What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?

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Abstract

This paper examines the cycling boom in Ireland, with a particular focus on the changes generated by the Covid-19 pandemic. The bicycle is considered a cheap form of transportation with a low risk of spreading infectious diseases. Cycling has been encouraged as a form of active transport since the beginning of the pandemic. Cycling became popular in Ireland during the Covid-19 pandemic resulting in a cycling boom. The sensation was described worldwide as a cycling renaissance. The Irish Government introduced strict lockdown measures to curb the virus. In order to stay fit and entertained during restrictions the Irish public turned to cycling. An increase in demand for cycling was the outcome of the pandemic along with a decrease in supply due to a failure to react to the phenomenon. A quantitative research method was selected and employed. An online questionnaire of n=68 participants collected data pertaining to the question "What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?". The data was analysed using SPSS software. The findings of the research indicate that the Covid-19 pandemic impacted the Irish cycling industry and in addition altered the public's perception of cycling thus proving the hypothesis. A clear increase in cycling was found along with changes in buying habits and cycling behaviours.

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Chapter 1: Introduction

Research Introduction

The research aims to assess the effects Covid-19 has had on Ireland's cycling industry and the public's perception of cycling in Ireland during the pandemic. Covid-19 is a highly infectious disease which has been declared by The World Health Organisation as a global public health emergency (Eastin & Eastin, 2020; Baldwin and Weder di Mauro, 2020). Covid-19 was initially discovered in Wuhan, China, in late 2019 (Huang, 2020) after a cluster of cases in Wuhan spread quickly throughout China resulting in a pandemic and it then spread across the globe (Dutheil et al., 2020; Li et al., 2020). Governments worldwide put control measures in place to limit the spread of Covid-19 (Schweizer et al., 2021). These control measures came in the form of lockdowns which were enacted in countries all over the world to minimize and slow the spread of the disease (Muhammad et al., 2020; Parrock, 2020).

The abrupt Covid-19 pandemic outbreak in late 2019 and early 2020 drastically changed the patterns of daily life all around the world (Molloy, 2021). The Covid-19 pandemic quickly spread to almost every country in the world and had a significant impact on that world's economies and commercial activities. Lockdowns that were implemented by governments around the world had an impact on all economics and the quality of life (Jones et al., 2021).

Since the pandemics emergence the world has been faced with unprecedented challenges (Hong et al, 2020). Globally, restrictions were put in place in an effort to prevent the virus's spread. To help stop the spread of the viruses, people were encouraged to limit their activities and stay at home when it was safe to do so (Hong et al, 2020). The pandemic had a severe impact on the environment, economic activity, and transportation of the world (Muhammad et al., 2020; Zhang et al., 2021). As a result impacts were noticed in relation to global trade and movements, day-to-day lives, and businesses (Haleem et al., 2020).

Although Covid-19 is recognised as being a phenomenon of negative attributes some positives did come about as a result. Cycling experienced an unexpected renaissance since the emergence of the pandemic. The number of cycling activities increased as a result of the pandemic and several nations have highlighted the value of cycling during Covid-19 (Sandor, 2020). With lockdowns, travel restrictions and public transport fears people turned to bikes as a safer form

of transport (Muhammad et al., 2020). According to Das et al., (2021) public transportation operations, travel patterns, and preferred mode preferences were all significantly impacted by the pandemic. Due to the shutdown of indoor and large outdoor events, more people engaged in outdoor activities like cycling (Schweizer et al., 2021). In Norway an increase of almost 300% was noticed in outdoor activities (Venter, 2020). The bicycle is one of the most convenient, affordable, peaceful, healthy, and adaptable modes of transportation which are primary drivers in the uptake (Panik et al., 2019). Nguyen and Pojani (2022) further noted that cycling has become popular among many individuals as a means of maintaining their physical and mental health as a result of the pandemic.

A lot of focus has been given to cycling's contribution to the Covid-19 pandemic and its anticipated consequences on a global scale. The extensive impacts seen at both a macro and micro level in terms of the expansion and demand towards cycling is extraordinary (Dunning and Nurse, 2020). Cycling has become increasingly popular as a result of the pandemic, whether it's for transportation or health reasons its popularity surges regardless. In terms of cycling, the pandemic led to new behaviours as people sought to be more active during times of social isolation or alternatively, to avoid using public transportation to reduce their risk of infection (Lock, 2020).

This research paper aims to investigate the impacts the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling.

Overview of Chapters

Chapters	Contents
Chapter 1: Introduction	Research Background, Problem Statement, Research Significance.
Chapter 2: Literature Review	Different themes of several literatures have been critically analysed in this section.
Chapter 3: Research Aims and Objectives	Research Rationale, Gaps in Existing Literature, Research Aims, Research Objectives, Research Questions and Research Hypothesis are introduced in this section.
Chapter 4: Research Methodology	Methods implemented to conduct the research have been addressed and analysed in this section.
Chapter 5: Analysis and Findings	The data analysis process has been analysed in this section and an in-depth analysis of the key findings has also been presented. Findings are introduced from the data analysis process.
Chapter 6: Discussion	In this section, a critical analysis between existing literature and different theories will be conducted based on the key findings. Limitations are also mentioned
Chapter 7: Conclusion	A conclusion has been presented based on the literature that has been critically evaluated and recommendations have also been presented which will help in improving further research

Chapter 2: Literature Review

Introduction

Approximately three years on from the emergence of Covid-19, it is evident that it will have lasting effects to life on Earth. It is apparent that the world is currently coping with a pandemic that will forever change the course of human history. Societies and economies around the world experienced a major slowdown as the infectious disease spread due to rigorous lockdown measures designed to greatly restrict the virus's transmission (Singh and Singh, 2020). The impact of Covid-19 has allowed for behavioural changes as well as government policies to combat the infection rate (Van den Berg et al., 2021). In the world of cycling Covid-19 had an unexpected effect on the uptake of cycling as a result of changes in human behaviour. According to Borkowski et al., (2021) it can be said that Covid-19 disrupted daily life for everyone on a global scale through lockdown procedures, social distancing guidelines, and recommendations to avoid crowded public transportation and areas to help prevent and control the virus from escalating further. Cycling became a safer option for transportation and exercise as a result of this.

The development of the Covid-19 pandemic has generated a renaissance for cycling internationally (Bernhard, 2020). According to Abdullah et al., (2021) the ongoing Covid-19 pandemic has created a new momentum for cycling. New forms of uptake and behaviour regarding cycling have been detected since the beginning of the pandemic (Lock, 2020). Cycling is regarded as a part of combined travel or as an independent method of transportation for relatively short distances (Gössling and Choi, 2015). Riding a bike is the most convenient, affordable, quiet, healthy, enjoyable, and flexible form of transportation (Volker and Handy, 2021).

There have always been discussions concerning how to get more people to cycle in society even before the pandemic. These debates focused on public health, traffic, and pollution issues, with cycling emerging as a means of reducing the effects of these problems (Handy et al., 2014). These concerns have all significantly improved as a result of the pandemic, making people's trips safer from the virus's deadly impacts (Fuller et al., 2021).

Impact of Covid-19 on the World of Cycling

Beginning in early 2020, the Covid-19 outbreak presented unforeseen difficulties for the manner in which people generally did things. Areas such as health, ways of life, and general well-being of communities around the globe diversified drastically. In the middle of international efforts to prevent the viruses from spreading things altered radically such as working arrangements, shopping habits, and getting from place to place (PFB, 2021). According to Kraus and Koch (2021) Covid-19 has caused major adjustments to the world's transportation arrangements. Buehler and Pucher (2021) further noted that the Covid-19 pandemic has significantly changed how people travel throughout the world. The way in which cycling was viewed internationally and in Ireland transformed considerably as a result of the Covid-19 outbreak more than anyone could have ever imagined. Significant shifts towards cycling occurred along with changes in transportation behaviours (Fischer and Winters 2021). It is important to note that cycling declined globally during periods of severe lockdown measures when there were strict travel restrictions in place. However, after restrictions were lifted, riding levels immediately resumed and increased exponentially once again (Buehler and Pucher, 2021).

People around the world began cycling or walking instead of taking public transportation to avoid contracting the virus (Nikitas et al, 2021). This change in transport modes is consistent with previous literature that looked at the relationship between the SARS outbreak and uptake in cycling in China at the time (Simha, 2016). The World Health Organisation's advice during the pandemic was "*whenever feasible, consider riding a bicycle or walking*" to help with physical distancing and physical activity (World Health Organisation, 2020). According to a study by Schweizer et al., (2021) Covid-19 related epidemic-control measures led to an increase in bicycle sport activities in Germany. Almost all countries experienced similar cycling trends during the pandemic. According to past literature on cycling trends, the Covid-19 pandemic's cycling movement was primarily caused by shifts in lifestyle factors as a result of the pandemic (Budi et al., 2021).

During the early stay at home stage of the pandemic there were public transport capacity reductions and closures of many typical recreational facilities. Large numbers of people shifted to active travel for transportation and physical activity in particular cycling (Fischer and Winters 2021). According to a survey of 1200 adults worldwide in 2021, it can be recognised

that people started cycling and walking more frequently (Abdullah, 2020). It is evident that cycling is an international social phenomenon that is widespread across the globe (Budi et al., 2021). The increase can be noticed across all genders, the majority of age groups, and all social classes (Brooks et al., 2020). The Irish Cycling Advocacy Network believe that Covid-19 prompted us to reimagine our lives and our systems and rethink the way in which we commute (Quinn, 2020).

PFB (2021) surveyed new cyclists in the US to learn about their main reasons for taking up cycling in 2020. The key factors that contributed to an increase in cycling were stress reduction and mental health (58%), followed by physical exercise and fitness (57%) and socializing with friends and family (43%) and relaxation (37%), along with being outdoors (33%) (Buehler and Pucher, 2021). Evidence of a large increase in cycling during the first lockdown of 2020 can be observed from an eight-week GPS-tracking study conducted in Switzerland which shows a spike in bicycle usage (Molloy et al, 2020). Additionally, spikes also occurred in areas where cycling is not renowned. Neither Los Angeles nor Houston are recognized as cycling capitals by any means, however they both observed increases in cycling as soon as Covid-19 emerged (Bliss, 2020). Examining May 2020 in contrast to May 2019 reports for Houston saw a 138% increase in cycling and in addition Los Angeles witnessed a 93% increase (Bliss, 2020). It is important to highlight that comparisons between data from 2019 and 2020 may yield misleading results because the latter year includes times when travel was restricted by regulations (Buehler and Pucher, 2021).

According to Harrington and Hadjiconstantinou (2022) cycling has health, economic and environmental benefits. Due to the diverse positive effects cycling had on public health, wellbeing, clean air, sustainability, and the adoption of an active lifestyle it is obvious as to why cycling prospered globally during the pandemic (Pantelaki et al, 2021).

International Perspective

Internationally cycling has been promoted as an active transportation method in a way that enhances the public's health. Active transport can be best described as using one's own energy to get from one location to another by using modes such as cycling and walking (Steinbach et al., 2011). Active travel options are used very differently around the world. For example, cycling is now an unremarkable means of transportation in European countries like

Denmark, Germany, and the Netherlands, while it is very uncommon in many Australian and North American cities (Pucher & Buehler, 2008). Years of expertise have been gained in the Netherlands, Germany, and Denmark on how to enhance cycling facilities' convenience, comfort, and safety. Numerous cities in the Netherlands, Germany, and Denmark have large networks of on- and off-road bicycle lanes and trails, frequently with priority traffic signals and advance stop lines for bicycles at junctions (Pucher and Buehler, 2008; Furth, 2012).

Cycling has emerged as a significant means of transportation in several cities over the past ten years (Saplıoğlu and Aydın, 2018). Due to the lockdown's restricted options for regular exercise, many cities saw significant increases in cycling (Hong et al, 2020). A study by Hong et al., (2020) found that after government measures, non-commuting cycling activities greatly rose. As anticipated, after government initiatives, cyclists were seen on common roadways more frequently. Normal roads became far less congested, making them more appealing to even inexperienced cyclists. Sport England carried out a study to learn more about how the Covid-19 pandemic changed the attitudes and behaviors of the English public regarding physical activity. According to the report, cycling and walking activity were up during the Covid-19 pandemic (Savanta: ComRes, 2020).

Cycling in Ireland During Covid-19

The Covid-19 pandemic's impacts have dramatically altered the state of transportation and exercise modes, especially cycling (Sharifi and Khavarian-Garmsir, 2020). The Irish general public is now much more aware of the value of exercise during the pandemic (Budi et al., 2021). In order to exercise, unwind mentally, and reduce stress brought on by the "*new normal*" individuals turned to the outdoors as they adjusted to their new way of life. Cycling was one of the most well-liked kinds of relaxation and exercise in cities all around the world by May 2020 including Ireland. For many years, the health benefits associated with cycling have been generally acknowledged (de Hartog, 2011; Celis-Morales et al., 2017).

Cycling can have a significant positive impact on the environment by reducing air pollution in cities and global climate change (Rojas-Rueda et al, 2012). Cycling was advertised as a way to stay active and keep the mind active throughout the lockdowns while none of the other active options were allowed to open (such as swimming pools, indoor gyms, recreation centers, and playgrounds) (Budd and Ison, 2020). The Irish public took up riding as a result of physical and

mental health reasons, environmental and favorable weather and the Covid-19 restrictions (O'Sullivan, 2020).

Numerous factors operate at various levels to influence such behavior. Individual variables, the micro- and macro-physical settings, and the social environment are the behavioral factors affecting cycling in Ireland as a result of the Covid-19 pandemic. Each of the factors interact and as a result a behavior change may occur causing an increase in cycling in Ireland (Michie et al., 2011).

Role of Governments on Cycling During Covid-19

Active transportation has the ability to reduce the danger of Covid-19 contagion and improve public health, according to governments and public health organisations (Slater and Gustat, 2020; World Health Organisation, 2020). In response to the virus, cities all around the world implemented a range of policies and initiatives designed to address this shift, including allocating more space to car free road spaces, adding pedestrian walk signals, lowering speed limits, and supporting bike share programs (Combs and Pardo, 2021). A low-cost mode of transportation with a low risk of spreading infectious diseases is the bicycle. Governments have encouraged cycling during the COVID-19 crisis by temporarily allocating roadway space (Kraus and Koch 2021). It is believed that governments should encourage cycling since it is sustainable from a social, environmental, and economic standpoint (Buehler & Pucher, 2021). Many towns and nations, according to Connolly (2020), aimed to increase cycling infrastructure in order to decrease air pollution and carbon emissions and boost physical activity.

Governments, organisations, and households have all had to reevaluate how they operated as a result of the effects of Covid-19, particularly in the area of transportation (Dunning and Nurse, 2021). With funding from governments, many of the world's city governments have taken action to accommodate and promote increased cycling during the pandemic (Buehler and Pucher, 2021). In order to address the transportation challenges caused by Covid-19, leaders from around the world advocated for a quick expansion of the infrastructure for walking and cycling (Dunning and Nurse, 2021).The rise of active travel modes such as walking, and cycling was one of the pandemic's major effects on travel demand and supply. This was enabled because of its unique capacity to offer a socially distanced method of transportation, reducing crowding in enclosed areas (Nikitas et al., 2021).

Cycling levels will continue to be higher than levels in 2019 in the years to come. To ensure that cycling thrives, it is imperative that governments at all levels support the development and enhancements in cycling infrastructure, programs, and legislation (Buehler and Pucher, 2021). Many cities have repurposed streets and open spaces for cyclists and implemented pro-bike interventions like pop-up cycle lanes, e-bike subsidies, free usage of bike-share programs, and traffic calming measures (Nikitas et al,, 2021).There is an urgent need for investment in greatly increased off-road greenways because utilisation growth there have outpaced those at other facilities and have been so significant that many greenways experience weekend overcrowding (Buehler and Pucher, 2021). According to estimates from 2013, the Great Western Greenway in Ireland brings in about €405,000 from foreign visitors and €737,000 from domestic visitors each year. On weekdays, there are morning peaks and afternoon/evening peaks; on weekends, there is no morning peak, but usage steadily rises throughout the day (Deenihan et al., 2013). Eamon Ryan, Ireland's current Minister for Transportation, claimed that the country's outdoors and greenways have proven to be a lifeline for the nation as a result of the increase in walking and cycling (Ó Conghaile, 2021).

Impact of Covid-19 On Cycling Industry

Covid-19 brought about a drastic increase in demand for bikes and cycling simultaneously (Combs and Pardo, 2021). According to Abdullah et al., (2020) and De Vos (2020) this change was triggered by a lack of faith in public transportation safety, the closure of schools and sports facilities, the urgent need to reduce traffic injuries to ease the pressure on hospitals, and a sharp decline in driving. Cycling was at an all-time high, bicycle sales were up, leaving store shelves and bike shops critically low on stock, and cities were blocking streets to make room for this boom in cycling (PFB, 2021). Bicycle hunting during the pandemic was shown to begin around mid-March. According to Google Trends data, the global peak for bicycle search trends took place on May 17, 2020 (Budi et al., 2021).

Bike shops were considered an "*important service*" and were excluded from closing down by governments, putting them on par with grocery stores, as lockdown procedures and social distancing were put in place (Bernhard, 2020). Cycling thrived off this inclusion. Long-forgotten bikes were dug out from sheds to be repaired and the owners of bike shops reported that they had "*sold out of entry-level bicycles because people want to avoid public*

transportation," (Nurse and Dunning, 2020). The demand in the industry was immense and bike shops were struggling to keep up. Bicycle stores who regularly sold 20 to 30 bikes per week were now selling 50 bikes per day and experiencing a corresponding increase in repair requests (Harrabin, 2020). When asked about the circumstance, a bicycle mechanic responded, "*We typically take bikes in for maintenance and servicing and deal with them the following day. We are currently making two-week service reservations*" (Harrabin, 2020).

A bike sharing company in London experienced its busiest year in 2021 and which shows evidence of the increase over the course of the pandemic. They experienced a 7% increase in customers from 2020 to 2021 and more than double that of any year prior to 2020. Overall the percentage of Londoners who cycled rose from 21% (2019/2020) to 27% (2020/2021) (Transport for London 2022).

Impact of Covid-19 On Irish Cycling Industry

Bike retailers in Ireland are hardly an exception to the trend of bike stores throughout the world reporting high sales in recent months (O'Sullivan, 2020). According to Quinn (2020) there has been record sales of bikes reported in Ireland since the pandemic. Many Irish bike retailers claimed they were having trouble keeping up with the demand for new bicycles, while many other retailers ran out of used bicycles (O'Sullivan, 2020). According to one Irish bike shop stock that came in the door was going straight back out the door to meet customer demand. Also there was a week-long waiting list for repairs (O'Sullivan, 2020).

Ireland's bicycle shops have enjoyed a 32% rise in sales since the pandemic due to reduced traffic, pleasant weather, and investments in riding infrastructure (AIB, 2020). Halfords, a bike and auto components retailer, reported "*quite substantial*" growth in its shares by 23% during the pandemic (Harrabin, 2020). According to a report by AIB (2020), since the pandemic's rise, consumers have been spending more money at bicycle shops. The amount of transactions increased by 13% from the previous year. This rise is demonstrated by data that was generated from roughly a million AIB debit and credit card transactions between January and September 2019 and 2020 (AIB, 2020).

In Dublin the capital of Ireland cycle lanes, traffic calming streets and widened paths were constructed in response to the pandemics effects. This was done due to the increase in cycling and decrease of 35% in traffic volumes (Cummins, 2020).

Effects Covid-19 had on Global Supply Chains

Even before the pandemic, cycling was an industry that was already booming and now has suddenly become a lot more attractive (Bernhard, 2020). In light of the pandemic, the global surge in demand has been helpful to the industry. The growing popularity of cycling has safeguarded the sector from the rate of layoffs that has affected many other industries (Budi et al., 2021). However, since the pandemic began, there has been a dramatic increase in the demand for bicycles around the world, as well as a shortage of the raw materials necessary to produce them. The worldwide supply chain has been significantly strained as a result, especially considering that bicycles are complicated products that are sourced from all around the world (Halfords, 2021). Graham Stapleton, the CEO of Halfords who operate in the UK and Ireland, said *"the retailer, and the rest of the industry, was struggling to keep up with unprecedented demand. Halfords is importing 100,000 bikes in the coming weeks as it tries to improve availability by shipping stock in from Europe as well as its usual sources in Asia".* (Butler, 2020).

Sales of bicycles surged globally. Bike stores raised their inventory of bicycles and even started to reorder bikes with a 50% deposit in order to prepare for the spike in demand (Budi et al., 2021; Heim, 2020; Bernhard, 2020). As a result of the spike in sales suppliers have found it challenging to meet demand (Bernhard, 2020). Demand outpaced supply due to the severe shortages and slowdown in production brought on by Covid-19 regulations around the world (Shaw, 2021).

Bicycle producers rely on a complex, geographically dynamic chain of production, with components coming from all over the world—a process that was completely disrupted by the pandemic (Bernhard, 2020). Bicycle facilities in Taiwan and Asia, where 99 percent of components are produced, were shut down for up to three months (O'Sullivan, 2020). The majority of bicycles and parts that arrive in Ireland do so via the UK, where demand significantly increased too (O'Sullivan, 2020).

There are many countries involved in the production of a bicycle (Galway Advertiser, 2021). Numerous locations, including Bangladesh, Cambodia, Europe, Indonesia, Northern Africa, Taiwan, the UK, and Vietnam, are sources for bicycles for bike stores (Halfords, 2021). A single bike requires the procurement of several raw materials, including rubber for tires and tubes, aluminium or carbon for frames, gear mechanisms, chains, wheels, nuts, bolts, saddles, and numerous other components (Galway Advertiser, 2021). Everyone involved in bringing the finished product to its destination—from the production team to the accounting team—plays a part. This demonstrates how reliant on global supply chains bike retailers are (Halfords, 2021). As a result of the pandemic and its associated constraints, the supply of bikes was severely disrupted. Combine the global shortage with an explosion in demand across the globe and we can really see the problems caused by the pandemic (Galway Advertiser, 2021). Covid-19 had an effect on several of these individual industries, including localized lockdowns, production suspensions, and social segregation measures that resulted in unavoidable delays. The supply of crucial components to these firms was also delayed by Covid-19 lockdowns at ports throughout Asia (Halfords, 2021). The cyclical supply chain problems, such as industrial output limitations, rising raw material prices, disruptions in freight, and driver shortages were felt heavily in Ireland (RTE, 2021).

Brompton, a global bike manufacturer that also sells its bikes in Ireland experienced a significant increase in sales during the pandemic. One of Brompton's stores in Germany reportedly had to close its doors because they were completely out of stock due to the demand increases (Budi et al., 2021). Will Butler-Adams, managing director of Brompton Bikes, said that *"The company's raw metal supplier closed down, while a shipping container carrying their goods sat in Rotterdam for a week, leading to scaled back services and an equipment imbalance. We saw the lockdown coming months before it happened, because many of our suppliers are in Asia. What we weren't prepared for was the speed at which it hit."* (Bernhard, 2020). This sort of impact was felt globally in all corners of the world disrupting the entire cycling industry.

Conclusion

The literature review has accumulated all the relevant up to date peer reviewed works that are relevant to the research topic. A multitude of studies have highlighted the impacts Covid-19 has had on the world as a whole. Covid-19 impacted people from all corners of the world in some way or another with everyone experiencing transmission, lockdowns, restrictions, new

policies, new trends, changes in behaviors among many other things. Covid-19 comes across as a negative event however it did have some positive contributions to society. A notable emergence was the exponential surge in cycling globally. It is well documented that Covid-19 brought about an unexpected boom that was experienced across the globe. A lot has been documented on the increase in cycling and also the supply shortages due to the demand created. However, in Ireland there appears to be little to know research around this concept except in a minority when looked at alongside the world. There appears a gap in the literature to further investigate the impact Covid-19 has had in Ireland at a business level and likewise on the people of Ireland.

Chapter 3: Research Aims and Objectives

Rationale

While analysing the research topic it has been observed that the Covid-19 pandemic has had a significant impact on the global populations attitudes and behaviours towards cycling in different ways. According to research conducted by Sport Ireland during the height of the pandemic in May 2020 it was noted that there was an unprecedented number of people out cycling in Ireland (O'Mahony, 2020). From this research conducted by Sport Ireland it was noted that the lowest level of inactive people was recorded in the history of Sport Ireland research to date with the majority of the population taking up some sort of activity as a result of the pandemic (Cycling Ireland, 2020). Research conducted by Ipsos MRBI on behalf of Sport Ireland discovered that the gender gap (Ipsos MRBI, 2020) in participation in sport at the time of restrictions was virtually non-existent (O'Mahony, 2020).

As both a means of transportation and leisure activity, cycling has well-known health, environmental, and economic benefits. For these reasons it has been encouraged in many countries, including Ireland (Gildea & Simms, 2021). Overall there was a significant surge noticed in walking, running and cycling since the restrictions were implemented in March 2020 (O'Mahony, 2020). Both internationally and domestically in Ireland there has been research into the effects Covid-19 has had on recreational activities. However, in Ireland there has not been a whole lot focusing on cycling solely but instead it has been observed along with walking and running activities. According to the research, which was conducted by Ipsos MRBI on behalf of Sport Ireland, the participation rate in May 2020 for sporting activities was just over half the population at 51%. Three sports dominated the sporting landscape with approximately 710,000 participants walking, 680,000 running and 510,000 cycling (O'Mahony, 2020)

The gradual calming of the restrictions in Ireland coupled with the fact that Irish citizens had been cooped up inside for weeks paved a way for a surge in outdoor activities like walking, running and cycling. It allowed both new and returning cyclists to explore some sort of freedom again on their bikes. Cyclists were able to reap rewards from both a physical and mental health perspective (Cycling Ireland, 2020). Cycling Ireland CEO Matt McKerrow commented on this saying "*I think everyone in the cycling community has anecdotally noticed more people cycling in and around their towns and suburbs recently, but it is great to see the*

research with numbers quantifying the levels of increased participation" (Cycling Ireland, 2020). Numerous advantages of cycling have been well-documented, including the reduction in emissions and traffic (Wegman et al., 2012).

Looking at cycling from this perspective would be a huge benefit to organisations and policy makers in the future. As well as gathering statistical data regarding the perspectives of Irish citizens on cycling in Ireland as a result of the pandemic that can help in future research and plans. During the 2021 period of the pandemic almost three in ten (29.5%) Dublin people chose to travel by either walking or cycling in comparison to just one in five (21%) during the pre-pandemic period of 2019 (Central Statistics Office, 2021). It is clear that there was an uptake in cycling as a result of the pandemic but previous research only touches the tip of the iceberg with walking constantly over shadowing results or being conducted in line with cycling being a secondary focus.

According to O'Leary (2020) Irish people took part in more individual sports such as cycling and recreational walking during the Covid-19 restrictions. This was the key finding of Ipsos research published by Sport Ireland, which shows a surge in numbers walking, cycling and running since the restrictions were put in place in March. Individual sports and activities such as walking, running and cycling experienced unprecedented growth, while some team and facility based sports experienced an unprecedented decline (Sport Ireland, 2020). This further urges the need for cycling to be investigated as it is clear that it was and still is thriving.

Along with this there is very little research into the business angle of the impact Covid-19 had on shops and manufactures. Due to their reliance on offshore suppliers, many businesses were dramatically exposed to supply chain disruptions during the pandemic and the ensuing lockdowns (Strange, 2020). The pandemic forced many factories to close globally resulting in supply shortages which affected both the world as a whole and Ireland. UK retailer Halfords which operates in Ireland too saw its sales hit by the global shortage as a result of supply chain troubles. A quote from Halfords describing the situation caused by an increase in demand for bikes coupled with a decrease in supply of bikes was "*The global cycling supply chain continues to experience considerable capacity constraints, leading to low availability of bikes throughout the period"* (Williams, 2021). According Morales et al., (2022) peak demand has been caused by the Covid19 epidemic and subsequent crises, and supply disruptions and shortages have happened across a wide range of industries. Thus, it can be said that more in-

depth research needs to be conducted into the impacts Covid-19 had on the business area of cycling in Ireland which will help in developing further research.

Due to the numerous product models and participating parties, the global value chain in the bicycle business is complicated (suppliers of components, assemblers and distributors). The majority of the components and subassemblies are typically manufactured outside of the factories of top bike manufacturers, who also design their goods. The final product is typically put together inside of the factories of the manufacturers, though occasionally this task is also outsourced. Manufacturing and assembly operations have been offshored during the past few decades for a variety of reasons (Morales et al., 2022). This proved to be a hindrance for bike shops in Ireland looking to source both complete bikes and parts for daily operations as there was not a straightforward process in place.

China and Japan are two countries that the world relies heavily on for production of bikes and associated parts (Barberi et al., 2020). Japan is a major supplier of bikes and parts to bike manufacturing companies and the bike market including Ireland. Manufacturers all around the world, who struggled to keep up with demand, heavily rely on Shimano of Japan, a bike part maker who controls an estimated 65% of the global market for high-end parts (Dempsey, 2021). Shimano's components had lead times from order to delivery that reached highs of 400 days, according to European and US producers, emphasizing the industry's challenges in keeping up with the pandemic-related spike in demand for bicycles (Dempsey, 2021).

Global shortages like this have been documented however within Ireland there is a gap to explore what occurred nationally in more detail. There has been little to no studies undertaken in Ireland and from what has been documented it has been very vague and only skimmed the surface. After the sale of bikes erupted during the Covid-19 outbreak, Irish bike shops feared that they would have almost no stock remaining for the summer months. One Dublin bike shop at the time reported sales that were 500 percent more than they had been during the same period the year before, and as a result, they were unable to find enough new stock to satisfy customer demand (O'Brien, 2020).

The research must take into account that Covid-19 is a relatively recent unexpected phenomenon which means that there is not a huge array of previous literature looking into the world of cycling and its effects as a result of Covid-19. Given this and from the literature review

it is clear that there are numerous gaps present especially if we delve deeper and focus solely on Ireland. Within the research focused on Ireland's cycling Covid-19 impacts there are several shortcomings that tend to focus on cycling under an activity umbrella with walking and running. For this study the aim is to focus on the Irish bicycle market and the societal impacts.

There is a substantial amount of international study on the bicycle industry and its effects on society, but it is uncertain how applicable these conclusions are to the Irish setting given the wide variations in cycling rates and conditions worldwide. As a result, the main objective of this study is to use an online survey to examine the effects of Covid-19 on the Irish bicycle market and its effects on Irish society as a result (Gildea & Simms, 2021).

Research Question

A research question provides a focal point on a specific issue that will be investigated (Collis & Hussey, 2014). The primary intention for conducting this research is to discover the answer to the central research question that follows:

"What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?".

Research Hypothesis

The following accepted hypothesis are to be tested during this study:

Hypothesis One

Null Hypothesis

> H_0**:** The Covid-19 pandemic has had no significant effect on the cycling industry in Ireland.

Alternative Hypothesis

> H_1**:** The Covid-19 pandemic has had a significant effect on the cycling industry in Ireland.

Hypothesis Two

Null Hypothesis

> H_0**:** The Covid-19 pandemic has had no significant effect on the Irish public's perception of cycling.

Alternative Hypothesis

> H_1**:** The Covid-19 pandemic has a significant effect on the Irish public's perception of cycling.

Chapter 4: Research Methodology

Introduction

The strategies considered to accomplish the chosen aims and objectives listed for this study will be described in this chapter. There will be a focus on how the research was examined to gather observations and information to answer the research questions proposed earlier on in the study.

The rationale for choosing a quantitative strategy to acquire data and make observations will be discussed below. Furthermore, how information was gathered by using primary and secondary sources. The research method, research philosophy, sampling, data collection method, data analysis procedure, and pilot study are all covered in detail in this section. Finally, the research limitations and ethical considerations will also be revealed.

The stages involved in creating a research study are depicted by the Saunders research onion metaphor (Saunders et al., 2019). The Saunders research onion gives researchers an efficient logical process to follow. Its versatility allows it to be able to be used in almost any form of research approach and it has the capacity to be applied in a variety of circumstances (Bryman, 2012). For the purpose of this study the Saunders research onion was chosen to guide the decisions related to the research methodology by working from the outside of the onion to the core. By following the research onions systematic approach the researcher was in a position to follow the adequate logical stages that a researcher must go through when conducting research (Saunders et al., 2015).

The model of the research onion can be divided up into 6 layers as shown below in figure 1:

1. Research Philosophy
2. Research Approach to theory development
3. Methodological choice
4. Research Strategy
5. Research time horizon
6. Data collection and analysis (Saunders et al., 2019).

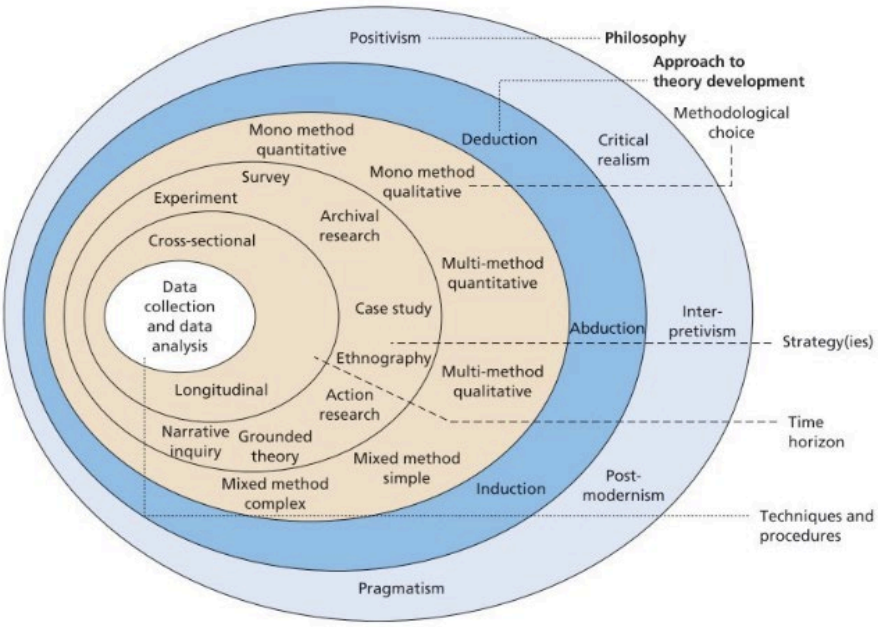

Figure 1: 'The research onion' (Saunders et al., 2019, pg. 130).

Research Philosophy

Research methodology indicates to the reader how the research was undertaken but also what philosophical assumptions underpin this research (Quinlan, 2011). It should become clear after reviewing the literature that selecting a suitable research methodology is essential. It requires a philosophical answer because it entails much more than just practical considerations (Burrell and Morgan, 2005). According to Saunders et al., (2019) research philosophy is defined as the set of assumptions and beliefs regarding the formation of knowledge. Although this may sound a bit far-fetched it is essentially what is being done here when researching the impacts of Covid-19 on cycling in Ireland since there will be a development in knowledge.

At the outermost layer of the research onion lies the philosophical layer where the research is built upon a set of beliefs. Burrell and Morgan (2005) argue that many different types of assumptions will be made at each stage of research. These assumptions may be ontological, epistemological or axiology assumptions which are the 3 most significant philosophies in the research process (Saunders et al., 2015).

The philosophical perspective of the natural scientist is associated with positivism (Saunders et al., 2019). According to Bryman (2012) positivism is an epistemological stance that

promotes using natural scientific approaches to explore social reality and other subjects. Working with observable social reality is required, and the result could be abstractions that resemble laws found in the physical and natural sciences (Saunders et al., 2019). In quantitative studies, positivism is typically the underpinning research philosophy (Lincoln et al., 2011). Positivism assumptions serve as the traditional form of research which hold higher significance for quantitative research (Philips et al., 2000).

The researcher has chosen the positivism philosophy for the purpose of conducting this research based on the collection of quantitative data through online surveys. The use of quantitative data in the research has led to the choice of positivism as the research philosophy. It has aided the researcher in assessing the data and statistics based on the impact of Covid-19 on cycling in Ireland.

Research Approach

A research approach is best defined as the study's overall plan and procedure. The research approach can be divided into 3 categories: deductive approach, inductive approach and abductive approach (Saunders et al., 2019). According to Ketokivi and Mantaere (2010) the 2 primary approaches are deductive or inductive.

Deductive approach - If the research employs a deductive methodology, it will have developed a set of hypotheses that must be verified or rejected throughout the research process (Saunders et al., 2019). According to Ketokivi and Mantaere (2010) when a conclusion is derived logically from a collection of theory-derived premises, deductive reasoning is used and the conclusion is true when all the premises are true. Deduction links theory to evidence (Suddaby, 2006). Similarly Bryman and Bell (2007) state that it represents the natural view of the nature of the relationship between theory and research.

The approach that has been used in this research is a deductive approach. As a method of science that prioritizes structure, quantification, generalisability and testable hypotheses. The deductive approach was the most acceptable approach chosen to assess the impacts of Covid-

19 on cycling in Ireland and is supported by the positivist research philosophy (Saunders et al., 2019).

As a scientific approach that emphasises structure, quantification, generalisability and testable hypotheses, the deductive approach is most likely to be underpinned by the positivist research philosophy (Saunders et al., 2019). Having already discussed the research hypothesis in a previous section it is important to note that the whole research process will be devoted to testing this hypothesis. In addition to this the hypothesis will be accepted or rejected by the end of the research process (Bryman and Bell, 2015).

Research Method

There are two sources of collecting data which are primary and secondary. Primary data is collected directly from the respondent, whereas secondary data sources its data from published and unpublished material (Gangrade, 1982). In this research paper data was collected through a primary method of online questionnaires. Since the research is concerned with the Irish public a questionnaire was chosen to be best suited to retrieve the necessary information. According to Gangrade (1982) a questionnaire is made to gather information from sizable, diverse, and dispersed populations which aligns with the research objectives of this study accordingly.

Numerous sources of literature have found that there are three main areas into which primary research can be divided which are quantitative research, qualitative research and mixed-method research (Swanson & Holton, 2005; Kothari, 2008; Creswell, 2011). According to Saunders et al., (2019) qualitative and quantitative are the two most common methodologies in research. For the purpose of this study mixed methods were not considered by the researcher.

Prior to selecting either approach, it was crucial for the researcher to be aware of the key differences between quantitative and qualitative types. Table 1 below outlines the primary differences.

Qualitative Research	*Quantitative research*
Small sample size	Larger sample size
Open ended questions	Scaled, specific questions
Rich, Hardcore data	Reliable, hard data
Exploratory	Descriptive or Causal
Semi or unstructured	Structured
Numerical or standardized data	Non standardized data
Deeper understanding	Richer understanding

Table 1: Difference between qualitative and quantitative research (Adopted from: Malhotra, 2012, Wilson 2003 & Saunders et al., 2019).

The researcher concentrated this study on the quantitative method in order to collect the necessary primary data after taking into account the main distinctions shown in the above table. This strategy made sense for testing the hypothesis. Online questionnaires can be used to gather data, which can then be visualized in graphs and subjected to statistical analysis.

This research uses a single quantitative data collection technique in the form of collecting data from an online questionnaire and corresponding quantitative analytical procedure. Following the methodological choice procedure the study takes a mono method quantitative approach. This methodological approach can be seen below in figure 2 (Saunders et al., 2019).

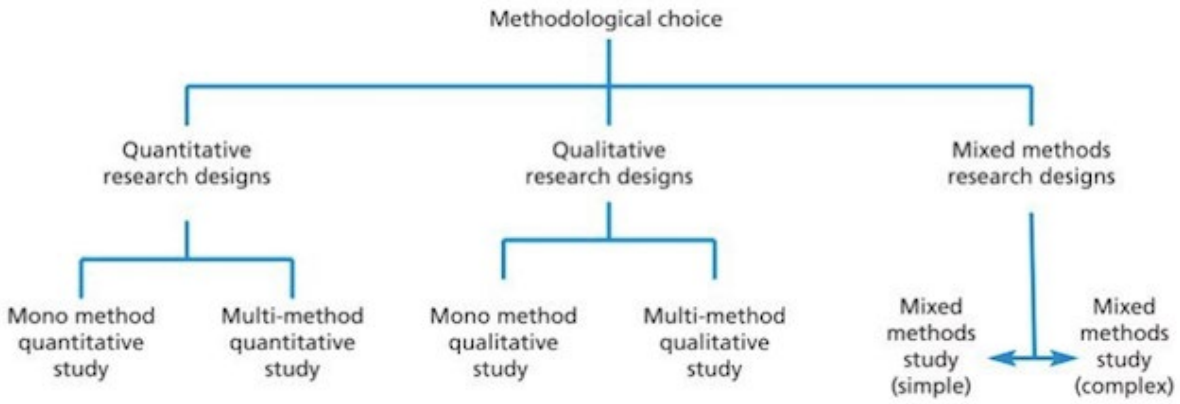

Figure 2: The methodological choice (Adopted from Saunders et al., 2019).

The research being conducted in this paper aims to build on something that already exists. Likewise as seen in the literature review where past research adopts a deductive approach so does this study (Mohajan, 2020).

This study's research design, which uses a mono-quantitative approach, was chosen. The selection criteria for a mono-quantitative technique have been influenced by the usage of an online questionnaire during the research. The quantitative approach of research is preferred because it enables the researcher to get the data required to respond to inquiries about the state of the study topic. The aim of this research which is to understand the impacts Covid-19 has had on cycling in Ireland will be achieved by administering a questionnaire that targets the Irish public.

Figure 3 below shows the primary steps that are essential in quantitative research. This flowchart was used as a starting point for this research and referred to throughout the research process. Bryman and Bell (2007) state that research is never as straightforward as this linear process but it still signals to us where to start and what interconnections need to be made throughout. Looking at the literature in which this study started out with, it can be further emphasised that a deductive approach was implemented since the research began with theory and then progressed to developing a relevant hypothesis.

Figure 3: Steps involved in quantitative research (Adopted from Bryman and Bell, 2007).

In figure 4 below there is a summary presented of the characteristics of quantitative research. After accessing the characteristics of quantitative research it was further emphasised that it was the correct approach for undertaking the research along with the corresponding quantitative methods implemented in the literature review.

- Researcher is generally seen as independent from those being researched.
- Those taking part are usually referred to as respondents.
- Designed to examine relationships between variables.
- Often uses probability sampling techniques to ensure generalisability.
- Method(s) used to collect data are rigorously defined and highly structured.
- Collection results in numerical and standardised data.
- Analysis conducted through the use of statistics and diagrams.
- Resulting meanings derived from numbers.

Figure 4: Characteristics of quantitative research (Adopted from Saunders et al., 2019).

According to Hox and Boeije (2005) information that has already been gathered by other sources for various purposes is known as secondary data. Secondary data relies on gathering reliable information from earlier study findings that is peer reviewed to the highest standards. Certain critical information, which this study lacked the time and resources to gather as primary data, was gathered as secondary data through publications, journals, internet sources, current studies, and surveys (Gangrade, 1982).

To conclude, an online survey served as the foundation for this research and its methodology. For the aim of this research, the questionnaire itself served as the main tool for gathering the vital data required to address the research issue. The questionnaire was created in a way that made it possible to gather replies in order to accomplish the research's objectives. The questionnaire was distributed online to reach the target sample of Irish citizens.

Research Strategy

According to (Denzin and Lincoln, 2018) a research strategy can be described as a strategy for how a researcher will approach addressing a specific research question. It is the methodological connection between the research philosophy and resulting selection of methodologies to collect and analyse data. The research strategy outlines how the researcher will conduct the primary data collection (Saunders et al., 2019).

For the purpose of this research surveys were the primary quantitative research technique implemented. Survey research in general employs statistically precise questionnaire design and scientific sampling techniques to determine population characteristics. It aims to respond to questions like, *"How many people feel a certain way?"* and *"How frequently do they engage in a certain behaviour?"* (Sukamolson, 2007). As a result of this surveys have been considered the best fit for answering the research question relating to *"What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?"*. Surveys were chosen because they meet the quantitative objectives but also they can be useful to quantify opinions, attitudes and behaviours or to discover how a population may feel about a certain problem (Sukamolson, 2007). Due to this, surveys were chosen as they were considered to be the best way to explore the Irish public's perceptions on cycling and the cycling industry during Covid-19. Uncovering this information would then allow for precise

conclusions to be drawn to test a hypothesis in order to assess the relationship between Covid-19 and cycling in Ireland.

For the purpose of this study an online questionnaire was chosen in order to collect the relevant rich and reliable data (Bryman, 2012). Through an online questionnaire, a comprehensive study was done on the factors influencing cycling in Ireland as a result of COVID-19. The survey approach made it possible to gather data that can be statistically examined using descriptive and inferential statistics (Saunders et al., 2019).

Research Sampling

According to Domegan and Fleming (2007), research sampling is the process of collecting data from a subset of the population that accurately represents the entire population. The need for research sampling is inevitable in quantitative research (Bryman and Bell, 2007). It would be impossible to gather and analyse data from the entire population for the purposes of this study so a sample was drawn from the population (Quinlan, 2011). This is because of limitations with regards to access, money, and time. However some authors argue that sampling techniques are more accurate as more time can be devoted to gathering rich data as there is a smaller sample size (Barnett, 2002 and Babbie, 1990). As a result sampling data may need to be chosen from a subset or sample (Saunders et al., 2019). Similarly Ghauri and Grønhaug (2006) mentions that an alternative way to collect relevant data is from a sample group. In this instance data is collected from a portion of the population that will then tell us something about the larger group as a whole. Using sampling techniques, this study was able to reduce the amount of data that was required to be gathered by focusing on data from a small subset rather than all potential cases or components (Saunders et al., 2019). In a survey the population is referred to as the aggregate of elements from which the survey sample is actually selected, which in this research was a population of 94 respondents (Baddie, 1990).

The challenges of surveying the entire population are avoided by using a small sample size because it is impracticable to get the required information from an entire population for the purpose of this study. Only 68 of the 94 respondents who were included in the study's sample gave their full consent to the use of their information. As a result, only 72 percent of the 94 total responses from the population could be analysed. Everyone who answered the questionnaire voluntarily did so knowing that it wasn't mandatory to participate.

Sampling Method

The primary purpose of sampling for this research topic is to select a subset of people from a population to determine the characteristics of the entire population (Fischer, 2007; Collis & Hussey, 2009). According to Quinlan (2011) and Ghauri and Grønhaug (2006) there are two types of sampling techniques which can be divided into probability sampling and non—probability sampling. Through probability sampling each case, individual, or element has an equal chance of being selected. Comparatively non-probability sampling techniques are used by researchers when it is considered inconvenient to compile a complete sampling frame (Quinlan, 2011).

The sampling technique adopted for this research study is the non-probability sampling technique. Non–probability approaches are occasionally used in place of probability sampling methods in survey research, despite their generally acknowledged superiority of probability research. In situations like that of this research topic non probability was used over probability for reasons such as the degree of costings, time and when precise representativeness is not necessary (Baddie, 1990 and Adams et al., 2014). Since a sampling frame is absent from the study this allowed for the choice of non-probability sampling to serve the aims and objectives of the study (Adams et al., 2014).

Different methods of non-probability sampling can be used such as quota sampling, snowball sampling and convenience sampling (Quinlan, 2011 and Collis & Hussey, 2009). This study used a convenience sampling technique, which means that the easiest participants to include in the study were chosen (Saunders et al., 2019). A convenience sampling method was chosen since it was simply available to the researcher by virtue of its accessibility (Bryman and Bell, 2007 and Quinlan, 2011). . In this case individuals including family, friends, colleagues, other students, neighbours and other people that were known to the author or easy to approach by the author were selected and invited to participate in the study. According to Adams et al., (2014) convenience sampling is the least reliable design however it was chosen by the researcher since it was the cheapest and easiest method to conduct.

Power Analysis

G*Power was used to justify the sample size through a power analysis test (figure 5). G*Power is an instrument to calculate statistical power analyses for t tests (Heinrich Heine University

Düsseldorf, 2022). A two tailed test was inputted into the software, a medium effect size (.50), alpha level of (0.05), power of (0.8). Using this information the power analysis software calculated a sample size of 34 participants. Detecting that effect size 80% of the time would require 34 participants. This result fits in with this study's final sample size of 68 participants.

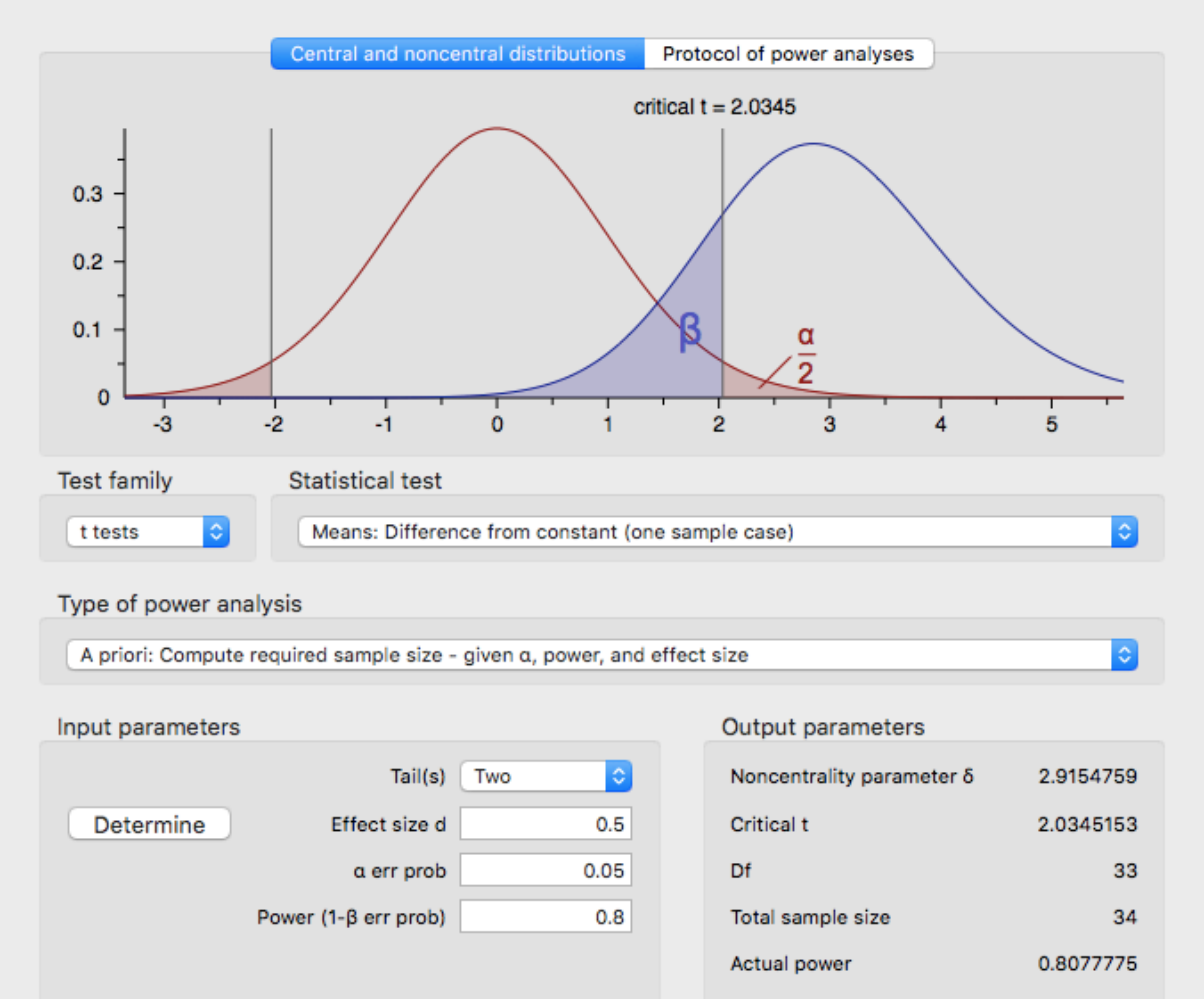

Figure 5: Power Analysis Test (Heinrich Heine University Düsseldorf, 2022).

Sample participants

94 respondents took part in the research study however only 68 respondents fully completed the online questionnaire. The primary data was collected from participants who fitted the criteria of those who lived in Ireland prior to the pandemic, during the peak and recovery stage. Once the participant was over the age of 18 and had given their consent then their data could be analysed. The researcher recruited candidates through various online platforms that include WhatsApp, Instagram, LinkedIn and Strava. The online questionnaire was made available on these platforms through a URL link that brought each participant to the Questionnaire on

SurveyMonkey Inc. The questionnaire was live from the 8th of July to the 29th of July and allowed respondents to choose if they wanted to participate and even where and when they wanted to complete it.

Questionnaire Process

This research was based on data collected from a self-report questionnaire made up of multiple questions. The questionnaire consisted of four sections: 1) Modes of Transport 2) Bicycle Use 3) Covid-19 Cycling Behaviour 4) Business Aspect, which were all targeted at gathering information to answer the research question. In conjunction with the four sections participants were also presented with various demographic questions at the start. The questionnaire included both open ended and close ended questions.

Where possible questions were borrowed from previous questionnaires involving similar topics. Through reading past papers and reviewing SurveyMonkey questions the researcher was able to extract the necessary questions (MacDonald, 2020 and Thacker 2020 and Sajid, 2021 and SurveyMonkey, 2021). Due to the nature of the research question some questions needed to be devised by the researcher in order to answer specific aspects as past questions were not sufficient enough in capturing the correct information. The researcher came up with these questions however they were all tested in the pilot study before being distributed in the questionnaire.

An information sheet outlining the purpose of the study, the confidentiality and anonymity of the questionnaire, and the voluntary nature of participation was included with the questionnaire used for this investigative process. Participants also received a consent form and a debriefing form in addition. The participants were advised that completion of the questionnaire would take no more than 10 minutes. Prior to the primary research, a pilot study was undertaken, which validated this. Attached in the Appendix section at the end of this study are the information sheet, consent form, debriefing form, and questionnaire.

Pilot Study

Prior to the questionnaire being distributed, it was crucial that the questionnaire be tested using a pilot study. This was done to make sure that the questionnaire would be understandable to all respondents and feasible to complete in order to meet the goals set by the researcher (Adams et al., 2014). The pilot study was directed at the exact same sample as the final study, it was

hoped that it would reflect similar characteristics to those participating in the actual research. Three potential respondents were asked to participate in the pilot study through SurveyMonkey for the purpose of relaying essential feedback to the researcher prior to the release of the actual questionnaire (Baddie, 1990).

The three participants who agreed to participate in the pilot study were aware that their responses were for the use of the pilot study and would not be contributed towards the final data collection. Baddie (1990) recommends that avoiding studying the same respondents in both the pilot study and the final questionnaire. Participants in the pilot study were invited to provide their thoughts on the questionnaire's content and design as well as offer suggestions.

Pilot studies are often used to test for content validity and internal consistency (Creswell and Creswell, 2018) however for the purpose of this study it was used to check the structure of questions, arrangement of the questionnaires information section, understanding of the instructions and wording of questions as well as answering options. This feedback was relayed back from the three participants who agreed to participate in the pilot study. Based on the recommendations from the pilot study the researcher made the necessary changes in order to improve the standard of the questionnaire. This was crucial feedback for the researcher since a portion of questions were made up in order to answer the specific research question however the remaining questions were borrowed from previously peer reviewed questionnaires.

Time horizon

The time horizon specifies how long it will take to complete the project work (Bryman, 2012). There are two options to consider when choosing a time horizon – cross-sectional and longitudinal. The choice of which of the two time horizons to choose in research depends on the research aims, objectives and research question. For the purpose of this study the researcher has chosen to implement the cross-sectional approach since the research deals with the collection and analysis of data at a specific point of time (Rindfleisch et al., 2008). According to Saunders et al., (2015) Cross-sectional studies deal with looking at a particular phenomenon at a particular time. Grounded in this research the researcher aims to assess people's thoughts and perspectives on cycling in Ireland during Covid-19, which is a specific time. Also time constraints were implemented as a result of the researchers relevant submission dates which all contributed to time restrictions which inevitably forced the researcher to choose a cross-

sectional time horizon. With the use of SurveyMonkey, an online survey software, the questionnaire was created and delivered to participants. The ability to conduct research quickly and affordably was one of the main benefits of choosing SurveyMonkey for this research (Malhotra et al., 2012),

Data Analysis and Data Collection

Data analysis is the method of methodically using logical and/or statistical techniques to describe, illustrate, summarize, and assess the data (Gallagher, 2009). Primary and secondary data are the two main forms of data used in data research analysis (Saunders et al., 2019). For this research, both sources were employed. Secondary data was used to conduct and construct the literature review. Whereas primary data was sourced from the questionnaire. Data collection is the act of acquiring and measuring information on variables of interest in a systematic and defined manner (Saunders et al., 2019). According to Bryman (2012) data collection and analysis is dependent on the methodological approach used and for this research topic it was the deductive approach.

After gathering the required primary raw data from the sample, the researcher had to sort the data before beginning the analysis. The analysis was carried out using SPSS software. Over the course of three weeks, the data was gathered from the questionnaire. The method of analysis was quantitative, which includes both descriptive and inferential statistics. The research questions were answered by carrying out correlation analysis and regression analysis.

Surveys that were not completed or whose respondents did not consent to the terms of participation in the study were removed once the data was gathered from Survey Monkey. The completed surveys were downloaded into an Excel file so that SPSS could portray them. All replies were given numerical codes, the questions were grouped, and fresh variables were made in SPSS before comparing each group of questions against each demographic category in an effort to find patterns.

Ethical Considerations

Saunders et al., (2019) define ethics as "*the standards of behaviour that guide your conduct in relation to the rights of those who become subject to your work or are affected by it*". The researcher can comment that the National College of Ireland's ethical standards and guidelines have been adhered to in this study. Every respondent has been given an information form,

consent form, debriefing form and it has been highlighted that participation in the survey is entirely optional. The researcher promoted ethical conduct throughout the entire study, protecting the subjects confidentiality and identity. The participants could pull out of the study at any time without prior notice to the researcher. It is crucial that the researcher make it a duty to ensure that the data collected are treated as anonymous and are only given to the Supervisors (Panter and Sterba, 2011).

The purpose and aim of the study are conveyed clearly to the respondents before handing them out the questionnaire. Informed consent from the participants has been taken. The participants have been told how the data collected will be used. The research intent, the type of data being collected, how the data is being collected, how the data will be used, and any risks associated are conveyed to the participants as recommended by Fleming and Zegwaard (2018).

Limitations

The researcher's inability to control the setting in which the respondents filled out the questionnaire was the study's initial restriction. Responses typically depended on the period of time during which the data were gathered and the researcher had no control over the conditions at that particular time. The behavior and opinions of the respondents at a particular period had a significant impact on the results. This is further emphasized by the fact that the survey was conducted during Covid-19, which may have affected respondents thoughts and choices because of the environment's constant change as a result of Covid-19 (OECD, 2020). Also a portion of the respondents failed to click the consent button at the end of the questionnaire which meant that their responses could not be used in the research and had to be removed.

Chapter 5: Analysis and Findings

Introduction

This chapter will outline the findings of the research study. The objectives set out for this study were to investigate *"What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?"*.

Since 26 questionnaires were deemed invalid for further analysis, Only 68 of the 94 questionnaires from respondents were examined. The data collection method made use of the 68 valid responses. SPSS was used to analyse the data, SPSS is a statistical data analysis tool assisted by IBM SPSS, a computer program that creates tabulated reports, charts and plots of distributions and trends, descriptive statistics, and complicated statistical analysis (Chandler, 2022). The participants in this study voluntarily chose to participate, and the researcher gathered and critically examined the primary data they provided. The researcher was able to analyse the impacts Covid-19 had on cycling in Ireland because the questionnaire obtained adequate information from the participants. The demographic information gathered for the study will be shown in this chapter, followed by a data analysis, inspection of descriptive statistics, inferential statistics and hypothesis tests. The data from the respondents will be examined and analysed, enabling for the presentation of the researchers conclusions. Finding various behavioural changes as a result of Covid-19's direct and indirect effects on cycling in Ireland will help find the answers to the research questions.

Demographic Information

Gender

Gender Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	51	75.0	75.0	75.0
	Female	17	25.0	25.0	100.0
	Total	68	100.0	100.0	

Table 2 : Gender frequency table

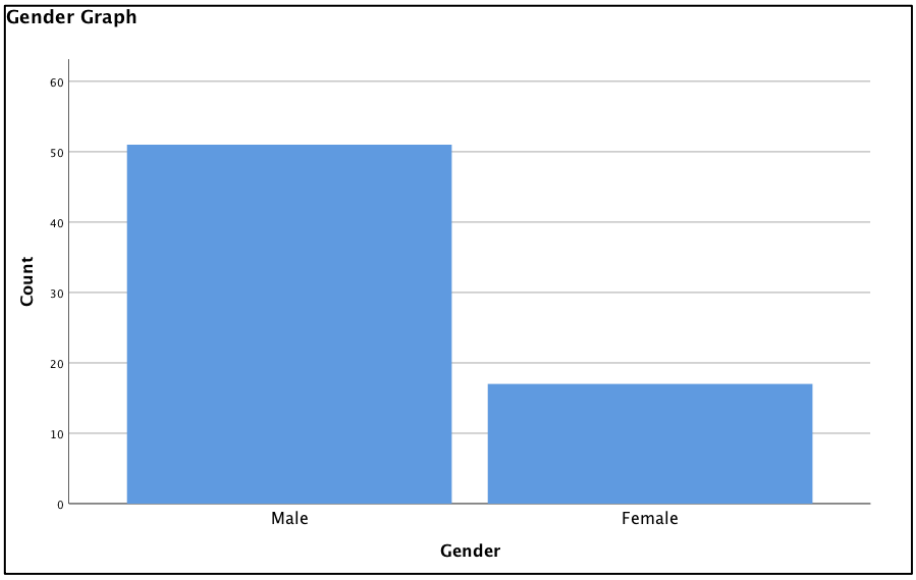

Figure 6: Gender bar chart

Table 2 reveals that 75.0% of the respondents were males and 25.0% of the respondents were females. The results were further represented pictorially in terms of frequency and presented in a bar chart as seen in figure 6 with 51 males and 17 females shown. This result implies that there were more male respondents than female respondents. Even though there were more male participants than female, which could have disadvantages, a research report that covers both genders is thought to be more accurate and easier to apply to the general public of Ireland. In order to identify disparities in behaviours and beliefs, the research needed representation from both genders. According to Carroll et al., (2020) the participation of men and women who participate in cycling in Ireland differs significantly. Approximately 25% of cyclists on Irish roads are women. This makes up for a 1 in 4 ratio of men to women cyclists which may suggest why there is such a significant gender imbalance here.

Age Category

Age Category Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	30	44.1	44.1	44.1
	25-34	9	13.2	13.2	57.4
	35-44	3	4.4	4.4	61.8
	45-54	14	20.6	20.6	82.4
	55-64	10	14.7	14.7	97.1
	65+	2	2.9	2.9	100.0
	Total	68	100.0	100.0	

Table 3: Age frequency table

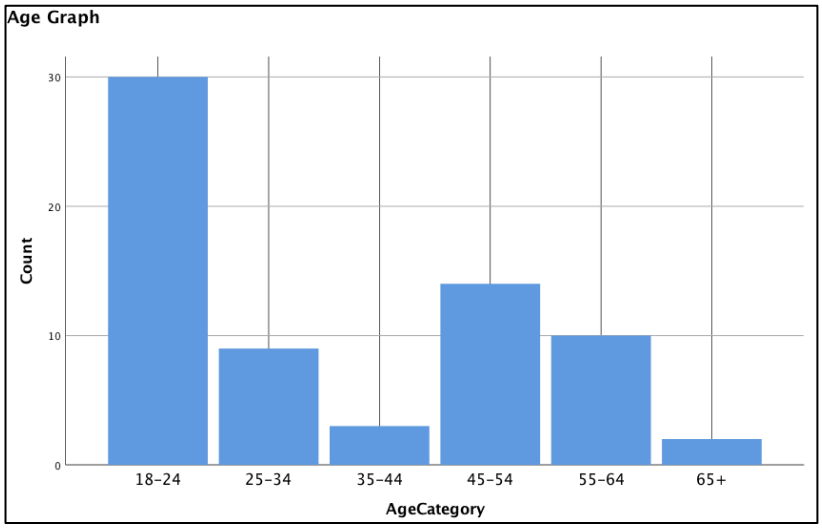

Figure 7: Age bar chart

Table 3 reflects the distribution of 6 different age categories in which the respondents identified themselves within. Of the 68 respondents 44.1% of the respondents were aged 18-24, 13.2% of the respondents were aged between 25-34, 4.4% of the respondents were aged between 35-44, 20.6% of the respondents were aged 45-54, 14.7% of the respondents were aged 55-64 and 2.9% of the respondents were 65 and over. All respondents were over the age of 18 as stated previously in the methodology section hence the 18 and below category omission. Of the 6 categories a substantial array of ages participated allowing for an accurate representation of the Irish public. The results were further represented pictorially using a bar chart in figure 7 which illustrates that the most the participants are from the 18-24 category which may be because Irish people in this age group are more active (World Health Organisation, 2021).

Annual Income

Annual Income Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under €15,000	9	13.2	13.2	13.2
	Between €15,000 and €29,999	20	29.4	29.4	42.6
	Between €30,000 and €49,999	14	20.6	20.6	63.2
	Between €50,000 and €74,999	13	19.1	19.1	82.4
	Between €75,000 and €99,999	7	10.3	10.3	92.6
	Between €100,000 and €150,000	3	4.4	4.4	97.1
	Over €150,000	2	2.9	2.9	100.0
	Total	68	100.0	100.0	

Table 4: Annual income frequency table

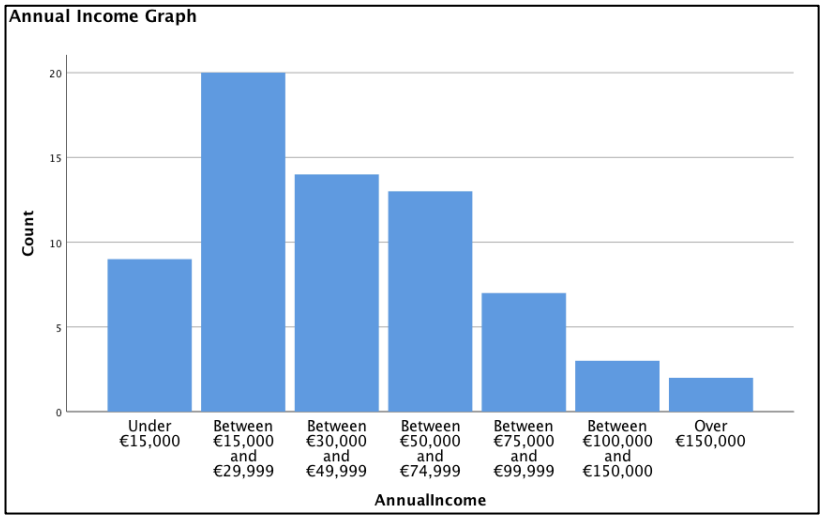

Figure 8: Annual income bar chart

The income level of respondents can be seen in table 4 Of the 68 respondents 13.2% earned below €15,000 annually, 29.4% earned between €15,000 and €29,999, 20.6% earned between €30,000 and €49,999, 19.1% earned between €50,000 and €74,99, 10.3% earned between €75,000 and €99,999, 4.4% earned between €100,000 and €150,000 and finally 2.9% of the respondents had income level above €150,000 annually. Similarly the same data is represented in figure 8 where we can see that the majority of the respondents (20) earned between €15,000 and €29,999 annually.

Educational Background

Educational Background Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	2	2.9	2.9	2.9
	Junior Certificate	1	1.5	1.5	4.4
	Leaving Certificate	22	32.4	32.4	36.8
	Higher Certificate	6	8.8	8.8	45.6
	Bachelor's Degree	21	30.9	30.9	76.5
	Postgraduate Diploma/Masters	16	23.5	23.5	100.0
	Total	68	100.0	100.0	

Table 5:Educational background frequency table

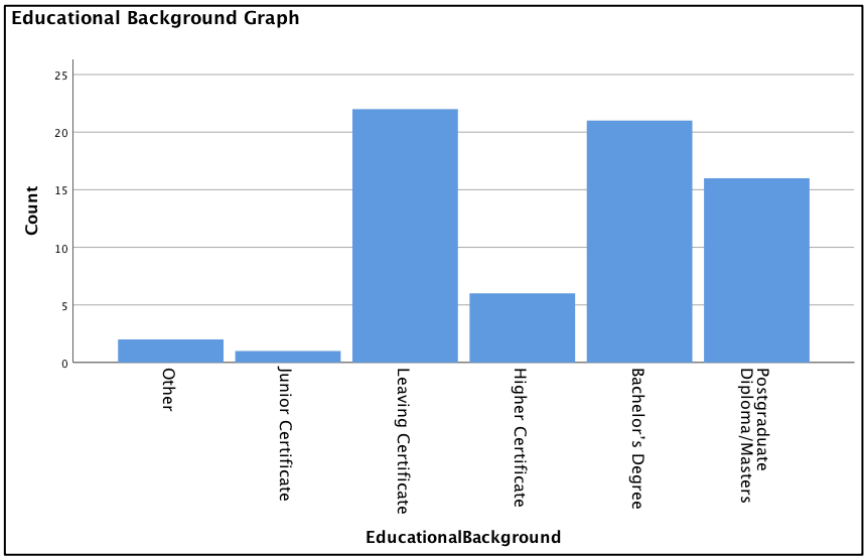

Figure 9: Educational background bar chart

The educational background of respondents is shown in table 5 which shows the respondents highest education status. Out of the 68 respondents that participated in this study 1.5% had a Junior Certificate only, 32.4% had a Leaving Certificate, 8.8% had a Higher Certificate, 30.9% had a Bachelor's Degree, 23.5% had a Postgraduate Diploma/ Masters and 2.9% had another form of education not listed. The results were further represented pictorially in a bar chart as seen in figure 9 which shows the two most common educational backgrounds to be the Leaving Certificate (22) and a Bachelor's Degree (21). This result implies that there were more bachelor's degree holders than any other educational qualification

Current Occupation

Current Occupation Description

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	6	8.8	8.8	8.8
	Management Occupations	5	7.4	7.4	16.2
	Business and Financial Operations Occupations	5	7.4	7.4	23.5
	Computer and Mathematical Occupations	1	1.5	1.5	25.0
	Architecture and Engineering Occupations	7	10.3	10.3	35.3
	Community and Social Service Occupations	1	1.5	1.5	36.8
	Education, Training, and Library Occupations	2	2.9	2.9	39.7
	Arts, Design, Entertainment, Sports, and Media Occupations	1	1.5	1.5	41.2
	Healthcare Practitioners and Technical Occupations	2	2.9	2.9	44.1
	Healthcare Support Occupations	1	1.5	1.5	45.6
	Protective Service Occupations	1	1.5	1.5	47.1
	Food Preparation and Serving Related Occupations	1	1.5	1.5	48.5
	Building and Grounds Cleaning and Maintenance Occupations	2	2.9	2.9	51.5
	Personal Care and Service Occupations	1	1.5	1.5	52.9
	Sales and Related Occupations	13	19.1	19.1	72.1
	Office and Administrative Support Occupations	6	8.8	8.8	80.9
	Construction and Extraction Occupations	1	1.5	1.5	82.4
	Installation, Maintenance, and Repair Occupations	4	5.9	5.9	88.2
	Student	8	11.8	11.8	100.0
	Total	68	100.0	100.0	

Table 6: Occupation frequency table

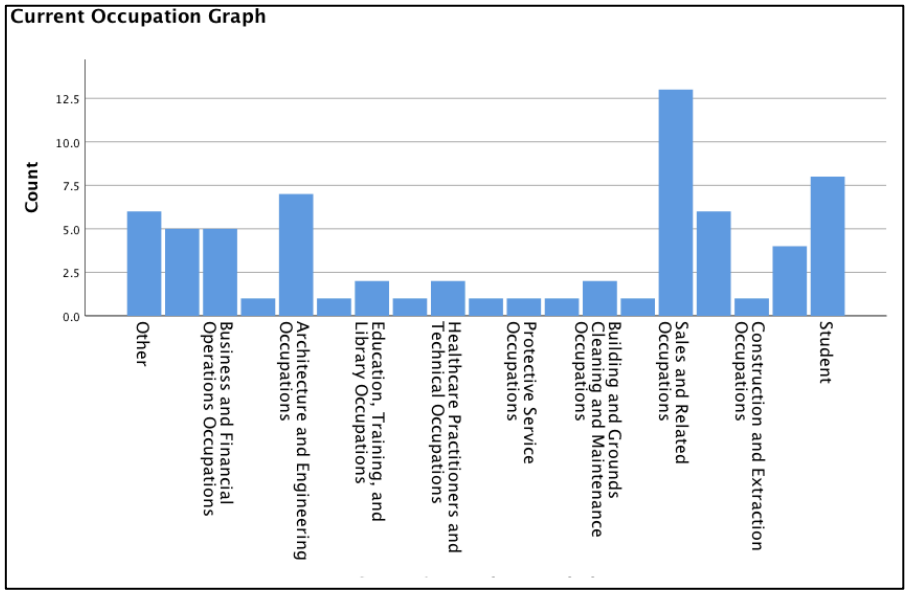

Figure 10: Occupation bar chart

Each of the respondents identified their current occupation sector shown in table 6 the results are as follows: Management Occupations (8.8%), Business and Financial Operations Occupations (7.4%), Computer and Mathematical Occupations (1.5%), Architecture and Engineering Occupations (10.3%), Community and Social Service Occupations (1.5%), Education, Training, and Library Occupations (2.9%), Arts, Design, Entertainment, Sports, and Media Occupations (1.5%), Healthcare Practitioners and Technical Occupations (2.9%), Healthcare Support Occupations (1.5%), Protective Service Occupations (1.5%), Food Preparation and Serving Related Occupations (1.5%), Building and Grounds Cleaning and Maintenance Occupations (2.9%), Personal Care and Service Occupations (1.4%), Sales and Related Occupations (19.1%), Office and Administrative Support Occupations (8.8%), Construction and Extraction Occupations (1.5%), Installation, Maintenance, and Repair Occupations (5.9%), Student (11.7%) and Other (8.8%). Looking at figure 10 we can see the data displayed visually with Sales and Related Occupations being the most common with 13 of the respondents reporting that they work in that particular area. The diversified amount of job sectors recorded (19) allows for an expansive data collection from across the Irish population.

Data Analysis

Frequency Table

TypicalmodeoftransportpreCovid19forcommuting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Car	40	58.8	58.8	58.8
	Public transport	12	17.6	17.6	76.5
	Bicycle	12	17.6	17.6	94.1
	Walk	4	5.9	5.9	100.0
	Total	68	100.0	100.0	

TypicalmodeoftransportpostCovid19forcommuting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.5	1.5	1.5
	Car	40	58.8	58.8	60.3
	Public transport	11	16.2	16.2	76.5
	Bicycle	12	17.6	17.6	94.1
	Walk	4	5.9	5.9	100.0
	Total	68	100.0	100.0	

Table 7: Frequency tables showing typical modes of transport pre Covid-19 for commuting and typical modes of transport post Covid-19 for commuting

Table 7 above compares the 2 frequency tables involving the different types of modes of transport people typically took to work pre Covid-19 and then post Covid-19. Prior to Covid-19 58.8% of people went by car, 17.6% by public transport, 17.6% by bike and 5.9% walked. In contrast to this post Covid-19 58.8% went by car, 16.2% got public transport, 17.6% by bicycle, 5.9% walked and 1.5% went in a company van (other). Based on these findings it can be noted that there was a small drop off in public transport, maybe as a way of avoiding contraction of the virus. Figure 11 & 12 below show the percentages of the pre and post Covid commuting options visually with percentages. Both pie charts remain constant throughout the timeframe except the decrease in public transport and addition of the other mode which was a company van.

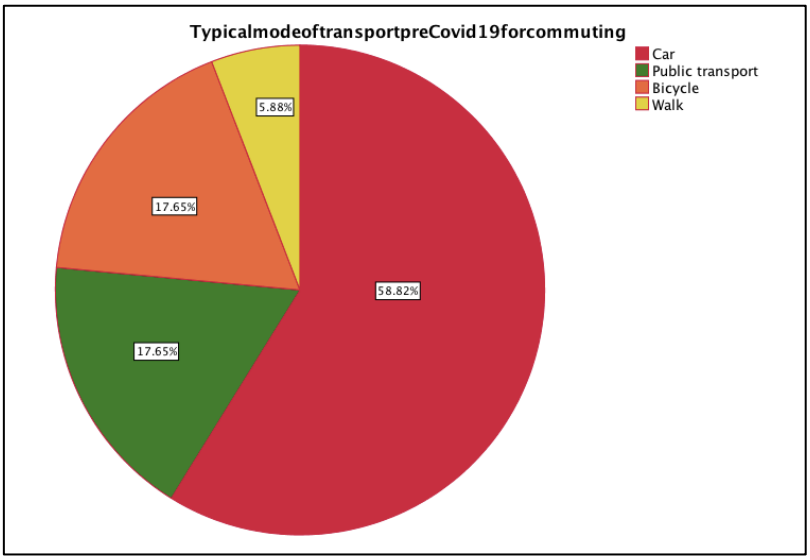

Figure 11: Bar chart showing typical mode of transport pre Covid-19 for commuting

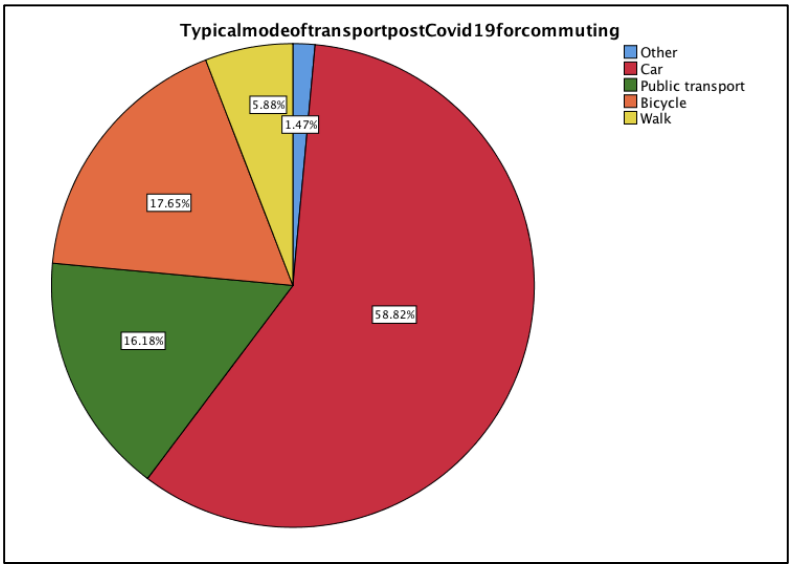

Figure 12: Bar chart showing typical mode of transport post Covid-19 for commuting

Frequency Table

ModeoftravelpreCovid19whennotworking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.5	1.5	1.5
	Car	40	58.8	58.8	60.3
	Public transport	6	8.8	8.8	69.1
	Bicycle	14	20.6	20.6	89.7
	Walk	7	10.3	10.3	100.0
	Total	68	100.0	100.0	

ModeoftravelpostCovid19whennotworking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	1	1.5	1.5	1.5
	Car	42	61.8	61.8	63.2
	Public transport	7	10.3	10.3	73.5
	Bicycle	12	17.6	17.6	91.2
	Car pool	1	1.5	1.5	92.6
	Walk	5	7.4	7.4	100.0
	Total	68	100.0	100.0	

Table 8: Frequency tables showing typical modes of transport pre Covid-19 when not working and typical modes of transport post Covid-19 when not working

Table 8 above presents the frequency tables for modes of travel outside of working pre Covid-19 and post Covid-19.1.5% travelled by other means, 58.8% by car, 8.8% by public transport, 20.6% by bicycle, 10.3% walked pre Covid. Alternatively post Covid-19 there were some shifts in modes. 61.8% drove, 10.3% chose public transport, 17.6% cycled, 1.5% car pooled and 7.4% walked. In figure 13 & 14 below we can see the segments of the pie chart change over the 2 moments in time. An increase can be seen in car transport, cycling, walking and car-pooling. However a decrease was recorded with regards to public transport.

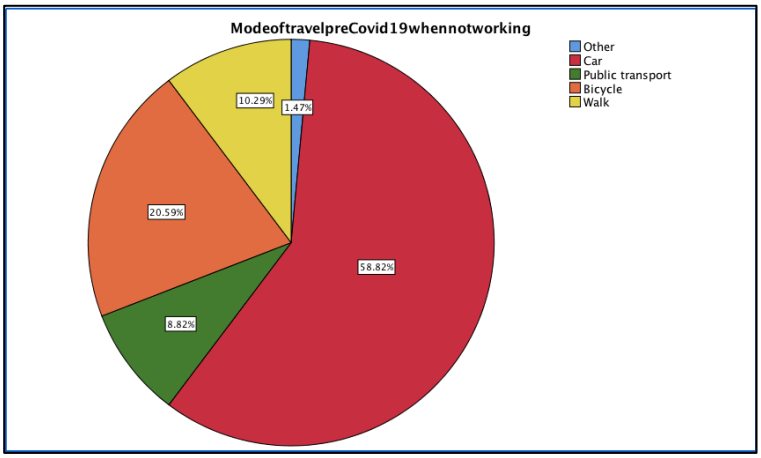

Figure 13: Bar chart showing typical mode of transport pre Covid-19 when not working

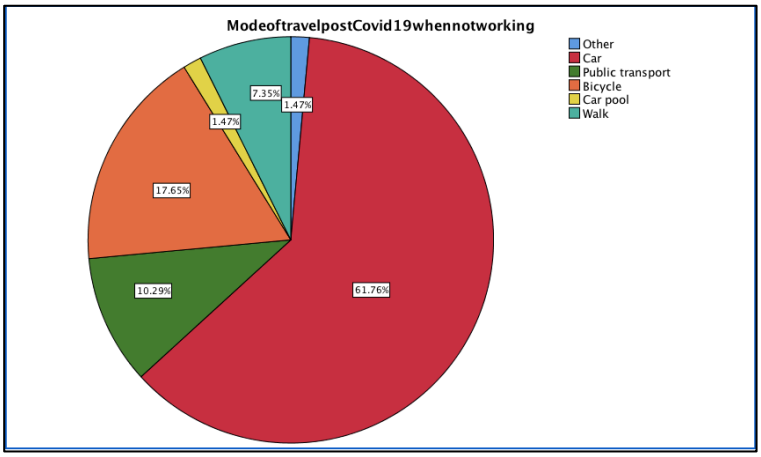

Figure 14: Bar chart showing typical mode of transport post Covid-19 when not working

Whichofthefollowingbestdescribesyou

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I don't ride a bike at the moment and I'm not interested in starting	10	14.7	14.7	14.7
	I don't ride a bike at the moment, but I'm thinking about starting	9	13.2	13.2	27.9
	During Covid-19, I started riding my bike but I don't see it as a mode of transport I'll use much in the future	2	2.9	2.9	30.9
	During Covid-19, I started riding my bike and I want to it do more	6	8.8	8.8	39.7
	I ride my bike every now and then (and did even before Covid-19)	19	27.9	27.9	67.6
	I ride my bike regularly (and did even before Covid-19) - it's one of my main modes of transport	22	32.4	32.4	100.0
	Total	68	100.0	100.0	

Table 9: Frequency table showing which rider category best describes the respondents

Respondents were asked which rider category best describes their cycling habits. The results can be seen above in table 9. 32.4% claimed they ride their bike regularly (and did even before Covid-19) – it's is one of their main modes of transport, 27.9% noted that they ride their bike every now and then (and did even before Covid-19), 14.7% said they ride a bike at the moment and are not interested in starting, 13.2% said that they don't ride a bike at the moment, but are thinking about starting, 8.8% noted that during Covid-19, they started riding a bike and want to it do more, 2.9% commented that during Covid-19, they started riding a bike but don't see it as a mode of transport that they will use much in the future.

Figure 15 below breaks down the 6 preferences into a more legible bar chart with percentages. The 2 most prominent characteristics chosen were the most regular user (22) of a bike and the least regular user of a bike (19).

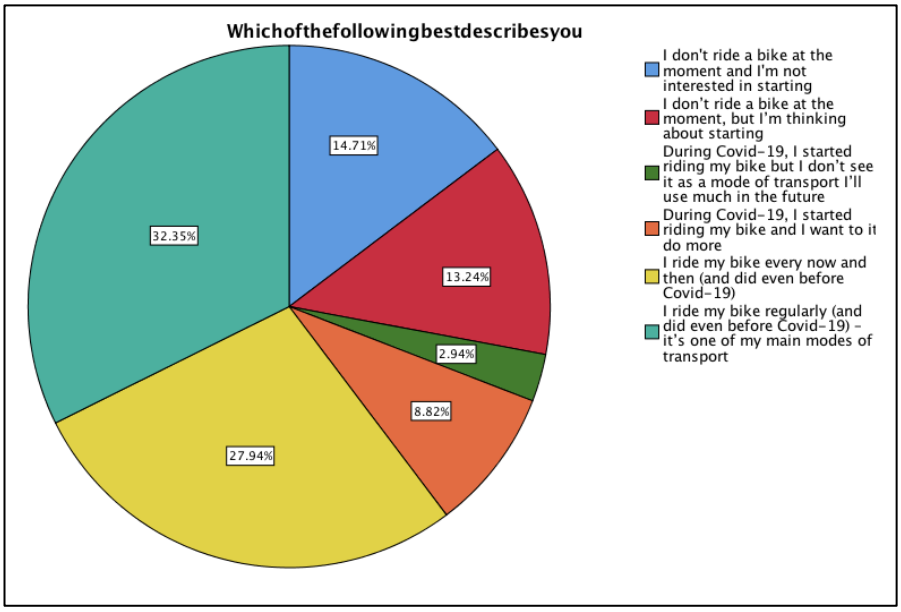

Figure 15:Bar chart showing the percentage of different rider description categories

Frequency Table

Doyouownorhaveaccesstoabike

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	58	85.3	85.3	85.3
	No	10	14.7	14.7	100.0
	Total	68	100.0	100.0	

Howmanybicyclesdoyouownorhaveaccesstoinyourhousehold

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	One	11	16.2	16.2	16.2
	Two	13	19.1	19.1	35.3
	Three or more	37	54.4	54.4	89.7
	I don't own a bike	7	10.3	10.3	100.0
	Total	68	100.0	100.0	

Table 10: Frequency tables showing the ownership and access to a bike as well as the number of bicycles owned or available in a house

Table 10 above looks at 2 frequency tables looking at bike ownership and access. Out of the 68 respondents 58 of them either owned a bike or had access to one within their household, alternatively only 10 did not own a bike or have access to one. This can be further expressed in the bar chart (Figure 16) showing a yes and no response to respondents owning or having access to a bike. 85.3% said yes and 14.7% said no.

Also in table 10 there is a greater breakdown of the amount of bikes that people owned or had access to. Of the people who said one bike there were 11 respondents, 13 people answered two, 37 people answered three or more. Finally 7 respondents said that they did not own a bike. There is an inconsistency however between the respondents answering no to not owning or having access to a bike in the yes no question and those answering the question regarding number of bikes owned or having access too. Figure 17 gives a presentation of the number of bike ownership/ access.

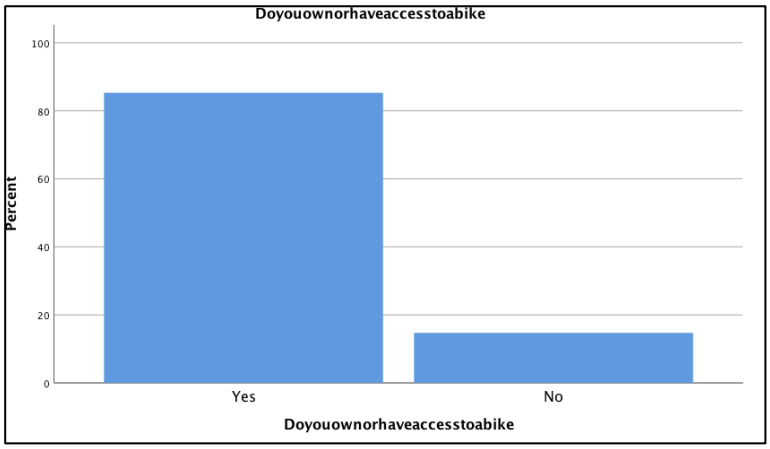

Figure 16: Bar chart showing the number of people who own or have access to a bike V the number who don't own or have access to a bike

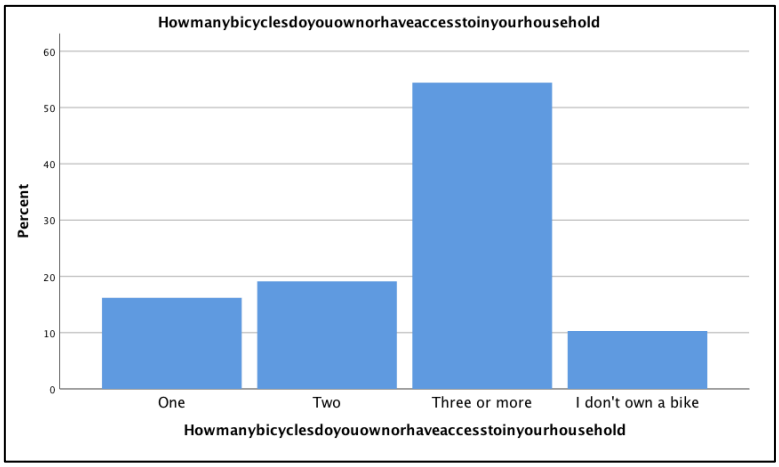

Figure 17: Bar chart showing how many bikes do you own or have access to in a household

Descriptive Statistics

AgeCategory * Whichtypeofridercategorybestdescribesyou Crosstabulation

Count

		Whichtypeofridercategorybestdescribesyou						
		Other	Leisure/ fun	Commuter	Club rider	Competitive rider	Indoor (e.g. turbo trainer)	Total
AgeCategory	18-24	1	21	4	1	1	2	30
	25-34	0	4	1	2	1	1	9
	35-44	1	2	0	0	0	0	3
	45-54	0	6	0	2	5	1	14
	55-64	0	3	1	2	4	0	10
	65+	0	0	0	1	1	0	2
Total		2	36	6	8	12	4	68

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	35.451[a]	25	.080
Likelihood Ratio	33.826	25	.112
Linear-by-Linear Association	9.016	1	.003
N of Valid Cases	68		

a. 32 cells (88.9%) have expected count less than 5. The minimum expected count is .06.

Table 11: Age category against rider category numbers

Table 11 compares the different age categories of riders to the different types of riders. In the 18-24 age group 1 person chose other, 21 people chose leisure/ fun, 4 chose commuter, 1 chose club rider, 1 chose competitive rider and 2 chose indoor rider. In the 25-34 category there were 4 leisure/ fun riders, 1 commuter, 2 club riders, 1competitive rider and 1 indoor rider. In the 35-44 category there was 1 other response and 2 leisure/fun responses. In the 45-54 there were 6 leisure, fun riders, 2 club riders and 4 competitive riders. In the 55-64 category there were 3 leisure/ fun riders, 1 commuter, 2 club riders, 4 competitive riders. Finally in the 65+ category there was one club rider and 1 competitive rider. Overall the most common riding category was leisure/ fun followed (36) by competitive riders (12), followed by club rider (8) and then commuter (6), indoor (2) and other (2).

A Chi-Square test was conducted. The value of the Pearson Chi-Square statistic was 35.451. The p-value of the Asymptotic significance (2-sided) was .080. This result is more than the designated alpha value (.05) meaning the p-value greater than the standard alpha value so we accept the null hypothesis meaning the two results are not independent of each other.

The below 2 histograms (Figure 18 & 19) present the results in hours of how often the respondents took a bicycle trip pre Covid and post Covid-19 respectively. There is a significant increase noticed in uptake with the 0 hours decreasing as the results move from pre to post. The people recording 0 hours initially appear to have taken up cycling and as a result the post Covid-19 chart appears to increase in hours. A change in the mean (5.13 to 5.18), standard deviation (9.828 to 9.621) can also be noticed.

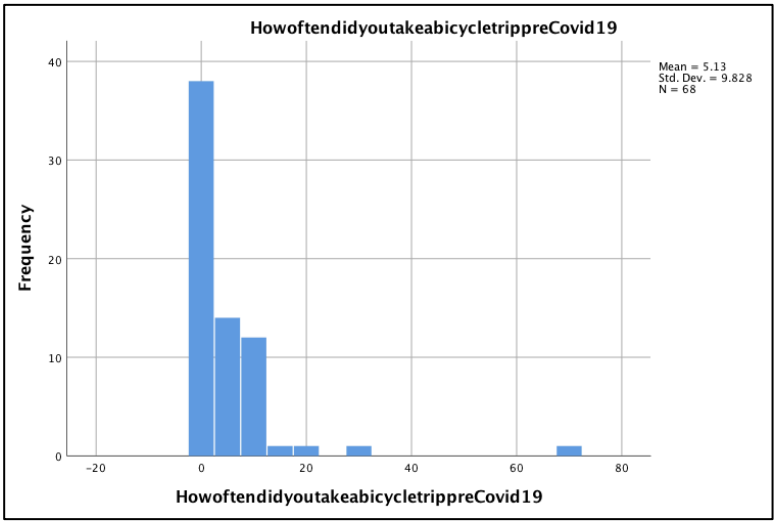

Figure 18: Histogram showing how often respondents took a bicycle trip pre Covid-19 (Hours)

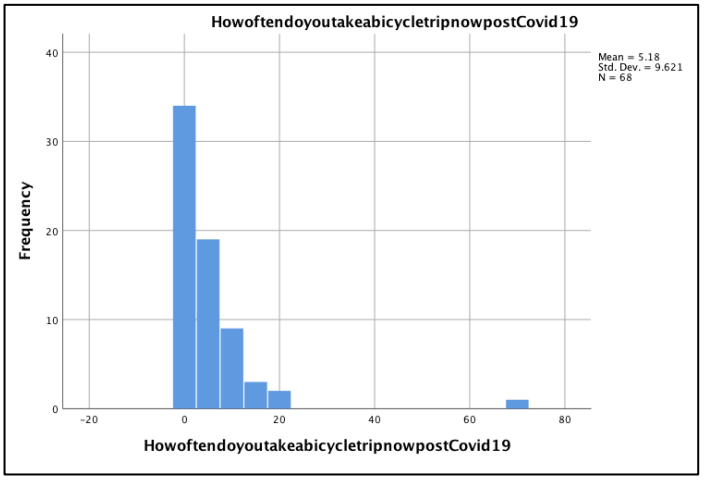

Figure 19: Histogram showing how often respondents took a bicycle trip post Covid-19 (Hours)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Primarymotivationforyou torideabike	68	0	6	1.49	1.387
DidtheCovid19restrictio nshaveanimpactonyour mentalhealth	68	1	2	1.28	.452
Valid N (listwise)	68				

Table 12: Primary motivation for cycling V did Covid-19 restrictions impact your mental health. Showing minimum, maximum, mean and standard deviation values

Table 12 above shows a descriptive statistics table of motivations for cycling and impacts on mental health. N shows how many observations were in the sample. The mean is the centre of the distribution of the data. The standard deviation represents the spread out of the data from the mean. The minimum and maximum show the minimum and maximum points of data. The primary motivation data has a higher mean and maximum point in contrast to the impacts data. There is a higher standard deviation associated with the primary motivation data showing that the greater spread of data in comparison to the impacts data.

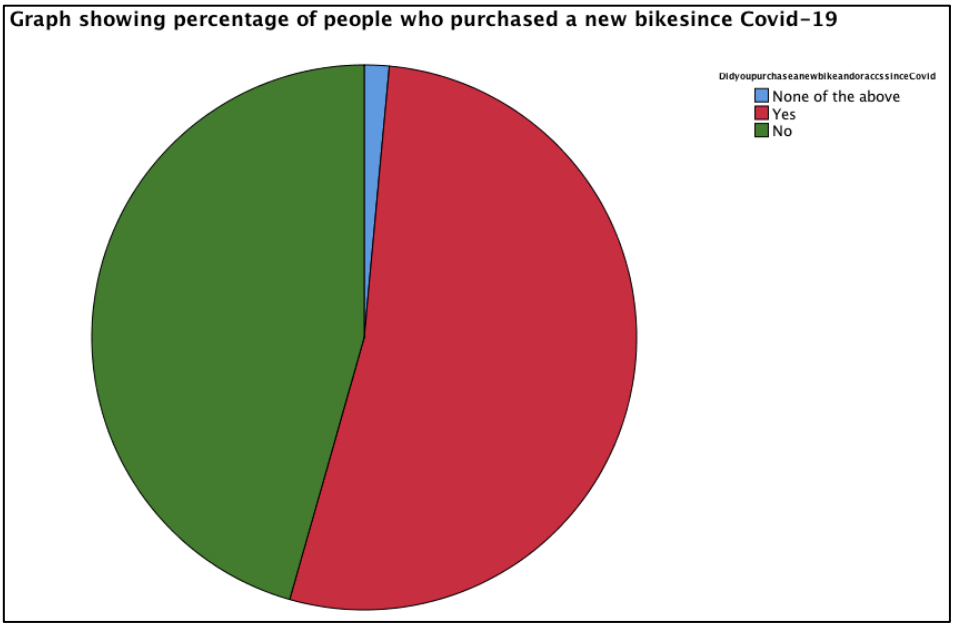

Figure 20: Pie chart showing percentage of people who purchased a new bike since the emergence of Covid-19

Figure 20 shows that a large number of respondents purchased a new bike since the beginning of Covid-19. 52.94% of respondents said that they did in comparison to 45.95% who claimed they did not purchase a new bike.

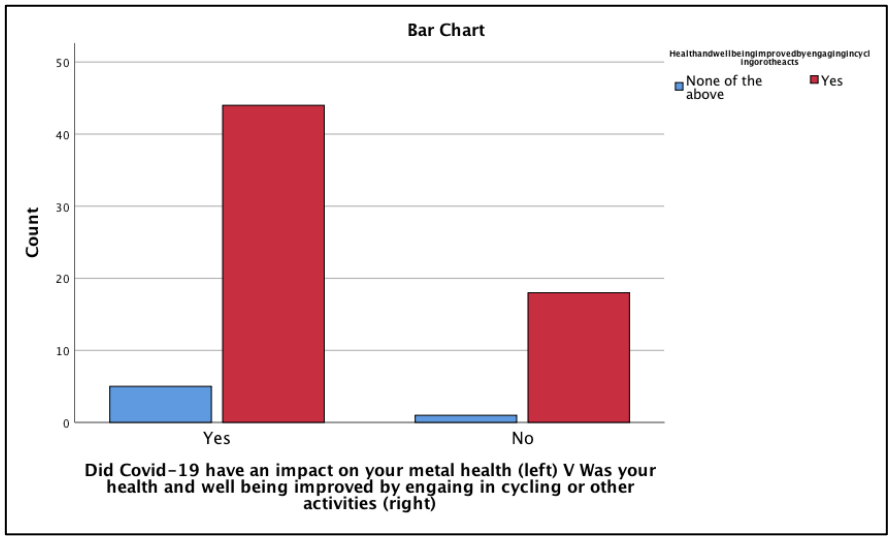

Figure 21: Bar chart showing the number of people that Covid-19 had an impact on their mental health (R) V the number of people who said their mental health was improved by engaging in cycling and other activities (L)

The right hand side of figure 21 above demonstrates that a large number of people feel that the Covid-19 pandemic had an impact on their mental health. 72.06% of respondents said that Covid-19 had a significant impact on their mental health in comparison to a small percentage of only 27.94% of people who claimed the pandemic did not affect their mental health. From the above table, it has been identified that the Covid-19 pandemic has a significant impact on the mental health of the Irish population due to the pandemic. These results can be compared to the left hand side of the table which shows the percentage of people who feel that engaging in cycling and other activities improved their mental health. 91.18% of respondents claimed that by engaging in physical activities their mental health was improved. Alternatively only 8.82% of respondents disagreed with this statement.

Primarymotivationforyoutorideabike

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	7	10.3	10.3	10.3
	Health and fitness	44	64.7	64.7	75.0
	It's more enjoyable than driving,walking, or taking public transportation	9	13.2	13.2	88.2
	To relieve stress	1	1.5	1.5	89.7
	Environmental concerns	2	2.9	2.9	92.6
	It's faster than the other options	2	2.9	2.9	95.6
	It's less expensive than the other options	3	4.4	4.4	100.0
	Total	68	100.0	100.0	

Table 13:Frequency table showing primary motivations for riding a bike

Table 13 above displays a frequency table illustrating the primary motivations for people to ride their bikes. 10.3% said other, 64.7% said for health and fitness, 13.2& claimed it was more enjoyable than other forms, 1.5% said to relieve stress, 2.9% said for emotional concerns, 2.9% said for its speed in comparison to other options and 4.4% said it was less expensive than other options. Figure 22 below breaks down the primary motivations into a pie chart showing how prominent the health and fitness motivation is.

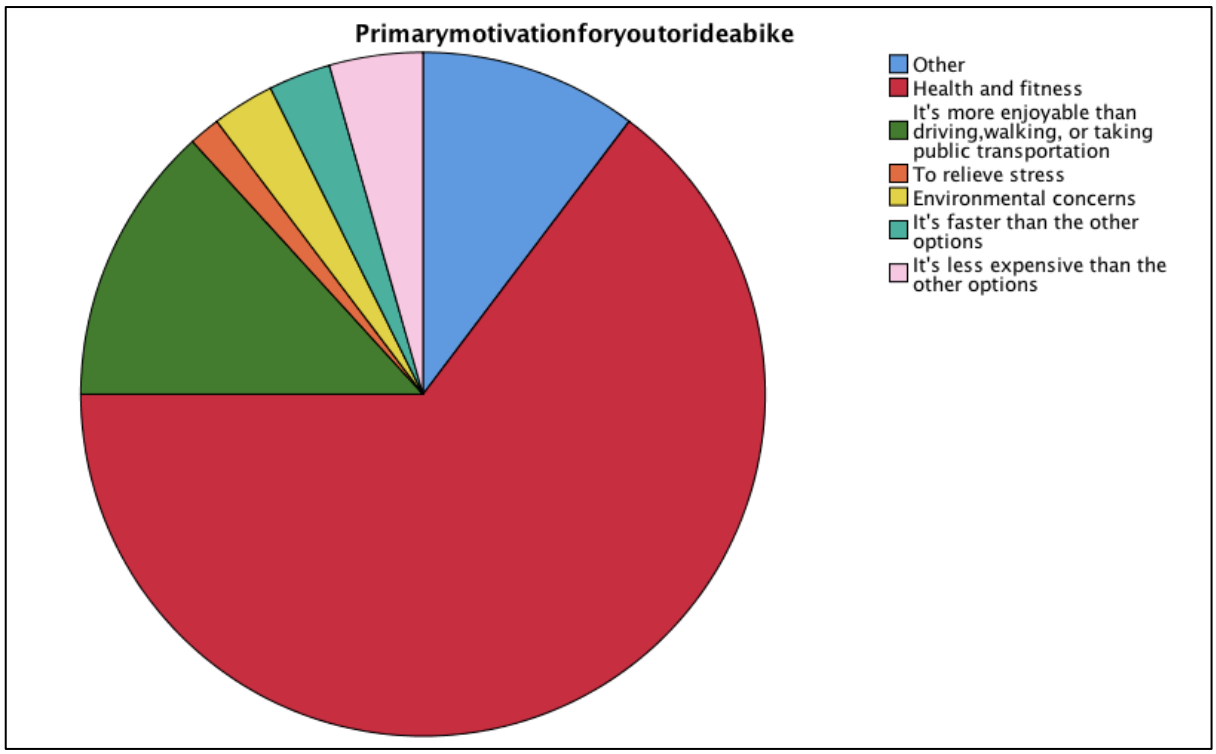

Figure 22: Pie chart visually showing breakdown of primary motivations for riding a bike

Statistics

		Awareofworldwideshortageofbikesanddparts	Didyouexperiencedelaysasaresultofpurchasinganewbike
N	Valid	68	68
	Missing	0	0
Mean		1.34	1.21
Median		1.00	1.00
Mode		1	2
Std. Deviation		.477	.821
Minimum		1	0
Maximum		2	2

Table 14: People aware of worldwide shortage of bikes and parts V did you experience delays as a result when purchasing a new bike or parts

Table 14 compares the means of people's awareness of a worldwide shortage of bikes and parts to the means of people who experienced delays due to the pandemic. A higher mean of 1.34 to 1.21 was recorded for awareness, an equal median (1.00), a higher mode for experience of 2 to 1, as well as a higher standard deviation of .821 to .477. Table 15 shows both results in a frequency table with 66.2% saying they were aware of the global shortage and 33.8 not being aware. Alternatively 29.4% of respondents experienced a delay and 45.6% did not experience a delay and finally 25% said none of the above meaning they did not experience either.

Awareofworldwideshortageofbikesandparts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	66.2	66.2	66.2
	No	23	33.8	33.8	100.0
	Total	68	100.0	100.0	

Didyouexperiencedelaysasaresultofpurchasinganewbike

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None of the above	17	25.0	25.0	25.0
	Yes	20	29.4	29.4	54.4
	No	31	45.6	45.6	100.0
	Total	68	100.0	100.0	

Table 15: Frequency table showing awareness of worldwide shortage V experience of delays

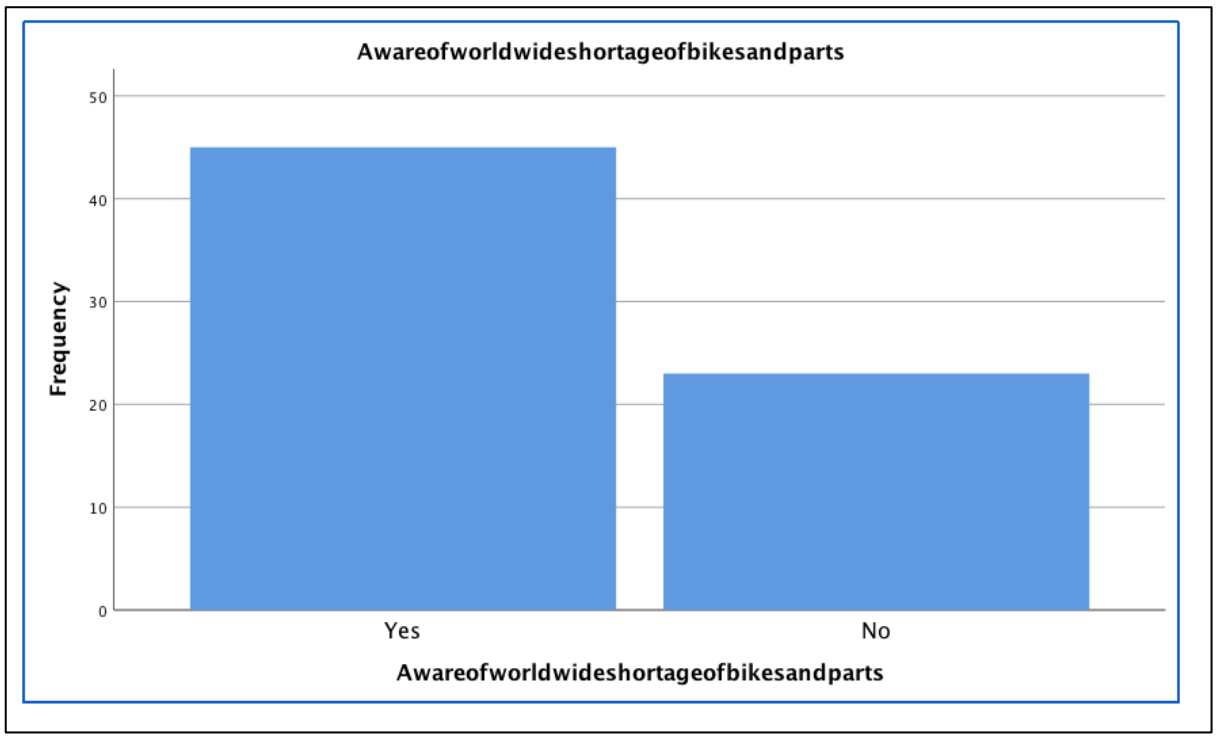

Figure 23: Bar chart showing awareness of worldwide shortage

Figure 23 represents the number who were aware (45) and the number who were not aware (23) of the shortage. Figure 24 shows the breakdown of respondents who said none of the above (14), yes (21) and no (33) to experiencing delays.

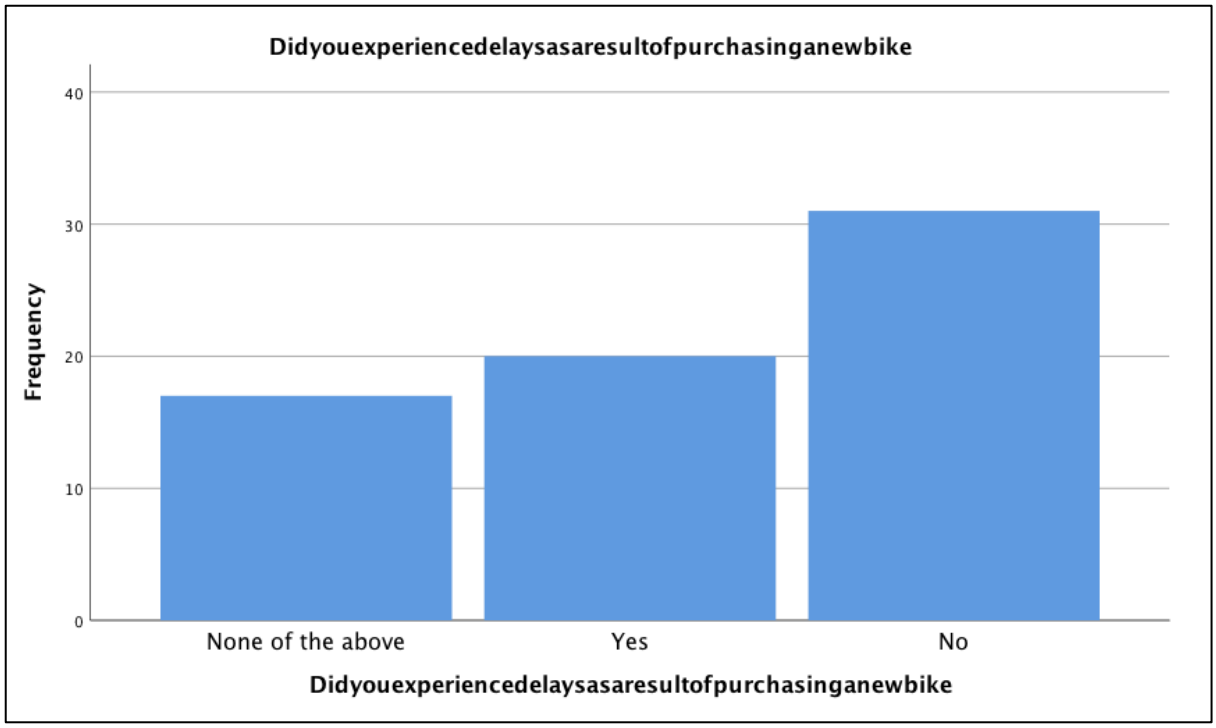

Figure 24: Bar chart showing peoples experience in whether they encountered delays or not

Inferential Statistics

ANOVA

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Awareofworldwideshortageofbikesandparts	Based on Mean	4.870	5	62	.001
	Based on Median	1.123	5	62	.357
	Based on Median and with adjusted df	1.123	5	58.948	.358
	Based on trimmed mean	4.386	5	62	.002

ANOVA

Awareofworldwideshortageofbikesandparts

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.575	5	.315	1.431	.226
Within Groups	13.646	62	.220		
Total	15.221	67			

Table 16: Showing One-way ANOVA for awareness of worldwide shortage

Table 16 shows a one-way ANOVA test carried out in order to determine if age category impacts the awareness of a shortage. The value is insignificant (.226) which reflects there is

not a difference in the means of age categories, therefore, it can be concluded that age category does not increase the awareness of knowledge of bikes and parts.

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
SinceCovidhaveyounoticedanincreaseincycling	Based on Mean	2.720	5	62	.028
	Based on Median	.844	5	62	.524
	Based on Median and with adjusted df	.844	5	32.211	.529
	Based on trimmed mean	2.241	5	62	.061

ANOVA

SinceCovidhaveyounoticedanincreaseincycling

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.970	5	.194	.844	.524
Within Groups	14.251	62	.230		
Total	15.221	67			

Table 17: Showing One-way ANOVA for awareness of increase in cycling

Table 17 shows a one-way ANOVA test carried out in order to determine if age category impacts the awareness of an increase in cycling. The value is insignificant (.524) which reflects there is not a difference in the means of age categories, therefore, it can be concluded that age category does not increase awareness of an increase in cycling.

Hypothesis Tests

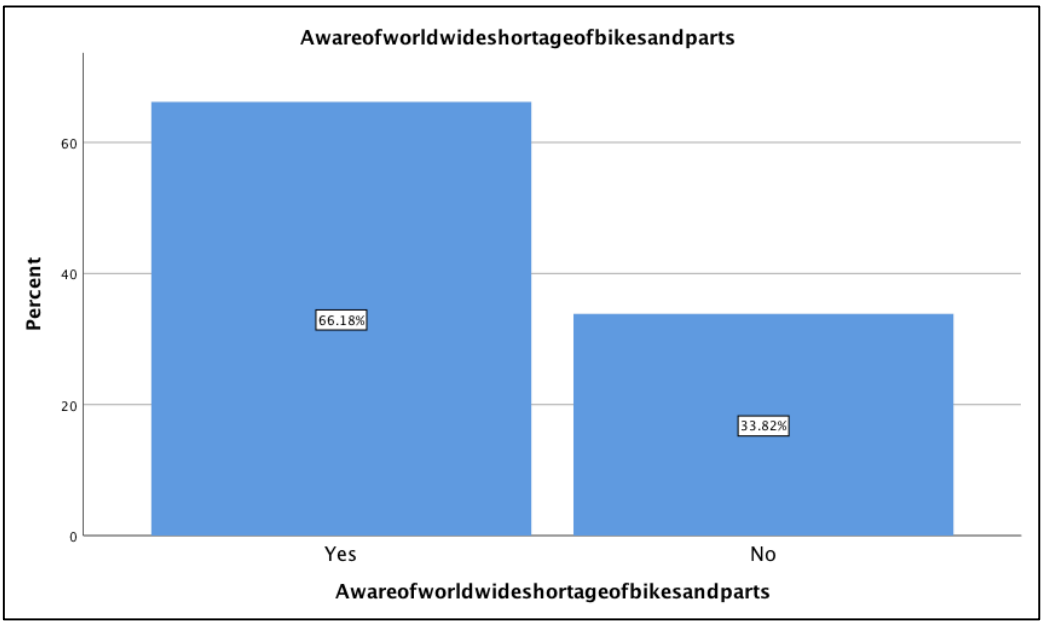

Figure 25: Bar chart showing percentage of people aware of worldwide shortage of bikes and parts

Figure 25 and table 18 shows the percentage of people who are aware of the worldwide shortage of bikes and parts as a result of Covid-19. 66.2% of the people were aware and a significantly less percentage of 33.8% who were not aware.

Awareofworldwideshortageofbikesandparts

N	Valid	68
	Missing	0
Mean		1.34
Median		1.00
Mode		1
Std. Deviation		.477
Skewness		.699
Std. Error of Skewness		.291
Kurtosis		-1.558
Std. Error of Kurtosis		.574
Range		1
Minimum		1
Maximum		2

Awareofworldwideshortageofbikesandparts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	66.2	66.2	66.2
	No	23	33.8	33.8	100.0
	Total	68	100.0	100.0	

Table 18: Frequency table showing people aware of worldwide shortage of bikes and parts

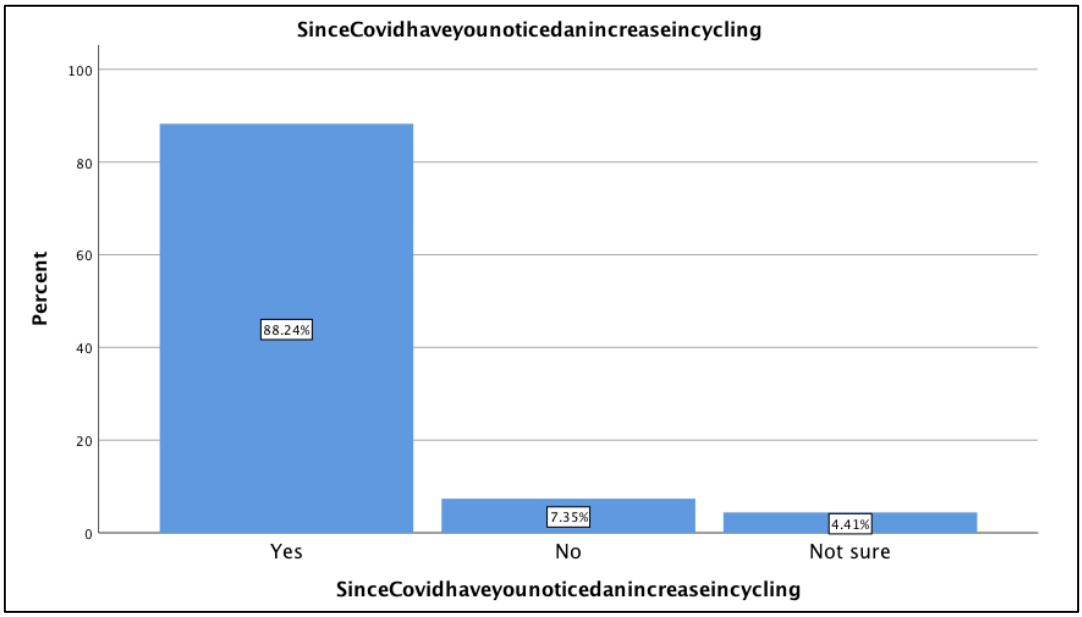

Figure 26: Bar chart showing percentage of people who have noticed an increase in cycling since the pandemics emergence

Figure 26 and table 19 shows the percentage of people who noticed an increase in cycling since the pandemic's emergence. 88.2% of the people noticed the increase while a significantly less percentage of 7.4% did not notice and 4.4% were not sure of the increase.

SinceCovidhaveyounoticedanincreaseincycling

N	Valid	68
	Missing	0
Mean		1.16
Median		1.00
Mode		1
Std. Deviation		.477
Variance		.227
Skewness		3.029
Std. Error of Skewness		.291
Kurtosis		8.490
Std. Error of Kurtosis		.574
Range		2
Minimum		1
Maximum		3

SinceCovidhaveyounoticedanincreaseincycling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	60	88.2	88.2	88.2
	No	5	7.4	7.4	95.6
	Not sure	3	4.4	4.4	100.0
	Total	68	100.0	100.0	

Table 19: Frequency table showing people who have noticed an increase in cycling since the pandemics emergence

Hypothesis One

Null Hypothesis

***H_0*:** The Covid-19 pandemic has had no significant effect on the cycling industry in Ireland.

Alternative Hypothesis

***H_1*:** The Covid-19 pandemic has had a significant effect on the cycling industry in Ireland.

The result of the analysis presented in figure 25 and table 18 shows that Covid-19 had a significant effect on the cycling industry in Ireland. The null hypothesis is rejected because from the analysis, there is a significant effect on the cycling industry in Ireland as a result of Covid-19 .

Hypothesis Two

Null Hypothesis

***H_0*:** The Covid-19 pandemic has had no significant effect on the Irish public's perception of cycling.

Alternative Hypothesis

***H_1*:** The Covid-19 pandemic has a significant effect on the Irish public's perception of cycling.

The result of the analysis presented in figure 26 and table 19 shows that Covid-19 had a significant effect on the Irish public's perception of cycling. The null hypothesis is rejected because from the analysis, there is a significant effect on the Irish public's perception of cycling in Ireland.

Chapter 6: Discussion

Discussion

There is a small, but growing array of literature on cycling in Ireland during the Covid-19 pandemic, however the results from this research intend to explore this topic in depth. The results indicate that Covid-19 has had a significant impact on the cycling industry and public perception of cycling in Ireland. According to this report, the Covid-19 pandemic has led to an increased interest in cycling since its emergence in 2020.

The objectives of this study were to explore the effects the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling. To achieve the research aims and objectives two accepted hypotheses were tested during this study to answer the research question.

The Covid-19 pandemic had a considerable impact on the Irish cycling industry and the public's perspective, as indicated by the data gathered from the participants through the online questionnaire. This study's findings are consistent with other research by Daly et al., (2020) that examined how Covid-19 affected cycling in Ireland.

The first alternative hypothesis claimed that "*The Covid-19 pandemic has had a significant effect on the cycling industry in Ireland*". This has been accepted based upon the results section presented above showing the effects Covid-19 had on the cycling industry in Ireland. From the literature reviewed both O'Sullivan (2020) and Quinn (2020) state that Ireland was significantly affected by the worldwide shortage of bikes and relevant parts. As a result, it is no surprise that the results presented above correspond to the public's knowledge of being aware of the shortage of bikes in Ireland. Additionally, the Irish public are simultaneously aware of the shortage globally and not just in Ireland. Furthermore, this aligns with Nurse and Dunning (2020) and Harrabin (2020) research into the global effects on the cycling industry.

The second alternative hypothesis claimed that "*The Covid-19 pandemic has a significant effect on the Irish public's perception of cycling*". This has been accepted based upon the results section presented above showing the effects Covid-19 had on the Irish public's perception of cycling. From the results a sizeable majority of the respondents felt that the pandemic had a

significant effect on the Irish public's perception of cycling in Ireland. From the literature it is clear that the pandemic had an impact on the public's perception through creating what is best described as a renaissance (Bernhard, 2020). This was further emphasised by Abdullah et al., (2021) who claimed the ongoing pandemic created a new momentum for cycling with people of all ages engaging in cycling activities (Nikitas et al, 2021).

Summary of Findings

The role gender plays in cycling is the first area whereby study findings and literature are correlated. The disparity in the numbers of men and women involved in cycling was noted in earlier works by Pucher and Dijkstra (2003) and Moudon et al. (2005). Men and women who cycle in Ireland participate at dramatically different rates, according to Carroll et al. (2020). Women make up about 25% of bicycles on Irish roadways. The people who cycled or started cycling during the pandemic were the target audience for the questionnaire. As a result, the gender split of 75% men and 25% women is consistent with the literature. This supports the research by Nguyen and Pojani (2022) which claims males were more likely than females to start cycling during the pandemic.

There were no significant changes recorded in the commuting modes of transport from pre Covid-19 to post Covid-19 except for a minor decrease in public transport. The drop in public transport coincides with the international decrease in transport noticed in a bid to avoid crowded transport (Nikitas et al, 2021). Moreover, shifts were noticed for transport when people were not commuting but travelling for other reasons. An increase can be seen in car transport, cycling, walking and car-pooling.

According to the literature Fischer and Winters (2021) and Abdullah et al., 2020 witnessed significant shifts in transport as a result of the public's change in transportation behaviours. Again a decrease was also noticed in public transport further emphasising Nikitas et al (2021) point. Furthermore Borkowski et al., (2021) and Harrington and Hadjiconstantinou (2022) also acknowledged the fact that people tried to avoid public transport.

The primary motivations recorded for riding a bike were 64.7% said for health and fitness, 13.2% claimed it was more enjoyable than other forms, 1.5% said to relieve stress, 2.9% said for emotional concerns, 2.9% said for its speed in comparison to other options and 4.4% said

it was less expensive than other options and 10.3% said other reasons. In comparison to a report by the Central Statistics Office (2019) the most common motivations for cycling were enjoyment (55.7%), fitness/ exercise (49%), freedom (17.6%) and convenience (16.5%). Although different questions, the enjoyment factors still correlate.

The Irish public's awareness of the shortage of bikes and parts was significantly higher than those who were not aware. From the literature it is clear that the shortage of bikes and parts was spread across the globe (Galway Advertiser, 2021). According to Heim, (2020) and Harrabin (2020) sales of bikes increased globally which corresponds to the Irish public's worldwide awareness.

Limitations

Several limitations encountered during the research are described below:

68 out of the 94 questionnaires that were returned were fully completed and had consent leading to a loss of 26 questionnaires. 16 of the 26 were fully completed questionnaires however the respondents failed to meet the requirements by selecting consent at the end. Additionally, the study employed a convenience sample technique, which meant that those chosen were known to the author and easy to get in touch with. It should be highlighted that the results of this study may not be generalizable to the population of Ireland and are realistically more relevant to the sample population.

SPSS was chosen as a means of interpreting and displaying the data. Unfortunately not enough time was spent by the researcher to understand SPSS. Prior realisation and experience should of been gained by the researcher in order to avoid the difficulties presented at the data analysis stage. SPSS is a complex tool but when used correctly it can greatly aid the research project however time constraints prevented SPSS full utilisation.

No financial support meant the study's capacity was limited and time was precious. Sample sizes and rewards were non-existent, coupled with the fact that many of the secondary sources availed of financial supports proving it difficult to benchmark the research accurately off some prior research.

Chapter 7: Conclusion

Conclusion of Research

This research aimed to identify the effects the Covid-19 pandemic had on the cycling industry and public's perception of cycling in Ireland. The administration of online surveys to participants allowed the researcher study the impacts of Covid-19 on cycling in Ireland possible. It was concluded from the quantitative data that Covid-19 did have an impact on cycling in Ireland. Both hypotheses that were set out to be tested were accepted.

In this study, evidence was found showing that cycling activities increased in Ireland in response to Covid-19. The cycling industry experienced high levels of demand along with negative supply shortages. Furthermore the public's perception of cycling shifted with awareness and uptake soaring.

The Covid-19 pandemic has allowed people to re-focus their lifestyle and as a result a lot of Irish people took up walking, running and cycling. An increase in cycling is particularly valuable since it promotes community spirit, improves public health and enhances cycling's reputation in society. It also encourages active aging and parenting. Additionally, cycling gives an area a friendlier and happier appearance (Nguyen and Pojani 2022).

The academic literature review led the researcher down the path to discover the plethora of written work associated with the impacts of Covid-19 on cycling. All of the studies allowed the researcher to gain a better understanding of the topic yet it was not sufficient enough to answer the research question, there appeared to be a gap in the literature. Consequently the research was conducted in order to investigate deeper into the impacts associated in Ireland concerning cycling during Covid-19. The analysis of the findings chapter, which was based on the primary research conducted using an online questionnaire, provided the answers to the study question. The effects on the cycling industry and public perception were shown in the findings chapter.

The Covid-19 crisis has significantly altered transportation behavior, and this change will persist as governments and people continue to weigh the advantages, disadvantages, and effects of using various modes of transportation. This study has revealed that, in Ireland cycling has

increased vigorously during the Covid-19 pandemic. It is not clear how long this boom will last in cycling but it is expected to continue for the foreseeable.

Research Recommendations

Based on these conclusions, practitioners should consider looking further into the future of cycling in Ireland. After experiencing an unexpected boom policy makers and practitioners should look ahead to try and capitalise on the revolutionary movement for the industry. The development of environmentally friendly transportation modes has increased in response to pressure worldwide. Cycling is one of the most environmentally friendly forms of transportation in Ireland with plenty of potential. The Irish government must seek to upgrade all bike infrastructure, parking, routes, schemes, safety, knowledge and social aspects. If this is done it will lead to successfully promoting cycling in Ireland. Clubs should receive more funding from the likes of cycling Ireland in order to promote and advance their presence. Additionally shop should seek to move part of their business online to keep up with the constantly advancing internet.

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Appendix

Appendix A: Questionnaire

1. I have read the above information and consent for my data to be used in this way.
   Yes

Section 1 - General Information

2. What age category do you belong to?
   18-24
   25-34
   35-44
   45-54
   55-64
   65+

3. What is your gender?
   Male
   Female
   Other

4. What is your current annual income level?
   Under €15,000
   Between €15,000 and €29,999
   Between €30,000 and €49,999
   Between €50,000 and €74,999
   Between €75,000 and €99,999
   Between €100,000 and €150,000
   Over €150,000

5. What is your educational background?
   Junior Certificate
   Leaving Certificate
   Higher Certificate
   Bachelor's Degree
   Postgraduate Diploma/Masters
   PhD
   Other

6. Which of the following best describes your current occupation?
   Management Occupations
   Business and Financial Operations Occupations
   Computer and Mathematical Occupations
   Architecture and Engineering Occupations
   Community and Social Service Occupations
   Education, Training, and Library Occupations
   Arts, Design, Entertainment, Sports, and Media Occupations
   Healthcare Practitioners and Technical Occupations
   Healthcare Support Occupations
   Protective Service Occupations
   Food Preparation and Serving Related Occupations
   Building and Grounds Cleaning and Maintenance Occupations
   Personal Care and Service Occupations

Sales and Related Occupations
Office and Administrative Support Occupations
Construction and Extraction Occupations
Installation, Maintenance, and Repair Occupations
Student
Other

Section 2 – Modes of Transport

7. What was your typical mode of transport pre Covid-19 for commuting?
   Car
   Public transport
   Bicycle
   Motorbike
   Car pool
   Walk
   Other

8. What is your typical mode of transport now (Post peak Covid-19) for commuting?
   Car
   Public transport
   Bicycle
   Motorbike
   Car pool
   Walk
   Other

9. How did you typically travel pre Covid-19 when not working?
   Car
   Public transport
   Bicycle
   Motorbike
   Car pool
   Walk
   Other

10. How do you typically travel now (Post peak Covid-19) when not working?
    Car
    Public transport
    Bicycle
    Motorbike
    Car pool
    Walk
    Other

11. Did you consider cycling to work during peak virus times? (E.g: to avoid crowded transport etc).
    Yes
    No

12. Which of the following best describes you?
    I don't ride a bike at the moment and I'm not interested in starting
    I don't ride a bike at the moment, but I'm thinking about starting
    During Covid-19, I started riding my bike but I don't see it as a mode of transport I'll use much in the future
    During Covid-19, I started riding my bike and I want to it do more
    I ride my bike every now and then (and did even before Covid-19)
    I ride my bike regularly (and did even before Covid-19) – it's one of my main modes of transport

Section 3 – Bicycle Use

13. Do you own or have access to a bike?
    Yes
    No

14. How many bicycles do you own or have access to in your household?
    One
    Two
    Three or more
    I don't own a bike

15. What is your primary bike type?
    Mountain bike
    Road bike
    Hybrid bike
    Electric bike
    Folding bike
    Gravel bike
    Cyclocross bike
    Fixed gear bike
    City bike
    Fat bike
    BMX bike
    I don't have a bike
    Other

16. Which type of rider category best describes you?
    Leisure/ fun
    Commuter
    Club rider
    Competitive rider
    Indoor (e.g. turbo trainer)
    Other

17. Approximately how often did you take a bicycle trip pre Covid-19? (Answer in whole hours per week)

18. Approximately how often do you take a bicycle trip now? (Answer in whole hours per week)

19. Do you ride your bike all year around?
    Yes
    No
20. Since the emergence of Covid-19 have you availed of any bike sharing schemes? (E.g. Bike rentals, Dublinbikes, Bleeper, Moby etc)
    Yes
    No

21. What is your primary motivation for you to ride a bike?
    Health and fitness
    It's more enjoyable than driving, walking, or taking public transportation
    To relieve stress
    Environmental concerns
    It's faster than the other options
    It's less expensive than the other options

Section 4 - Covid-19 cycling behaviour

22. Which of the following **activities** did you do whilst the Coronavirus restrictions were in place?
    Cycle outdoors
    Cycle indoors (e.g. turbo trainer)
    Walking
    Running
    Swimming
    None of the above

23. Due to the Covid-19 pandemic, do you believe people of all ages have taken part in more physical activities?
    Yes
    No
    Not sure

24. During the Covid-19 pandemic emergence from March 2020 until now, have you noticed an increase in cycling?
    Yes
    No
    Not sure

25. Would you have considered shopping for a bike and accessories pre pandemic?
    Yes
    No
    Not sure

26. Since the pandemics emergence do you think that you are more likely to shop for a bike and/or accessories?
    Yes
    No

Not sure

27. Did you purchase a new bike and/or accessories since the emergence of the pandemic?
    Yes
    No
    None of the above
28. Did the Covid-19 restrictions have an impact on your mental health?
    Yes
    No

29. Do you feel that your health and wellbeing was improved by engaging in cycling or other activities?
    Yes
    No
    None of the above

Section 5 – Business Aspect

30. Are you aware of the worldwide shortage of bikes and relevant parts as a result of supply shortages and unpredicted increases in demand?
    Yes
    No

31. Did you experience delays as a result of purchasing a new bike?
    Yes
    No

32. Did you get an old or new bike serviced during the pandemic?
    Yes
    No

33. Did you experience shortages when buying parts or accessories for your bike?
    Yes
    No
    None of the above

34. Due to the shortage of bikes, parts and accessories were you left dissatisfied?
    Yes
    No
    None of the above

35. Were you more inclined to purchase bikes and related products online or in your local bike store?
    Online
    Local bike store
    None of the above

36. Submit data
    Yes

Appendix B: Questionnaire Information and Consent Form

Study on what impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?

Research participant information and consent form

Researcher: Conor Harford **Email:** x18740825@student.ncirl.ie

Should you have any queries regarding the study, or your participation in the study, please contact the researcher above who will be happy to answer your questions.

I. DETAILS OF STUDY:

Welcome to the online questionnaire. This survey is about cycling in Ireland and the impacts as a result of the Covid-19 pandemic. Your opinion is important to this study. The researcher appreciates you taking the time to complete this questionnaire. It will take you about 10 minutes.

As part of the requirements for my Master of Science in International Business degree at the National College of Ireland, I have to carry out a research study. The study is concerned with *"What impact has the Covid-19 pandemic had in Ireland on a) the cycling industry and b) public perception of cycling?"*.

You are being asked to participate in a research study. In order to decide whether or not you want to be a part of this research study, you should understand enough about its risks and benefits to make an informed judgment. This process is known as informed consent. This consent form gives detailed information about the research study. Once you understand the study, you will be asked to tick the consent box at the end of this form if you wish to participate.

II. NATURE AND DURATION OF PARTICIPATION:

The researcher would like to invite you to be involved in this study. This would mean answering a 10 minute questionnaire. At the end of the study the researcher will collate the information gathered from all participants and analyse it for patterns of response. The information you provide is completely anonymous. It is impossible to trace your answers back to you once you have submitted them to the study.

III. POTENTIAL RISKS AND BENEFITS:

Due to the content of the questionnaire and the general topic of the Covid-19 pandemic, it is possible that you may become distressed in answering the questions, particularly if they resonate with you personally. Should this happen, you have the right to 1) terminate your participation in the study, and 2) skip any questions that you would prefer not to answer or think about. A debriefing form will also be provided at the end of the questionnaire detailing the contact details of the researcher who you may wish to contact for further information.

While there will be no direct benefit from participation, studies like this can make an important contribution to our understanding of Covid-19 on cycling in Ireland. As such, the findings from this study may be presented at national and international conferences and may be submitted for publication in peer-reviewed journals. However no individual participant will be identified in any publication or presentation. Individuals will not be offered any monetary or other rewards for their participation.

IV. PARTICIPANT RIGHTS:

Participation in this study is entirely voluntary. All information gathered from you will be non-identifiable (we do not gather data on names, addresses, birthdates). All data gathered will be stored by the researcher in a password protected file and kept, as per NCI policy, for a period of five years before being destroyed. You have the right to withdraw from the study at any time up until the point of submission of answers, after which it is not possible to identify and retrieve your personal response. There will be no penalty or loss of benefits to which you are otherwise entitled if you choose not to participate. In addition, your participation in the study may be terminated by the investigator without your consent.

V. AGREEMENT TO CONSENT:

The research project has been explained to me. I have had the opportunity to ask questions concerning any and all aspects of the project and any procedures involved. I am aware that participation is voluntary. I am also aware that my responses cannot be traced back to me personally.

Participant Consent by ticking the box: ☐

Date:

Appendix C: Questionnaire Debriefing Form

Participant debriefing form

Many thanks for your participation in this research study.

If you have any questions about this study, please contact Conor Harford at x18740825@student.ncirl.ie

Thank you again for your participation.

Conor Harford