson models compared side by side.

	CS/trip	**Lower CS**	**Upper CS**	**Annual CS**
Model 3 (2016) Full	134.05	122.84	147.52	26,810,000
Model 1(2023) Full	141.78	128.10	158.72	28,355,337
Model 9 (2016) Restricted	162.55	142.69	188.82	32,510,000
Model 2 (2023) Restricted	158.34	137.31	186.99	31,668,930
Best fitted model - Model 12 (2016)	192.59	149.38	270.99	38,518,000
Best fitted model- Model 6 (2023)	169.06	145.48	201.77	33,812,000

However, comparing CS estimates for the restricted sample models shows a different result. In the 2016 study, the CS per trip was 162.55 NOK, while in the 2023 study, it was 158.34 NOK. These figures suggest a decrease in CS per trip over the seven years for the restricted sample. This implies that individuals in the 2016 study were willing to pay more for each trip compared to those in the 2023 study when considering the restricted sample.

Both studies have identified different models to be best fitted for CS estimation. 2023 study chose the corrected Poisson model for restricted sample (Model 6), while 2016 study identified basic Negative Binomial model for restricted sample (Model 12) as best fitted. The comparison of these models suggests that CS per trip has decreased in 7 years from 192.59 NOK to 169.06 NOK.

8. Discussion

The results of this study indicate a 23% increase in the number of trips to the Dalsnuten-/Dale area in 2023 compared to 2016, suggesting a growing demand for the area over time. These findings align with previous research conducted by Voltaire et al. (2017), which also observed an increasing demand trend over time.

Regarding the impact of COVID-19 on recreation demand, previous studies have yielded mixed conclusions, with some reporting positive effects and others negative effects (Venter et al., 2021; Parsons et al., 2022; Landry et al., 2021). While it could be inferred from the comparison of studies from 2016 and 2023 that individuals are going on more trips after COVID-19, most respondents in this study reported that COVID-19 did not significantly impact their participation in recreational activities. Therefore, our findings do not align with the existing literature in terms of the impact of COVID-19 on recreation demand.

The previous study conducted on the Dalsnuten area indicated that the construction of windmills in recreation areas would have a negative impact on the demand for the area. However, our findings align with previous studies, including those by Frantàl & Kunc (2011), Hanley & Nevin (1999), and Landry et al. (2012), which suggest that the presence of a windmill farm in a recreation area does not have a significant effect on the overall demand for recreational activities in that area.

Both studies have shown a negative correlation between TTC and the number of trips, giving a downward-sloping demand curve for recreation areas, which corresponds with the theory and other research (Varian, 2014; Freeman et al., 2014; Shrestha et al., 2007; Loomis et al., 2001). However, both studies' results have shown a significant but opposite relationship between time spent on site and the number of trips, indicating a changing pattern of visitors to the area over time. The previous study indicated that individuals who spent less time on site take more annual trips. Findings from 2016 correspond with other recreation demand studies (Bell & Leeworthy, 1990; Creel & Loomis, 1990; Shrestha et al., 2002; and Shrestha et al., 2007). However, this study has observed a positive relationship between time spent on site, and it can be concluded that in 2023 individuals who visit the area more often prefer to take longer trips on site.

In terms of personal variables impacting demand, there were also some changes over time. The 2023 study yielded similar results to the study conducted by Voltaire et al. (2017), highlighting a significant and positive relationship between respondents' age and the number of trips taken. However, the other personal variables examined in the 2023 study did not show significant associations with demand. In contrast, the Dalsnuten study conducted in 2016 presented varied results regarding the impact of different variables on demand, which depended on the specific model used. These findings make direct comparisons with other literature findings challenging. It can be concluded that the influence of personal factors on demand will vary depending on the specific recreation area, the time period, and the characteristics of the respondent sample.

Further, some studies, such as Bliem et al. (2012) and Bhattacharjee et al. (2009), did not observe any significant changes in respondent demographics over time. Similarly, the comparison of two studies conducted in the Dalsnuten area did not show significant changes in gender distribution, average household size, and the proportion of members of tourist associations. However, there were notable increases in other demographic characteristics, including average household income, age, education level, and employment rate. These observations are consistent with the findings of studies conducted by Liebe et al. (2012) and Rolfe & Dyack (2019).

The closure of the Dalsnuten peak is anticipated to have a negative impact on both the demand for the area and consumer surplus. This aligns with the initial expectations, considering that the Dalsnuten peak is the area's most popular and frequently visited peak. On the other hand, the findings indicate that the improvement of bus accessibility is anticipated to impact the area demand and consumer surplus positively. Initially, it was expected that the majority of area visitors would opt for using the bus to reach the site, considering that the existing route from the bus stop to Gramstad might be perceived as challenging. This anticipated preference for bus transportation aligns with the hypothesis that the enhancement of bus accessibility would be well-received by visitors. Moreover, this improvement is expected to attract new area users and lead to an overall increase in the annual consumer surplus of the area.

Lastly, the preferred model for estimating the consumer surplus in this study was Model 6, which is the corrected Poisson model with random effects for the restricted sample. Using this model, the estimated consumer surplus for the Dalsnuten-/Dale areas was found to be 169.06 NOK per trip, with an annual consumer surplus of 33,812,000 NOK. The consumer surplus for the area falls within the range of CS values reported in other studies, where values range from €7.33 to $29.23 (Alessandro et al., 2023; Hesseln et al., 2004; Weiqi et al., 2004; Berz et al., 2003).

In the 2016 Dalsnuten study, the preferred model for estimating consumer surplus was the Negative Binomial model for the corrected sample, which resulted in a consumer surplus per trip of 192.59 NOK. Based on these findings, it can be concluded that the consumer surplus for the Dalsnuten-/Dale area has decreased over time. However, the magnitude of this decrease is not as significant as the study by Rolfe & Dyack (2019), where the increase in consumer surplus per trip for the same recreation area over seven years was equal to $136.06.

8.1 Limitations and Further Research

This study acknowledges several limitations that should be taken into account. One primary limitation concerns the number of visitors in the Dale area. Data collection was expanded to include the Gramstad and Dale parking lots to obtain a comprehensive assessment of the area's value. However, the survey revealed a relatively low participation rate of respondents from Dale, with only 20% representing this specific area. This limited number of respondents from Dale hampers a thorough evaluation of visitor behavior in this area, and more accurate results could have been obtained with a higher number of respondents. Furthermore, the comparison of individuals visiting different locations becomes less credible due to the significantly higher number of respondents from the Gramstad parking lot. This disparity in respondent distribution between the two areas poses challenges in drawing conclusive comparisons regarding visitor types.

The primary objective of this study was to compare the findings with a previous study conducted in 2016. However, a limitation of this comparison arises from the fact that the earlier study exclusively examined individuals who initiated their visits from the Gramstad parking lot, neglecting those who were hiking from the Dale parking lot. Consequently, the assessment of temporal stability for recreational values in the Dalsnuten and Dale area becomes restricted, leading to imprecise and unequal comparative results.

In estimating the total travel cost, respondents in this study only provided their postcode to determine travel time and distance. However, this approach is limited because the postcode alone does not provide precise travel time and distance information. Instead, it gives the midpoint of the postcode on a map. While using postcodes for estimation purposes offers convenience, the resulting estimates may not be sufficiently accurate. This method can lead to both underestimation and overestimation of the calculated values. To enhance the precision of estimating the total travel cost, a more precise measure would be to request respondents to provide their home addresses. This would also allow for a more accurate assessment of the consumer surplus.

This research presents various avenues for future investigations. Firstly, conducting surveys with a larger sample size, particularly among individuals starting from the Dale parking lot, would provide more comprehensive results and reduce the discrepancy in respondent numbers between Dale and Gramstad areas. Additionally, employing the negative binomial model to address potential errors in regression would enhance the robustness and accuracy of the estimated variables.

The current and 2016 studies were conducted during the Easter period. Future research could explore the recreational area during different seasons, such as winter, spring, summer, and autumn, to better understand which consumers utilize the non-market goods at different times of the year.

Furthermore, while this study utilized on-site sampling, an opportunity for future research lies in conducting off-site sampling. This approach would enable the inclusion of a broader range of respondents with diverse backgrounds and capture insights from non-users of the area. Consequently, a more comprehensive and nuanced understanding of the visitors in the area could be obtained.

9. Conclusion

This research aimed to estimate the recreational value of the Dalsnuten/Dale area using the travel cost model with contingent behavior (CB). To ensure accurate valuation, the study employed random and fixed effects Poisson models, specifically designed for analyzing count data related to recreational activities. To enhance the robustness of the analysis, a panel data approach was utilized, combining contingent behavior (CB) data with actual behavior observations from the same individuals. The data was carefully divided into full and restricted samples to mitigate potential biases, and a corrected model with minus one for trips was employed. Additionally, the study focused on examining the temporal stability of the recreational value by conducting a comparative analysis with a previous study conducted in 2016 by Marte Lohaugen and Greta Refsdal, who conducted similar research within the same recreation area.

A potential closure of the Dalsnuten peak showed a detrimental effect on the value of the recreation area, indicating a decrease in demand and consumer surplus. On the other hand, the availability of bus transportation directly to Dale and Gramstad parking lots showed a positive impact, leading to increased demand and consumer surplus for the area. Contrary to previous studies, this research did not confirm the potential negative impact of wind turbines on the area (Lohaugen & Refsdal, 2016). Most respondents reported no change in their demand for the area following the establishment of wind turbines.

This study's consumer surplus (CS) per trip ranged from 141.78 NOK to 790.70 NOK, with the best-fitted model (Model 6) estimating CS per trip at 169.06 NOK. When comparing CS with the 2016 study, using the same models yielded mixed results regarding the change in CS (Lohaugen & Refsdal, 2016). A comparison of the best-fitted models showed a decrease in CS per trip from 192.59 NOK to 169.06 NOK over a span of 7 years. Further research and implementation of other models are necessary for a more comprehensive analysis of changes in recreational value over time.

10. References

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Appendix 1: Invitation Card

Friluftsliv i Dalsnutenområdet og Daleområdet: Hva synes du?

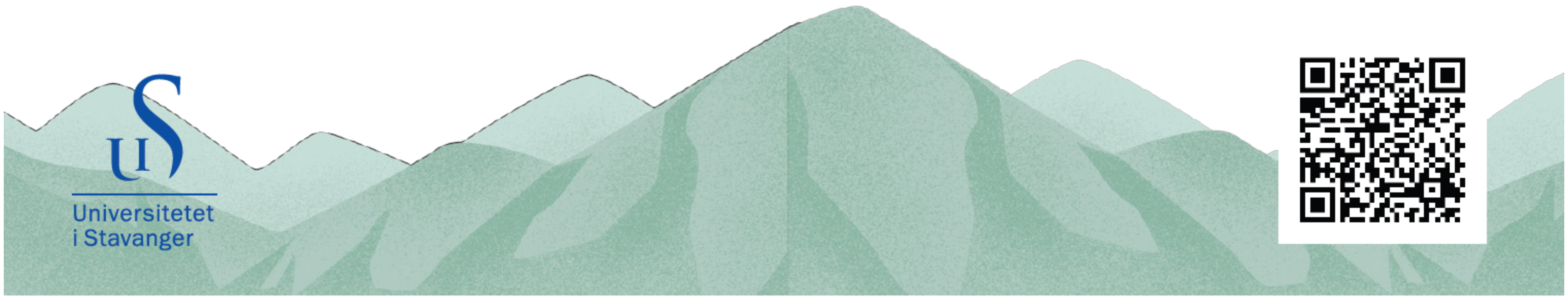
Gå inn på linken og svar på bruker-undersøkelsen: **bit.ly/dalsnuten**

Formålet med undersøkelsen er å kartlegge folks rekreasjonsadferd og preferanser, med spesielt fokus på Dalsnuten-/Daleområdet. Svarene dine vil være anonyme og vil kun bli brukt i forskningsanalyser.

Undersøkelsen er en del av samfunns-økonomisk forskning ved Universitetet i Stavanger. Ved spørsmål kontakt leder for forskningsprosjektet:

E-mail: gorm.kipperberg@uis.no
Telefon: +47 47 67 48 29

Takk for din deltakelse!



Appendix 2: Questionnaire

Friluftsliv i Dalsnutenområdet og Daleområdet: Hva synes du?

DINE MENINGER ER VIKTIGE!

Takk for at du deltar i denne spørreundersøkelsen. Undersøkelsen er en del av samfunnsvitenskapelig forskning på folks fritidsaktiviteter og friluftsliv og er gjennomført av forskere på Handelshøgskolen ved Universitetet i Stavanger.

Temaet for denne undersøkelsen er folks forhold til Dalsnuten-/Daleområdet. Kunnskap fra undersøkelsen kan gi myndighetene bedre forståelse av bruk og vern lokale naturområder, noe som kan bidra til en mer helhetlig og bærekraftig forvaltning av turområdet.

Vi er kun interessert i dine erfaringer og meninger. Det finnes ingen riktige eller uriktige svar. Som deltaker i undersøkelsen er du helt anonym. Det vil ta omtrent 10 minutter å svare på alle spørsmålene.

Gorm Kipperberg
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Nasra Abdille, Master-student
Julija Tisko, Master-student

Hva vil skje med informasjonen vi samler inn?
Dine individuelle svar på undersøkelsesspørsmålene vil være anonyme da de vil bli gruppert sammen med svarene fra alle deltakerne som fullfører undersøkelsen. Du kan når som helst trekke deg fra spørreundersøkelsen ved å lukke nettleseren før du sender inn dine svar.

Ved å krysse av i boksen under "Jeg godtar å delta i denne undersøkelsen", indikerer du at du samtykker i følgende:

- Jeg har lest informasjonen om denne undersøkelsen.
- Jeg forstår at min deltakelse i denne undersøkelsen er frivillig.
- Jeg forstår at det står meg fritt til å trekke tilbake min deltakelse når som helst under fullføring av undersøkelsen ved å lukke nettleservinduet.
- Jeg forstår at svarene jeg gir på spørreundersøkelsen vil være anonyme, og at ingen personlig identifiserbar informasjon om meg vil vises i noen rapport eller artikkel basert på funnene i denne undersøkelsen.

○ Jeg godtar å delta i denne undersøkelsen

○ Jeg godtar ikke å delta i denne undersøkelsen

VENNLIGST FORTELL OM DIN BRUK AV DALSNUTEN-/DALEOMRÅDET.

1. Hvilket postnummer og poststed kom du fra på denne turen?

○ Postnummer ____________

○ Poststed ________________

2. Når du teller med dagens tur, hvor mange ganger har du besøkt Dalsnuten-/Daleområdet de siste 30 dagene? *[Vennligst kryss av ett alternativ.]*

○ 1 tur de siste 30 dagene

○ 2

○ 3

○ 4

○ 5

○ Flere enn 5 turer de siste 30 dagene (vennligst oppi antall):

3. Tenk tilbake på sist år, altså 2022. Omtrent hvor mange ganger besøkte du Dalsnuten-/Daleområdet i fjor?
[Vennligst kryss av ett alternativ.]

○ 0 turer i 2022

○ 1

○ 2

○ 3

○ 4

○ 5

○ 6

○ 7

○ 8

○ 9

○ 10

○ Flere enn 10 turer i 22 (vennligst spesifiser antall)

4. Hvor sikker er du på at det antallet besøk du oppga for i fjor (2022)?

[Vennligst kryss av ett alternativ.]

VELDIG USIKKER VELDIG SIKKER

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

5. Inkludert dagens tur og andre turer du har tatt så langt i år (2023), omtrent hvor mange ganger forventer du å besøke Dalsnuten-/Daleområdet i løpet av hele 2023? *[Vennligst kryss av ett alternativ.]*

○ 1 tur i 2023 ○ 5 ○ 8

○ 2 ○ 6 ○ 9

○ 3 ○ 7 ○ 10

○ 4

6. Hvor viktig er de følgende faktorene for deg når du oppsøker friluftsliv generelt?
[Vennligst indiker viktigheten av hver faktor på en skala fra 1 (helt uviktig) til 5 (svært viktig).]

	1	2	3	4
Kort vei hjemmefra	○	○	○	○
Parkeringsmuligheter	○	○	○	○
Kvalitet på stier	○	○	○	○
Muligheten å gå forskjellige distanser	○	○	○	○
Lite folk	○	○	○	○
Tilgjengelige toaletter	○	○	○	○
Barnevennlig	○	○	○	○
Åpen kiosk/snackutsalg	○	○	○	○
Dyreliv og naturomgivelser	○	○	○	○

7. Hva synes du om Dalsnuten-/Daleområdet med tanke på disse faktorene? *[Vennligst rate hver faktor på en skala fra 1 (svært dårlig) til 5 (svært bra).]*

	1	2	3	4
Kort veihjemmefra	○	○	○	○
Parkeringsmuligheter	○	○	○	○
Kvalitet på stier	○	○	○	○
Muligheten å gå forskjellige distanser	○	○	○	○
Lite folk	○	○	○	○
Tilgjengelige toaletter	○	○	○	○
Barnevennlig	○	○	○	○
Åpen kiosk/snackutsalg	○	○	○	○
Dyreliv og naturomgivelser	○	○	○	○

NOEN SPØRSMÅL OM DAGENS TUR TIL DALSNUTEN-/DALEOMRÅDET.
[Dersom du ikke var på Dalsnuten-/Daleområdet i dag, tenk i stedet på ditt siste besøk når du besvarer de neste spørsmålene.]

8. Hvor startet du besøket til Dalsnuten-/Daleområdet i dag?
[Vennligst kryss av ett alternativ.]

○ Gramstad ○ Dale ○ Annet sted

9. Hvor avsluttet du besøket til Dalsnuten-/Daleområdet i dag?
[Vennligst kryss av ett alternativ.]

○ Gramstad ○ Dale ○ Annet sted

10. Hvilken/hvilke av disse turmålene/toppene benyttet du deg av i dag?
[Vennligst kryss av ett/flere alternativer.]

○ Dalsnuten
○ Bjørndalsfjellet
○ Kallandsnuten
○ Mattirudlå
○ Skjørestadfjellet
○ Jødestadfjellet
○ Sørafjellet
○ Lifjell
○ Øvre Eikenut
○ Fjogstadnuten
○ Resasteinen
○ Kollirudlå
○ Annen, vennligst spesifiser

____

11. Besøket til Dalsnuten-/Daleområdet i dag var…
[Vennligst kryss av ett alternativ for å avslutte setningen.]

- ◯ ...det **eneste formålet** da jeg reiste hjemmefra i dag.
- ◯ ... **hovedformålet** da jeg reiste hjemmefra i dag.
- ◯ ...**ett av flere formål** da jeg reiste hjemmefra i dag.

12. Omtrent hvor mange kilometer måtte du reise (en vei) for å komme deg til Dalsnuten-/Daleområdet i dag? *[Vennligst gi oss ditt beste anslag på reisedistanse.]*

- ◯ 0-1 kilometer
- ◯ 1-3
- ◯ 3-5
- ◯ 5-10
- ◯ 10-15
- ◯ 15-20
- ◯ 20-25
- ◯ 25-30
- ◯ Mer enn 30 kilometer (vennligst oppgi antall):

____

13. Omtrent hvor mange minutter tok det deg å komme til Dalsnuten-/Daleområdet (en vei) i dag?
[Vennligst gi oss ditt beste anslag på reisetid.]

- ◯ 0-5 minutter
- ◯ 5-10
- ◯ 10-15
- ◯ 15-20
- ◯ 20-25
- ◯ 25-30
- ◯ 30-45
- ◯ 45-60
- ◯ Mer enn 60 minutter (vennligst oppgi antall):

____

14. Hvilket transportmiddel brukte du i hovedsak for å komme deg til Dalsnuten-/Daleområdet i dag?
[Vennligst kryss av ett alternativ.]

- ○ Dieselbil
- ○ Bensinbil
- ○ El-bil
- ○ Hybridbil
- ○ Gikk til fots
- ○ Sykkel
- ○ Buss
- ○ Tog
- ○ Annet (vennligst spesifiser)

____

15. Hvor lenge varte besøket ditt til Dalsnuten-/Daleområdet i dag?
[Vennligst gi oss ditt beste anslag på besøkslengde.]

- ○ 0 - 1 time
- ○ 1 - 2 timer
- ○ 2 - 3 timer
- ○ 3 - 4 timer
- ○ mer enn 4 timer

16. Hvem var du sammen med i Dalsnuten-/Daleområdet i dag?
[Kryss av ett/flere alternativer.]

○ Familie

○ Kollegaer

○ Venner

○ Ektefelle/samboer/kjæreste

○ Ingen - var alene

○ Annen (vennligst spesifiser)

____

17. Hvor mange personer (inkludert deg selv) reiste du sammen med til Dalsnuten-/Daleområdet i dag? [Vennligst velg ett alternativ.]

○ 1

○ 2

○ 3

○ 4

○ 5

○ Flere enn 5, vennligst spesifiser

____

18. Vennligst gi oss ditt beste anslag på utgifter forbundet med dagens besøk til Dalsnuten-/Daleområdet for deg og ditt reisefølge.
[Vennligst kryss av ett/flere alternativer.]

	0 kr	1-50 kr	51-100 kr	101-150 kr	151-200 kr	>200 kr
Drivstoff:	○	○	○	○	○	○
Bompenger:	○	○	○	○	○	○
Bussbillett:	○	○	○	○	○	○
Annet (vennligst spesifiser):	○	○	○	○	○	○

19. Hvilke andre aktiviteter ble vurdert som alternativer til Dalsnuten-/Daleområdet i dag?
[Vennligst kryss av ett/flere alternativer.]

- ○ Være hjemme
- ○ Dra på besøk
- ○ Kino/teater
- ○ Gå på kafe/restaurant
- ○ Museum
- ○ Treningssenter
- ○ Tur til Sandvedparken
- ○ Tur til Mosvatnet
- ○ Tur til Stokkavatnet
- ○ Tur til Preikestolen
- ○ Tur til Månefossen
- ○ Solastranden
- ○ En annen Jærstrand
- ○ Annet (vennligst spesifiser)

____

20. Dersom du ikke hadde besøkt Dalsnuten-/Daleområdet i dag, hva ville du gjort?
[Vennligst kryss av ett alternativ.]

- ◯ Vært hjemme
- ◯ Dratt på besøk
- ◯ Kino/teater
- ◯ Kafe/restaurant
- ◯ Museum
- ◯ Treningssenter
- ◯ Tur til Sandvedparken
- ◯ Tur til Mosvatnet
- ◯ Tur til Stokkavatnet
- ◯ Tur til Preikestolen
- ◯ Tur til Månefossen
- ◯ Solastranden
- ◯ En annen Jærstand
- ◯ Annet (vennligst spesifiser)

____

21. På skala fra 1 til 5, hvor fornøyd er du med besøket til Dalsnuten-/Daleområdet i dag?

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5

I DE NESTE SPØRSMÅLENE BER VI DEG ANSLÅ DIN BRUK AV DALSNUTEN-/DALEOMRÅDET UNDER ULIKE ENDRINGSSCENARIER

22. DOBBEL REISEKOSTNAD: Se for deg at reisen til Dalsnuten-/Daleområdet **kostet deg dobbelt så mye** som normalt. [Eksempel: reisekostnaden øker fra Kr 200 til kr. 400].**Hvor mange turer ville du da tatt til Dalsnuten-/Daleområdet i løpet av et typisk år?** *[Vennligst gi oss ditt beste anslag.]*

- ○ 0 turer i året
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10
- ○ Flere enn 10 turer i året (vennligst oppgi antall):

____

23. DOBBEL REISETID: Se for deg at reisen til Dalsnuten-/Daleområdet tok deg **dobbelt så lang tid** som normalt. [Eksempel: reisetiden øker fra 20 minutter til 40 minutter].

Hvor mange turer ville du da tatt til Dalsnuten-/Daleområdet i løpet av et typisk år?
[Vennligst gi oss ditt beste anslag.]

- ○ 0 turer i året
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10
- ○ Flere enn 10 turer i året (vennligst oppgi antall):

____

FORBUDT MOT FERDSEL PÅ DALSNUTEN-TOPPEN.
Dalsnuten-/Daleområdet blir stadig mer populært, spesielt turen til Dalsnuten-toppen. Se for deg at forvaltende myndigheter begrenset turgåing til Dalsnuten-toppen i en avgrenset periode. Formålet med en slik restriksjon ville være å beskytte/restaurere naturen fra skader påført sårbare plantearter, dyrehabitat, og forebygge erosjon i området.

24. Se for deg at du IKKE kunne benytte deg av Dalsnuten-toppen men at ingen av de andre turmålene/toppene ble påvirket. Hvor mange turer ville du da tatt til Dalsnuten-/Daleområdet i løpet av et typisk år? *[Vennligst gi oss ditt beste anslag.]*

◯ 0 turer i året	◯ 4	◯ 8
◯ 1	◯ 5	◯ 9
◯ 2	◯ 6	◯ 10
◯ 3	◯ 7	

◯ Flere enn 10 turer i året (vennligst oppgi antall):

____

25. Hva er ditt beste alternativ dersom Dalsnuten-toppen skulle være utilgjengelig?
[Vennligst kryss av ett alternativ.]

- ◯ Bjørndalsfjellet
- ◯ Kallandsnuten
- ◯ Mattirudlå
- ◯ Skjørestadfjellet
- ◯ Jødestadfjellet
- ◯ Sørafjellet
- ◯ Lifjell
- ◯ Øvre Eikenut
- ◯ Fjogstadnuten
- ◯ Resasteinen
- ◯ Kollirudlå
- ◯ En annen topp i Dalnuten/Dalevatnet området
- ◯ Ville ikke dratt på friluftstur
- ◯ Annet fjell
- ◯ Annet friluftsområdet

‘

BUSS TIL PARKERINGSPLASSENE.
På de mest besøkte dagene er det stor trafikk i Dalsnuten-/Daleområdet. Det kan være utfordrende å komme seg opp til Gramstad/Dale og få parkert bilen sin.

Se for deg at det ble opprettet bussforbindelse fra Sandnes til Gramstad/Dale. Anta at bussen ville ha avgang to ganger i timen i helgene og en gang i timen på ukedager. Formålet ville være å redusere biltrafikk, samt å gjøre turområdene mer tilgjengelig for de som ikke har tilgang til privatbil.

26. Hvor sannsynlig er det at du ville tatt buss til Dalsnuten-/Dale området på ditt neste besøk?

Veldig usannsynlig Veldig sannsynlig

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

27. Hvis det hadde vært mulig å ta buss til parkeringsplassene på Gramstad/Daleområdet hvor mange turer ville du da tatt til Dalsnuten-/Daleområdet i løpet av et typisk år? *[Vennligst gi oss ditt beste anslag.]*

- ◯ 0 turer i året
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10
- ◯ Flere enn 10 turer i året (vennligst oppgi antall):

____

28. Siden 2020 er vindkraft turbiner synlige fra ulike punkter i Dalsnuten-/Daleområdet. Hvordan har dette påvirket ditt forhold til Dalsnuten-/Dalenområdet? *[Kryss av ett alternativ.]*

- ◯ **Ingen** påvirkning
- ◯ Går **flere** årlige turer
- ◯ Går **færre** årlige turer

29. Mange mennesker rapporterer at deres forhold til friluftsliv og naturopplevelser endret seg i løpet av COVID19 pandemien? Hvilket av disse utsagnene beskriver deg?

- ◯ Jeg oppsøker friluftsliv og naturopplevelser OFTERE nå enn før COVID19 pandemien.
- ◯ Jeg oppsøker friluftsliv og naturopplevelser SJELDNERE nå enn før COVID19 pandemien.
- ◯ Jeg oppsøker friluftsliv og naturopplevelser omtrent LIKE MYE nå som før COVID19 pandemien.

TIL SLUTT LITT DEMOGRAFISK INFORMASJON. *Svarene du gir oss på disse spørsmålene er bare for statistisk klassifisering slik at vi kan forsikre oss om at utvalget av respondenter er representativt for den generelle befolkningen.*

30. Hva er ditt kjønn?
[Vennligst kryss av ett alternativ.]

- ○ Kvinne
- ○ Mann
- ○ Annet/ønsker ikke å oppgi

31. Hva er din alder?
[Vennligst kryss av relevant alderskategori.]

○ Under 18	○ 36-40	○ 56-60
○ 18-25	○ 41-45	○ 61-65
○ 26-30	○ 46-50	○ 66-70
○ 31-35	○ 51-55	○ Over 70

32. Hva er ditt høyeste utdanningsnivå?
[Vennligst kryss av ett alternativ.]

- ◯ Barneskole
- ◯ Ungdomsskole
- ◯ Videregående skole
- ◯ Høyere utdanning (1-4 år)
- ◯ Høyere utdanning (over 4 år)
- ◯ Vet ikke/ønsker ikke å svare

33. Hva beskriver best din nåværende arbeidssituasjon?
[Vennligst kryss av ett alternativ.]

- ◯ Jobb fulltid
- ◯ Jobb deltid
- ◯ Student uten jobb
- ◯ Student med deltidsjobb
- ◯ Annet (vennligst spesifiser)
- ◯ Jobbsøker
- ◯ Hjemmeværende
- ◯ Pensjonist

____

34. Hvor mange uker ferie pleier du vanligvis å ta ut i løpet av et år?
[Vennligst oppgi antall nedenfor.]

- ◯ 0 uker i året
- ◯ 1
- ◯ 2
- ◯ Flere enn 5 uker i året (vennligst oppi antall):
- ◯ 3
- ◯ 4
- ◯ 5

____

35. Hvor mange medlemmer er det i din husstand (inkludert deg selv)?
[Bokollektiv regnes ikke som husstand. Vennligst oppgi antall i boksen nedenfor.]

	1	2	3	4	5	>5
Antall medlemmer	○	○	○	○	○	○

36. Er det barn i husstanden din?
[Vennligst kryss av ett eller flere alternativer.]

○ Ja, barneskolebarn

○ Ja, ungdomskolebarn

○ Ja, videregåendeskole barn

○ Ja, barn under barneskolealder

○ Nei

37. Omtrent hva var totalinntekten for din husstand før skatt (brutto årsinntekt) i 2022?
[Vennligst kryss av det alternativet som passer best.]

○ Under 500 000

○ 500 000 - 750 000

○ 750 000 - 1 000 000

○ 1 000 000 - 1 500 000

○ Over 1 500 000

○ Vet ikke/ønsker ikke å svare

38. Er du medlem i en organisert turforening, f.eks. Stavanger Turistforening (STF)?
[Kryss av ett alternativ.]

- ◯ Ja
- ◯ Nei

39. Hvor mange friluftslivdager har du i løpet av et typisk år?
[Indiker et tall mellom 1 og 365]

	0	28	84	140	197	253	309	365
Dager på tur								

40. Til slutt, har du noe mer du ønsker å tilføye før undersøkelsen avsluttes?

Appendix 3: Corrected Regression Table

Table A3. Corrected model random and fixed Poisson regression results.

	Random effects		**Fixed effects**	
	Full sample	**Restricted sample**	**Full sample**	**Restricted sample**
Variables	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Constant	2.1767* (0.8980)	0.5645 (0.7182)	2.8444*** (0.0304)	2.8132*** (0.0371)
TTC	-0.0050*** (0.0004)	-0.0059*** (0.0005)	-0.0013*** (0.0002)	-0.0029*** (0.0002)
STC	0.0048* (0.0022)	0.0066*** (0.0019)		
INCOMEDUM	0.1145 (0.1433)	-0.1468 (0.1265)		
ONSITETIME	0.2127* (0.0861)	0.2303** (0.0707)		
HYPDUM	-0.1071*** (0.0310)	-0.1105** (0.0382)	-0.3482*** (0.0282801)	-0.2516*** (0.0350)
HYPDALSNUTEN	-0.4002*** (0.0361)	-0.2930*** (0.0432)	-0.1924*** (0.0339)	-0.1780*** (0.0406)
HYPBUS	0.1983*** (0.0298)	0.27552*** (0.0357)	0.3582*** (0.0272)	0.3542*** (0.0326)
DALEDUM	0.8190** (0.2623)	0.2122 (0.2472)	0.8870*** (0.0244683)	0.2798*** (0.0372)
GENDER	-0.3664. (0.1974)	-0.0589 (0.1691)		
AGE	0.0157* (0.0075)	0.01297* (0.0058)		
EDUCATION	-0.0468 (0.0522)	0.0473 (0.0371)		
MEMBER	0.1244 (0.2110)	0.1708 (0.1749)		
Alpha	1.0944*** (0.1272)	1.4827*** (0.1864)		
Observation	686	643	686	643
Log likelihood	-2264.928	-1821.053	-7060.804	-4016.826

Note: Significance levels: 1%(***), 5%(**), 10%(*). Standard deviation is reported in parentheses.

Appendix 4: Changes in CS/trip – Dalsnuten Scenario

Table A4. *Summary of CS/trip (NOK) and the change in CS/trip (NOK) for the Dalsnuten scenario for all 8 models.*

Dalsnuten scenario						
			CS/pers -RP	**△ CS/trip - SP**	**CS/trip - SP**	**%△ CS**
Basic model	**Random**	**Model 1**	141.78	-62.27	79.51	-43.92%
		Model 2	158.34	-55.09	103.25	-34.79%
	Fixed	**Model 3**	649.62	-141.76	507.86	-21.82%
		Model 4	325.68	-76.02	249.65	-23.34%
		Average	**318.85**	**-83.79**	**235.07**	**-26.28%**
Corrected model	**Random**	**Model 5**	198.81	-79.56	119.25	-40.02%
		Model 6	169.06	-49.54	119.52	-29.30%
	Fixed	**Model 7**	790.70	-152.10	638.59	-19.24%
		Model 8	349.63	-62.22	287.41	-17.80%
		Average	**377.05**	**-85.86**	**291.19**	**-22.77%**

Appendix 5: Changes in CS/trip – Bus scenario

Table A5. *Summary of CS/trip (NOK) and the change in CS/trip (NOK) for the Bus scenario for all 8 models.*

Bus scenario						
			CS/pers -RP	**△ CS/trip - SP**	**CS/trip - SP**	**%△ CS**
Basic model	**Random**	**Model 1**	141.78	29.02	170.80	20.47%
		Model 2	158.34	46.09	204.43	29.11%
	Fixed	**Model 3**	649.62	276.52	926.14	42.57%
		Model 4	325.68	132.08	457.76	40.55%
		Average	**318.85**	**120.93**	**439.78**	**37.93%**
Corrected model	**Random**	**Model 5**	198.81	39.43	238.24	19.83%
		Model 6	169.06	46.57	215.64	27.55%
	Fixed	**Model 7**	790.70	283.27	1073.96	35.82%
		Model 8	349.63	123.84	473.47	35.42%
		Average	**377.05**	**123.28**	**500.33**	**32.70%**

Appendix 6: Annual CS – Dalsnuten Scenario

Table A6. *Summary of annual CS (NOK) and the change in annual CS (NOK) for the Dalsnuten scenario for all 8 models.*

Dalsnuten scenario					
			Annual CS- RP	**Annual CS- SP**	**△ Annual CS**
Basic model	**Random**	**Model 1**	28,355,337	15,901,521	-12,453,816
		Model 2	31,668,930	20,650,857	-11,018,074
	Fixed	**Model 3**	129,923,280	101,571,520	-28,351,760
		Model 4	65,135,929	49,930,992	-15,204,937
		Average	**63,770,869**	**47,013,722**	**-16,757,147**
Corrected model	**Random**	**Model 5**	39,762,356	23,850,386	-15,911,970
		Model 6	33,812,119	23,903,963	-9,908,156
	Fixed	**Model 7**	158,139,020	127,718,414	-30,420,606
		Model 8	69,925,669	57,482,050	-12,443,619
		Average	**75,409,791**	**58,238,703**	**-17,171,088**

Appendix 7: Annual CS – Bus Scenario

Table A7. Summary of annual CS (NOK) and the change in annual CS (NOK) for the Bus scenario for all 8 models.

Bus scenario					
			Annual CS- RP	**Annual CS- SP**	**△ Annual CS**
Basic model	**Random**	**Model 1**	28,355,337	34,159,709	5,804,372
		Model 2	31,668,930	40,886,681	9,217,751
	Fixed	**Model 3**	129,923,280	185,227,789	55,304,508
		Model 4	65,135,929	91,551,353	26,415,424
		Average	**63,770,869**	**87,956,383**	**24,185,514**
Corrected model	**Random**	**Model 5**	39,762,356	47,647,933	7,885,576
		Model 6	33,812,119	43,127,087	9,314,969
	Fixed	**Model 7**	158,139,020	214,792,044	56,653,024
		Model 8	69,925,669	94,694,203	24,768,534
		Average	**75,409,791**	**100,065,317**	**24,655,526**