UNIVERSITY OF AGDER

The Economic Impact of Norseman Xtreme Triathlon 2013

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This Master's Thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods used or the conclusions that are drawn.

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Abstract

This study provides an empirical examination of the direct economic impact of Norseman Xtreme Triathlon in Eidfjord. Confirming the results of other ex post analyses of sports in general, this study finds statistically significant evidence that Norseman Xtreme Triathlon contribute positively to a host's economy. The visitors of the event were surveyed with two different self-administrated questionnaires, developed by the researcher. The main generators of expenditure were found to be: accommodation, food and drinks, entertainment, tourist activities, local traveling and parking. The characteristics of the visitors do effect the expenditure pattern at site, and the preferences for each visitor are important to understand when it comes to length of stay at site, type of accommodation chosen, number of escorts and method of transport. These factors play a major role in the final results. The total, locally relevant, direct expenditure was calculated to be approximately 7 000 000 NOK, and this expenditure can be looked upon as an injection of "new wealth" to the local economy.

Acknowledgments

This thesis is written as part of my Masters degree in Financial Economics at the University of Agder. Last fall I contacted my supervisor and presented my idea for the thesis, and after some meetings the topic became clear. I am very grateful to my supervisor Professor Jochen Jungeilges for his guidance and several interesting discussions.

Special thanks are assigned to Line Amlund Hagen and the rest of the crew in Norseman Xtreme Triathlon. Thanks for introducing me to the crew family and for the experience of organizing such a race. I am looking forward to participate in the race myself on August 2th, 2014.

Kristiansand June 3rd, 2014

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1 Introduction

The worlds most ultimate triathlon experience is provided by the organizers of Norseman Xtreme Triathlon (hereafter Norseman XT). The event is known to athletes and sport enthusiasts all over the world due to its reputation of the extreme challenges. At 5 am every athlete makes the famous jump from a ferry into the dark fjord of Hardanger and swims 3800 meters to the shore. The water temperature in Eidfjord is almost never more than 16 degrees Celsius, in fact, the warmer the air, the colder the water. The next discipline is cycling. There is a 180 kilometers cycling journey over the national park of Hardanger through three steep mountains which includes a total ascent of 5000 meters. During the cycling adventure the athletes will experience a great deal of physical pain, and without mental strength they will never reach the transition zone before the cut-of-time. If the athletes make it to the final discipline, they can look forward to a marathon run of 4.42 kilometers. The finish line is located at the top of the mountain Gaustatoppen. At this point in the race, pain is something you associate with pleasure, the pain and soreness they once felt is now transformed to a positive outcome, and the more pain the better the experience. As you run up the hills with family and friends the athletes are totally focused on the road putting one foot in front of the other. Step by step they consume a total distance of 220 kilometers all in one day. The weather conditions are unpredictable and every athlete should expect both strong wind and heavy rain, as well as snow and a heating sun during the same race. The best way to prepare for a race of this kind, is to prepare for the worst, expect the worst, train hard and long and never give in before you have reached the goal.

The aim of this research is to gain an understanding of the characteristics of the visitors in the race and their expenditure pattern in the region. The expenditure of the visitors is studied to analyze the direct economic impact in the form of an injection of "new wealth" in the region. The approach is to collect primary expenditure data from visitors in the region during the event. The data has been collected through two different questionnaires developed by the researcher using a survey toolkit called SurveyXact. The collected data were then converted and analyzed to find the direct expenditure by using econometric models.

The visitors are classified as everyone who are in Eidfjord because of the event. The term visitors referes to the athletes, spectators, media and organizers and other people who came to Eidfjord due to the race in 2013. Every year, 250 athletes from about 20 different countries participate in the race. For security resons, the organizers demand that every athlete brings at least one person to support them

during the race. The group of organizers consists of more than 100 voluntaires, where some travel to the region about a week in advance and others arrive a few days before the race starts. At the race day and the days before every volunteer‘s expenses, accommodation, food, crew-uniforms and traveling costs, are covered.

Economical impact is defined as a measure of total expenditure within a defined area. The expenditure is to be directly attributed to the staging of the event. Based on visitor spending, the direct economic impact is an assessment of the increased spending as a result of the event. Economic impact has been found by previous research to be dependent on indicators such as length of stay, number of participants, evaluation of the destination, expenditure pattern, type of accommodation, number of companions and the characteristics of the visitors and their companions, see Raya (2012) . The visitors of the event decide if the sporting event is good by the amount spent in the destination as a result of the process of maximizing utility subject to budget and time restrictions. The holding of an event may generate wider economic effects and “intangible” costs and benefits, like social and environmental effects, other than the economic impact Dwyer *et al.* (2000) . The cooperation between the organizers of the event and the local government can be significantly improved by informing about the benefits that accrue. Governments are acting as the agent of their constituents in deciding whether or not to provide support to the race.

This thesis provides an empirical examination of the direct economic impact of Norseman XT in the local region of Eidfjord. The economic impact is measured by visitor spendings on the different proposed locally relevant categories. The results suggest that the level of direct expenditure is dependent on the characteristics of the athletes and their preferences at site. The variables which affect expenditure most are: length of stay, type of accommodation, employment status and method of transportation. The atlethes and the visitors who stay more than two days at site, stay the night in a hotel, travel with a rented car and do not have a full time job are the ones that spend most money at site. International athletes and visitors are more likely to rent a car, stay longer at site and they do bring more escorts to the event compared to the Norwegian visitors. The estimated direct economical impact is approximately 7 000 000 NOK. This expenditure would not have occurred if it was not for the event.

I will start by introducing relevant theory concerning economic impact of sporting events. After that, I will explain the methodology used to collect the primary data, find the transparency in the data set and methods used to derive economic impact measures. Before some concluding remarks, I will present the results from the data set and the expenditure pattern of the visitors in Eidfjord.

2 Theoretical Background

In this part of the thesis, there will be a presentation of the previous literature on how researchers have managed to measure economic impact and the most common approaches used to accomplish this. Based on this information, there will be a section on econometrics and definitions of statistical tools that later on will be used to analyze the results.

The theoretical framework of economic impact was first studied by Burns et al. (1988) , and has been further developed by several authors (including Crompton and McKay (1994) , Crompton (1995) , Dwyer *et al.* (2000) and Delpy and Li (1998)). Measuring economic impact not only allows public sectors to evaluate their economic return on investment, but it also demonstrates how events drive economic benefits that can lead to allowing event organizers develop practices which maximize these benefits. Economic impact studies typically seek to establish the net change in a host economy. In other words, cash inflows and outflows are measured to establish the net outcome. The most common approach in such studies is to collect primary expenditure data from visitors, spectators, media and organizers and/or to analyze secondary sales or tax revenue figures to estimate economic impact of events through well known methods. Some studies clearly show economical impact based on indicators such as: expenditure, evaluation of destination and number of participants, while other studies with similar approaches do not state any economical impact. The size of an event, location, number of visitors and timing is considered to be highly important for a successful event. The baseline for the previous studies is to compute and derive economic impact through some main principles. It is important to define what economic impact is, and in this context, economic impact can be defined through direct and indirect effects of expenditure. Furthermore, the area of research must be defined. This process will help to establish the type of event and which indicators that are of interest to demonstrate the economic impact.

Economic impact measurements have become a powerful tool to capture and prove benefits that can result from the hosting of an event. This toolkit is very useful for researchers to examine events and their economic impact whether it is on a local economy or a national economy. Economic impact measurements have also become powerful tools for those looking to capture and find evidence of the financial benefits that can result from the hosting of a major event. Measuring economic impact not only allows public sector to evaluate their economic return on investment, but it also demonstrates how events drive economic benefits that can lead to allowing event organizers develop practices which maximize these benefits.

Wilson (2006) studied the wider economic benefits of hosting four small-scaled local swimming events in the United Kingdom. The four studies are based on primary

research, namely self-completion questionnaires and the same questions used at each of the events. The questions used were: 1. How many visitors will come to the event from outside the local area? 2. How long will they stay in the local area? 3. How much will they spend? and 4. What will the expenditure be on? Wilson (2006:60)

These questions are used as a basic in other studies too, see Gibson *et al.* (2012) , Crompton (2010) , Hodur and Leistritz (2006) , Daniels (2007) and Elkington (1997)).

To analyze the data Wilson used average expenditure per day for each group of respondents. There were four groups of respondents: spectators, volunteers, officials and competitors. The findings in this study are interesting due to the large significant effect of the spectators. Overall the spectators generated about 50% of the additional expenditure, mostly used on food, drinks and accommodation. Many of the volunteers and officials lived in the local area, and this group did not bring any new money to the community. The competitor group was the second highest contributor to the overall impact with more than 30% of the additional expenditure. The size of the event has a significant effect on the results generated by the visitors.

Gratton *et al.* (2000) was the first to define events typology, and Wilson continued the work by adding additional typology following the development of events. Wilson makes it clear that events of Type E (see definition below) generate significant impact on additional expenditure, and that these events can act as a catalyst for the towns and cities where they are arranged. The larger the event, the more money spent on food and drinks. Furthermore, small events increase the sale of souvenirs and shopping. To understand the different typology of events, see Gartton *et al.* (2000:22) . Higram (1999) confirms that small communities that intend to develop sport tourism should focus on regular season sports for the hosting of small scaled events. Wilson gives a definition as an addition to the existing typology:

> Type E: Minor competitor/spectator events, generating very limited economic activity, no media interest and part of an annual domestic cycle of sport events (e.g. Local and Regional sport events in most sports). Wilson (2006:68)

The typology of Norseman XT do not fit this definition by Wilson in all aspects. The race has limited slots for athletes, but the media interest is large and the economic impact is significant. Norseman Xtreme Triathlon can be defined as a "special event". Special events are typically regarded as major generators of economic activity. Moreover, special events are defined as "major one-time or recurring events of limited duration, developed primary to enhance awareness, appeal and profitability

of a tourism destination" Ritchie (1984) . The direct economic impact of special events is estimated by the amount of expenditure by visitors, spectators, organizers and media. Only the proportion of expenditure that represents an injection of "new money" to the local region is relevant. It has also been recognized that the holding of an event may generate wider economic effects and "intangible" costs and benefits like social and environmental effects. Dwyer *et al.* (2000) . These intangibles are not quantifiable to generate economic impact directly.

Raya (2012) suggests in a research study that there are more than these simple economical indicators (expenditure, number of participants, evaluation of destination and timing) that effect the impact. Raya introduces "length of stay" as a new indicator of economical impact:

> "The length of stay of participants in a sporting event is a major concern for any destination, since longer lengths of stay are positively related to the aggregate earnings obtained from the event" Raya (2012:90) .

These results are convincing, and it is clear that the type of event makes a difference in the results of economical impact. Size, the athletes the event attracts, media interest and timing of the event, do play an important part in the decision making process. To understand the dependent variable, length of time spent at a given destination, Raya used an econometric duration model which made it possible to model and analyze the effects of different explanatory variables on the observed duration. The information needed to ascertain the characteristics of participants was taken from a survey carried out by Maresme County Council in (2009). The survey was administrated to the participants during the competition. The explanatory variables in the model were evaluation of the destination, expenditure, nationality, age, whether the participant had visited the destination before, type of accommodation, the number of companions and type of participants.

It was observed that foreign participants, increased expenditure, evaluation of destination, and the number of participant give higher survival rates for the participant. The type of accommodation appears to effect the length of stay, the opposite pattern was observed for participates who come to the event with friends, their age and and if they have visited the region before. According to Raya (2012:99) , the type of event helps to explain why these last variables result in a negative effect

> "it is likely that elite athletes travel with their family and coaches. This athlete will spend more days at destination pre-and post-event, as it need

> arriving a few days before, in order to prepare for the event, and a few days after, to recover." Raya (2012:99) .

These results indicate what type of people you want to attract to an event if the aim is to generate high economical impact. If you are able to attract elite athletes, you are almost guaranteed that they bring family or coaches, and that they stay for a longer period than regular athletes. Elite athletes stay longer, spend more money, bring family and coaches and they are loyal to the event if it is an annual event.

Gibson *et al.* (2012) wanted to examine sustainable development through sport tourism. They did an online-survey on participants and spectators of six small-scaled events in the United States to collect information. The data were analyzed using descriptive statistics: frequencies, percentages, means, medians, and standard deviations. The paper divides sustainable development in three pillars: economic, social and environmental. These three pillars define what is called a "triple bottom line" that is used as corporate accountability. The first pillar is the economic indicators. That is, the average of nights spent, the expenditure patterns for the day and overnight participants and the overall direct spending impact. The second pillar is the social indicators. These indicators are what other activities did the event participants and spectators take part in, what were the primary motivations for attending the event, what were the satisfaction levels of the participants and spectators with the event and the involvement of local residents. The third pillar is the environmental indicators, The facilities used at site, and the promotion of environmental quality within the community Gibson *et al.* (2012:163)

The results of this study suggest that a small-scaled sport event portfolio is viable as a form of sustainable tourism development. Tourism depends on attractions. If the environment where the event is arranged is in an attractive area for tourists it can effect the economical impact. An attractive area can potentially make the visitors want to stay for a longer period than just the race. The result of the study by Gibson can be compared to other studies within the field (ex: Raya (2012)). This article introduces more than the economical indicators, it introduce the social and environmental indicators as well. These indicatores are important to include in a deep study like this.

Baade *et al.* (2008) finds no statistically significant evidence that college football games contribute positively to a "host economy" in his study. The analysis is based on metropolitan areas that played host to big-time college football programs from 1970 to 2004. They stated in their research that neither the number of home games played, the winning percentage of the local team, nor winning a national championship have a discernible impact on either employment or personal income. It is interesting to see

these results when we try to understand why football is one of the main popular sports in the the US. During the period of their study there where more than 48 million fans at the games. The results are negligible on direct economic indicators such as employment, personal income and for the host economy. The reason is that even if restaurants, hotels and t-shirt sellers produce good results during the event, there are other retailers and service providers that do not benefit from the event. Baade et.al divide economical impact analyses into two main categories: ex ante studies and ex post studies. Ex ante studies predict the economic effect of an event by estimating the number of visitors to the event as well as their average expenditures, while ex post studies is based on information collected after the event/happening itself. Baade used an ex ante study in his research, and the model for the estimators used is as follows:

$$Y_{it=}\beta_0 + \beta_1 POP_{it} + \beta_j OTHER_{it} + \beta_k CFB_{it} + \gamma_t + \alpha_i + \varepsilon_{it}$$

They estimated using three different independent variables to explain the dependent variable (Y_{it}): growth rates of real personal income, employment, and real per capita income in year t. POP_{it} is the log population of city i in time t. $OTHER_{it}$ is a vector of dummy variables that represents identifiable deviations of the national business cycle. CFB_{it} represents the vector of college football proxies, which includes numbers of home games, winning percentage, and dummy variables for teams in a national championship season and the year following a national championship. If the perspective of the local government is taken, it is only the local effects of the event that are relevant. However, where a state or federal government is giving financial support for an event, it will be interested not just on the impact in the local area but also the impacts on the state and/ or nation.

Baumann *et al.* (2009) studied daily arrival data on Hawaii to determine the net change in tourism for a variety of sporting event. In this study it is found that three events generate a positive and significant net impact on arrivals. The three events studied eas: the Honoulu Marathon, the Ironman Triathlon, and the Pro Bowl. Alle these three events generate the same impact, but the triathlon event was the event who attracted leased visitors measured on daily arrivals. The number of visitors is not the best indicator in this study.

In short, the methodology employed to calculate the direct economic impact associated with a sports event can be summarized in six stages. These six stages are to quantify the number of visitors, establish basic characteristics of visitors, define area, quantify the number of visitors staying overnight at site, quantify their expenditure pattern, and quantify the expenditure on other categories at site.

Norseman XT uses existing facilities, it brings people to the community who would not have visited Eidfjord if it was not for the event and it provides income for hotels, restaurants and gasoline stations.

3 Methodology

3.1 Study site

Eidfjord is a small municipality in Norway. The village of Eidfjord has 614 inhabitants as of May 14th, 2013 **?**, 2013[1]. Large parts of Hardangervidda National Park and conservation area are found within the boundaries of Eidfjord. Steep mountains with waterfalls diving into the fjord is just one of the spectacular nature phenomena this beautiful region has to offer. In the centrum of Eidfjord there are two hotels with more than 100 rooms available for booking. Here you can also find restaurants, two food markets, one gasoline station and some tourist shops. Furthermore, there is a hotel a few minutes outside the centrum as well, and several cabins, guest houses and boarding houses that can be rented by visitors. Eidfjord has a portfolio of annual events: "Tour des fjords", "Eidfjord mini-fields cup", "Salomon Xreid Hardangervidda" and the "Eidfjord mini-triathlon". These events are regarded to generate economic activity in the local region, and to promote and position Eidfjord internationally.

3.2 The event

Norseman XT is an annual happening and the study of this thesis was carried out when the race was organized for the eleventh time August 3rd, 2013. Norseman XT was arranged for the first time in 2003, with a starting field of 21 athletes. The race quickly gained popularity and in 2013 there were more than 1200 eager athletes who dreamed of a slot in race. The race is limited to 250 athletes due to safety reasons. The course of the race runs point-to-point-, or fjord to peak, starting at sea level, with a 4 meter drop from a ferry into the dark fjord of Hardanger, continued by a 3800 meters swim to the shore. The second discipline consists of a cycling adventure of 180 kilometers through Hardangervidda and ends at the rocky peak of Gaustatoppen, after a 42 kilometer run. The total ascent is 5000 meters, and the total distance during the event is 220 kilometers. The male/female ratio is 85/15 and half of the athletes are Norwegian. There are more than 20 different countries represented from all over the world. 234 athletes completed the race in 2013, but only 160 athletes received the black t-shirt prize which is given to athletes who reach the top of the mountain before the cut of time at 15 hours and 30 minutes. Norseman XT is a race where the experience shared with family and friends is more important than the finish time.

[1] http://www.ssb.no/befolkning/statistikker/folkendrkv/kvartal/2013-05-14?fane=tabell\&sort=nummer\&tabell=112359

3.3 Data collection

The key input to economic impact assessment is the amount of expenditure generated by visitors, spectators, organizers and media in the local region. To collect necessary information two different self-completion questionnaires were used. Both questionnaires were made and collected in SurveyXact, a tool for developing questionnaires provided by the University of Agder. The information from SurveyXact was converted into STATA in order to conduct a more advanced statistical analysis.The first questionnaire (I) was handed out to the spectators, crew and officials during the event (see figure 2). The administrator approached as many respondents as possible and moved on if any were unwilling to participate in the study. The researcher managed to approach a sample of random selected spectators giving a response rate of 77%. The second questionnaire (II) was sent out by e-mail after the event (see figure 1). This was only for the athletes who had completed the event. 175 completely filled out questionnaires resulted in a response percentage of 74. These questions were carried out in a corporation with one of the event officials Line Amlund Hagen.

The raw material, that is data directly transformed from SurveyXact to STATA12, included variables of the type string and integer. Every variable of the type string had to be converted to the type integer for STATA12 for the material to be readable. Variables of this type were converted by assigning binary representations. If the string variables consisted of more than one binary variable they were coded by using l levels, which become l-1 levels to the variable. The dataset in the first questionnaire consists of four string variables represented by (0,1)-form; GEN, EXP, RVISIT and EDU, and five string variables with l-levels; CITIZEN, EMP, PRDIS ACCOM and MOT. The variables of the type integer were not changed. The data set in the second questionnaire consists of one string variable by (0.1) form: Gender, and two variables with l-levels: CITIZEN, ACCOM. The second questionnaire does not include as many variables as the first questionnaire. The variables are coded with the same method for both questionnaires and they can be taken care of in sections. There are eight variables representing the characteristics of the athletes, and these are gender, age, origin, education level, triathlon experience, preferred discipline, employment and whether they have visited Eidfjord before. Four variables define the athletes‘preferences at site and these variables are length of stay, the number of escorts, method of transportation and type of accommodation. The last section of variables is the expenditure. There are nine variables generating expenditure, these are accommodation, food and non-alcoholic drink, alcoholic drinks, local traveling and parking, entertainment, tourist activities, other alternatives and total expenditure.

3.3.1 Data set

I will now introduce the characteristics of the athletes‘ and the visitors in the data set. The variables are equal for both questionnaires.

The variable of gender (GENDER) is defined as the gender of the athletes‘ and the visitors survey at site. The gender variable is coded as a binary variable ((0,1)-form). The females are represented by zero and males by one. The age of the athletes‘ and the visitors (AGE) is a numerical value and the range is $20 \leq AGE \leq 60$. The nationality is coded as Origin (ORIG) and this variable has two binary variables represent in a dummy form; *origd1* and *origd2*. The levels are coded as Europeans, which include people from Denmark, France, Germany, Greece, Italy, Netherlands, Poland, Spain, Sweden, the United Kingdom and Austria. The non-Europeans include Oceania, South America, Asia, United States and South Africa. The Norwegians, which include all the athletes‘ from Norway. Table 1 shows how the dummies are coded.

Table 1: Origin

Origin	label	origd1	origd2
Europe	EUR	0	0
non- Europeans	NEU	1	0
Norway	NOR	0	1

**The table shows the the coding of the variable Origin*

The next variables, EMP, EDU, EXP,PRDIS and RVISIT were only given in the questionnaire meant for the athletes (see appendix). The reason for this was that the researcher could gather more characteristics from the athletes‘ based on their interest for triathlon.

Employment status of the athletes‘ (EMP) has four levels with three binary variables represented in dummy form *empd1, empd2* and *empd3*. The four levels are fully employed athletes, partly employed athletes, unemployed athletes and students. Table 2 show how the dummies are coded.

Table 2: Employment

employment status	Label	empd1	empd2	empd3
Fully employed	FE	0	0	0
Partly employed	PE	1	0	0
Unemployed	NE	0	1	0
Student	ST	0	0	1

**The table shows the coding of the variable Employment*

Education (EDU) is defined as the athletes‘ level of education. The binary represented dummies are secondary education (SED) which is represented by zero, and tertiary education (TED) represented by one. Then there is a variable giving information on whether the athletes have any triathlon experience (EXP). No experience is represented by zero and previous triathlon experience is represented by one. The preferred discipline (PRDIS) of the athletes is a ranking of the discipline they preferred most to least preferred discipline. This variable has three levels: swimming, cycling and running. Two binary variables represent in dummy form; *prdisd1* and *prdisd2*. Table 3 shows how the dummies are coded.

Table 3: Preferred discipline

Preferred discipline	prdisd1	prdisd2
Swimming	0	0
Cycling	1	0
Running	0	1

**The table shows the coding of the variable Preferred discipline*

Repeat visit (RVISIT) is coded as a binary (0,1)-form. If the athletes have visited the region before it is represented by zero, and if the athletes are visiting the region for the first time they are represented by one.

Now, I would like to make clear that the next variables are choices made by the visitors and athletes based on their interests and limitations. These variables are highlighted so the organizers of the event could evaluate and use information from these variables to improve the overall economic expenditure that is locally relevant. I will come back to this in the section of results (see section 4).

Length of stay (LOSTAY) is a numerical value and the range is $1 \leq LOSTAY \leq 9$. Escort (ESCORT) is defined as the number of escorts including family and friends of the athletes and the visitors. This variable is numerical and the range is $2 \leq ESCORT \leq 7$. The athletes and the visitors method of transportation to Eidfjord variable (MOT) consists of three levels, with two variables represented in dummy form *motd1* and *motd2.* The three levels are private car, rental car and other alternatives. Table 4 below shows how the dummies are coded.

Table 4: Method of transport

Transportation	Label	motd1	motd2
Private car	OC	0	0
Rental car	RC	1	0
Other	OT	0	1

**The table shows the coding of the variable Method of transport*

Accommodation (ACCOM) is defined as the type of accommodation chosen by the athletes. This variable consists of six levels, with five variables represented in dummy form *accomd1, accomd2, accomd3, accomd4* and *accomd5.* The six levels are hotel, cabins, boarding houses, camping, tri-camp that is organized by Norseman XT and other alternatives. Table 5 below shows how the dummies are coded:

Table 5: Accommodation

Accommodation	Label	accomd1	accomd2	accomd3	accomd4	accomd5
Hotel	HO	0	0	0	0	0
Cabins	HU	1	0	0	0	0
Camping	CA	0	1	0	0	0
Tri-camp	TC	0	0	1	0	0
Boarding House	BO	0	0	0	1	0
Other Alternatives	OT	0	0	0	0	1

**The table shows the coding of the Accommodation*

The expenditure variables are numerical values which were directly transformed to the data set. These variables had to be rescaled by dividing every variable with 1000. The dimension of the new variables are 1000 NOK and they are renamed with small letters (eaccom, ershop, efood, ealc, eent, etour, eltp, eother and etot) .

The variables are coded in such a way that we now are able to estimate the direct economic impact by the amount of expenditure by the athletes, visitors, spectators, organizers and media in a statistical method. Only the proportion of expenditure that represents an injection of "new money" to the local region is relevant. The data set now provides basic characteristics about the visitors e.g. where they live, composition of the party, length of stay and their expenditure pattern. Below is a summary of all the variables and their codings:

Table 6: Summary- Data set coding

Variable	Raw Material	Meaning	Type	encoded version	Binary	Dummies	Baseline
Demographics							
1	GENDER	gender	string	gendernc	genderd	1	female
2	AGE	age	integer	-	-	-	-
3	ORIG	nationality/orign	string	citizennc	origd	2	Norway
4	EMP	employment status	string	empnc	empd	3	fully employmed
5	EDU	education level	string	edunc	edud	1	secondary edu
6	EXP	tri experience	string	expnc	expd	1	no experience
7	PRDIS	prefered discipline	string	prdisnc	prdisd	2	swimming
8	RVISIT	previous visit at site	string	rvisitnc	rvisitd	1	no previous visit
Variables of choice							
1	ACCOM	type of accommodation	string	accomnc	accomd1	5	hotel
2	MOT	method of transport	string	motnc	motd	2	own car
3	LOSTAY	length of stay	integer	-	-	-	
4	ESCORT	number of escort	integer	-	-	-	
Expenditure							
1	EACCOM	accommodation	integer	eaccom			
2	ERSHOP	race shop	integer	ershop			
3	EFOOD	food and soft drinks	integer	efood			
4	EALC	alcoholic drinks	integer	ealc			
5	EENT	enterntainment	integer	eent			
6	ETOUR	tourist activities	integer	etour			
7	ELTP	local traveling/parking	integer	eltp			
8	EOTHER	other	integer	eother			
9	ETOT	total	integer	etot			

**The table shows a summary of all the variables in the data set and their coded names.*

3.4 Econometric modeling

In this section I will present the statistical tools used for analyzing the effect of economic impact in the local region of Eidfjord.

3.4.1 Regression analysis

Regression analysis is an important statistical tool used to describe and evaluate the linear relationship between a given variable and one or more other variables. In this thesis, I am going to test the dependent variable of expenditure against the independent variables in the data set effecting the expenditure. This procedure will attempt to explain movements in expenditure by referencing to movements in the other variables. The variable whose movements the regression seeks to explain is denoted y and the variables used to explain those variations by x_1, x_2,..., x_k. I will now present the simple regression approach (one regressor). In the empirical work I use the more complicated multiple regression approach.

This relationship between the variables can be described with a general equation for a straight line, if there is a positive linear relationship between x and y. An increase in x will lead to an increase in y. The general equation for a straight line:

$$y = \alpha + \beta x \tag{1}$$

As a researcher I would try to find the values of the parameters α and β that would place the line as close as possible to the data points. The most common method for this process is known as ordinary least squares (OLS). The method of OLS is to take each vertical distance from the data point to the line, squaring it and then minimize the total sum of the areas of squares (hence, least squares). The α parameter is a constant and the intercept of the linear estimated regression line. If x is equal to zero the value of y would be equal to α. The β is a parameter that reflects the slope of the linear estimated regression line. It gives the estimated change in y if x changes with one unit.

To make the model more realistic, a random disturbance term, denoted ϵ, is added to the equation:

$$y_t = \alpha + \beta x_t + \epsilon_t$$

where the subscript t (1,2,3...) denotes the observation number. Now, if we let y_t denote the actual data point, and $\hat{y}_t$ denote the fitted value from the regression line based on the model estimations. The new estimated regression line:

$$\hat{y}_t = \hat{\alpha} + \hat{\beta} x_t + \hat{\epsilon}_t \tag{2}$$

$\hat{y}_t$ is the estimated value of y_t for every observation t. The difference between the real value and the estimated value of y is defined as the error term. The error term can be reformulated as:

$$\epsilon_t = y_t - \hat{y}_t$$

The OLS method use the following notation:

$$\sum_{t=1}^{T} \varepsilon_t^2 = \sum_{t=1}^{T} (y_t - \hat{y}_t)^2 = L$$

The residual sum of squares (RSS) is denoted L, and L is minimized to find the values of α and β to give the line that is closest to the data.

It is always possible to calculate the values of the two parameters $\hat{\alpha}$ and $\hat{\beta}$ given the sets of observations x_t and y_t.

$$\hat{\alpha} = \bar{y} - \hat{\beta}\bar{x}$$

$$\hat{\beta} = \frac{\sum x_t y_t - T\bar{x}\bar{y}}{\sum x_t^2 - T\bar{x}^2}$$

The regression determination parameter, R^2, measure how well the regression model actually fit the data. R^2 can be defined as a square of a correlation coefficient, which implies that it must lie between 0 and 1. If the number of variables x increases, then R^2 will also increase. R^2 is a measure of what the model is trying to explain.

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS} \tag{3}$$

To make sure that the model evaluates the number of variables the adjusted R^2 measure is used.

$$adj.R^2 = \frac{\frac{RSS}{(T-t-1)}}{\frac{TSS}{(T-1)}} = 1 - (1 - R^2)\frac{(T-1)}{(T-t-1)} \tag{4}$$

TSS is the total sum of squares. That is the sum of all the square deviations on the observations of y to the estimated regression line $\hat{y}$. ESS is the explained sum of squares. This is the part of the TSS the model is able to explain. RSS is the residual sum of squares.

$$TSS = ESS + RSS$$

$$\sum_t (y_t - \bar{y})^2 = \sum_t (\hat{y}_t - \bar{y})^2 + \sum_t \hat{\epsilon}_t^2$$

Brooks (2008)

I use this simple regression to estimate the total expenditure generated in the region of Eidfjord during the event. The OLS is taken into the calculation by the model to estimate this expenditure.

A more general approach to measure the goodness of fit of the model to the data is to use information criterion. The first information criterion was the Akaike Information Criterion (AIC) developed by Akaike (1974) . The AIC is defined as:

$$AIC = -\frac{2log\mathcal{L}}{T} + \frac{2m}{T} \tag{5}$$

Where, $log\mathcal{L}$ is maximized value of likelihood. The first part of the equation give the goodness of fit, and the second part penalizes the model by the number of parameters used. The second part is known as the penalty function and varies for different information criterion. Another information criterion function is the Schwarz-Bayesian Information Criterion (BIC) developed by Schwarz (1978) . The BIC is defined as:

$$BIC = \frac{2log\mathcal{L}}{T} + \frac{m * log(T)}{T} \tag{6}$$

The BIC penalize the number of parameters used to a higher degree than AIC when the sample size is not normal.

3.4.2 Moments of Random Variables

It is important to provide measures of the variability of random variables. The first measure I would like to introduce is the arithmetic average that is weighted by the likelihood of occurrence, the mean. For a discrete random variable X the mean is defined as

$$\mu_X = E(X) = \sum_{i=0}^{\infty} x_t p_t$$

A measure for the spread around the mean μ_X of the values taken by a random variable X is given the variance, σ_x^2, denoted also by Var(X), which is defined as:

$$\sigma_X^2 = Var(X) = E((X - E(X))^2) = E((X - \mu_X)^2)$$

The square root of the variance, $\sigma_X = \sqrt{\sigma_X^2}$, is called the standard deviation of X.

Some random variables have probability densities with non-symmetric shapes. One way to measure asymmetry is to find the skewness of β_x and the corresponding density. The skewness of a random variable X :

$$\beta_x = E((\frac{X - \mu_X}{\sigma_X})^3) \tag{7}$$

For a random variable X the density is called positively skewed if $\beta_x > 0$, negatively skewed if $\beta_x < 0$ and symmetric if $\beta_x = 0$.

The data set includes some extreme values or observations stated by the respondents of the questionnaire. These extreme values can be reflected by the kurtosis κ_X, that is:

$$\kappa_X = E((\frac{X - \mu_X}{\sigma_X})^4) \tag{8}$$

Platen and Heath (2006)

These are useful measures to understand the density of the expenditure variable.

All these introduced measures are used to calculate and derive the impact of expenditure by the athletes and the visitors of the event.

3.4.3 Correlation analysis

Pearson‘s linear correlation coefficient ρ between two random variables X_1 and X_2 is defined by:

$$\rho\,(X_1, X_2) = \frac{Cov(X_1, X_2)}{\sqrt{Var(X_1)Var(X_2)}} \tag{9}$$

I use the correlation coefficient to measure the association between the variables in the data set. If the correlation between two variables is high, then it can be stated that there is some structure of dependence between the variables of interest. The correlation interval ranges over the interval $[-1, 1]$. Fusai and Roncornoni (2008:236) . The correlation simply gives information that there is evidence for a linear relationship between the two variables, and that the movement in these to variables are on average related to an extend given by the correlation coefficient. I use correlations to see if the characteristics of the athletes have any relationships with their expenditure pattern and preferences.

3.4.4 Box-Cox transformation

This transformation is used to make data normally distributed to be able to use statistical tools for analysing the results. The box-Cox transformation:

$$Y^{(\lambda)} = \frac{Y^{\lambda} - 1}{\lambda},\ \lambda \neq 0$$

where I test this function on particular: $Y^{(\lambda)} = \begin{cases} ln(Y), & \lambda = 0 \end{cases}$
the Lambda Model (right-hand-side):

$$Y_j^{(\lambda)} = \beta_0 + \beta_1 x_{1j}^{\lambda} + \beta_2 x_{2j}^{\lambda} + ... + \beta_k x_{kj}^{\lambda} + \gamma_1 z_{1j} + \gamma_2 z_{2j} + ... + \gamma_\iota z_{\iota j} + \epsilon_j$$

Box and Cox (1964) . The lambda value indicates the power to which all data should be raised. $\epsilon \sim N(0, \sigma^2)$ and the dependent variable is Y. Each independent variable is $x_1, x_2 \ldots, x_k$ is transformed with λ.

4 Results

The aim of this study is to find the direct economic impact of Norseman Xtreme Triathlon in the region of Eidfjord. The effect is submitted by the visitors in the area, including athletes, spectators, media and organizers. Their expenditure can be looked upon as an injection of "new wealth" in the local area. The hotels, cabins, boarding houses and camping areas are full during the weekend of the race, and the region is busy with people from all over the world. These visitors would not have been in Eidfjord if it was not for the race. The next section is a descriptive report of the main features of the collected data.

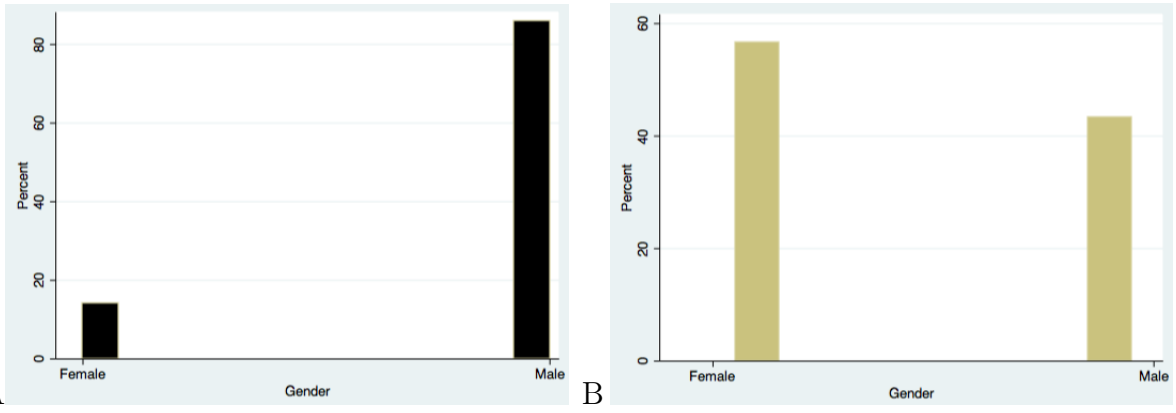
I will present the results from the demographics of the visitors, spectators, athletes, media and organizers, and the economic impact results as an effect of total expenditure in the local region of Eidfjord. The results are analyzed using a statistical tool called STATA.

4.1 Descriptive data analysis

The demographics of the athletes and the visitors are presented below. Graphs and comments from the first survey, where the athletes are the respondent group, are referred to as A (black colored histogram), and the graphs and comments from the second survey where visitors, spectators, organizers and media are the respondent group, are referred to as B (the khaki colored histogram). The y-axes represent the percentage of respondents, and the x-axes represent the result of the given variable coded in the data set.

The distribution of gender is shown in Figure 1:

Figure 1: Histogram: Gender

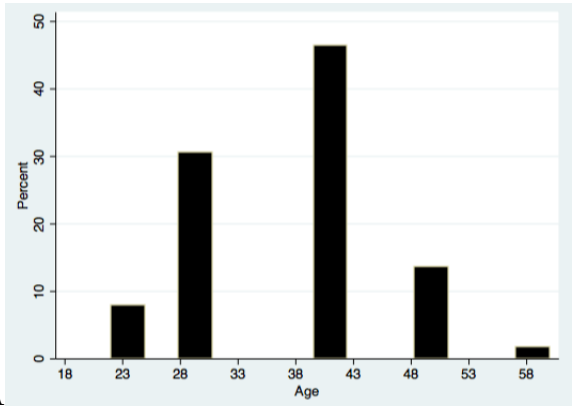


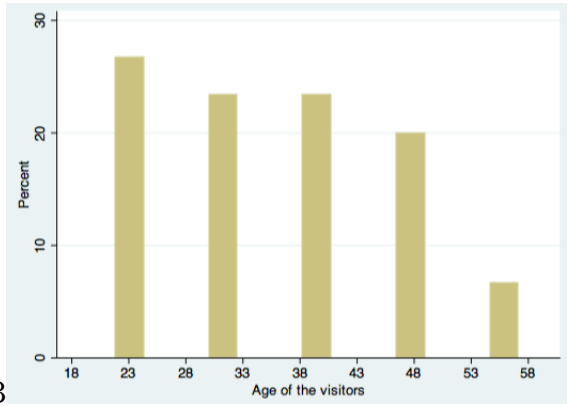
A. The result from the histogram show that most of the athletes are male, represented by 86%. The females are represented by the remaining 14%. In extreme

sports like Norseman XT it is normal that males dominate. B.The histogram result from the visitors show that 56.67 % are female respondents and 43.33 % males. These are randomly selected respondents.

The distribution of age is shown in Figure 2:

Figure 2: Histogram: Age

A 

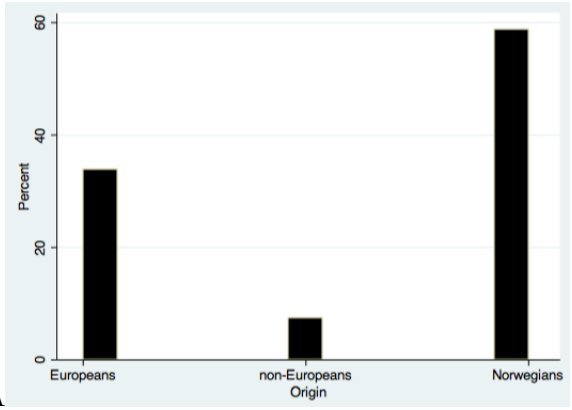
B 

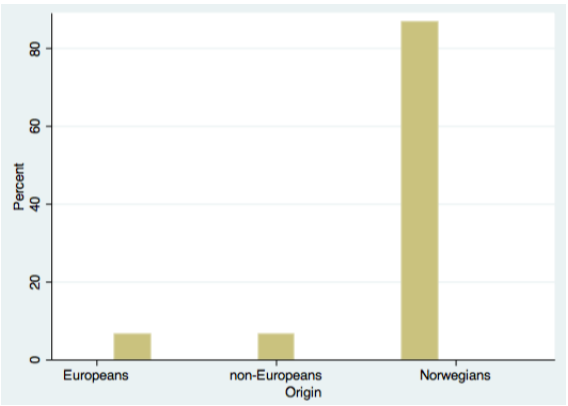
A. The x-axis show the age in the respondent group and the range is 18 to 58. There is a gap of 5 between the age levels for both histograms representing the mean age. The mean of age is 37.22 for the athletes. By now it is clear that a random chosen athlete is likely to be a male around the age of 37. The mean of the age gives information about more than the age itself. It is reasonable to believe that a male in his late thirties have a full time job and a family to take care of, and this might reflect his expenditure pattern and the number of escorts. If the mean age was 25 it would had been more difficult to draw these conclusions.

B. The mean age is 36 years for the visitors, which is similar to the athletes mean of age.

The distribution of origin is shown in Figure 3:

Figure 3: Histogram: Origin

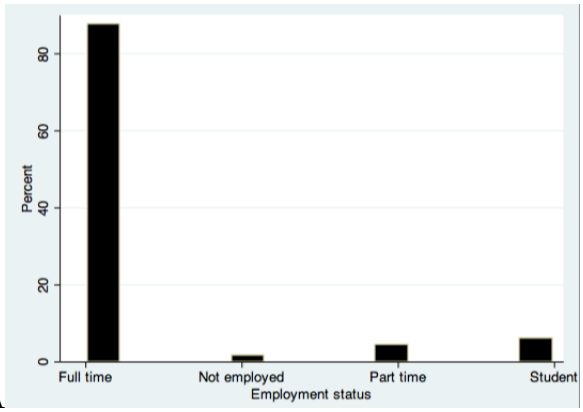
A 

B 

A. There are more Norwegian athletes than international athletes in the respondent group. Norwegians are represented by 59% of the sample. B. Most of the visitors represented in this sample group are Norwegians.The organizers of the event demand that there is a at least 50 % Norwegian athletes‘ in the race, a fixed percentage based on organizers preferences. “Since the race is arranged in Norway there should be Norwegians in the race”. If the organizers were willing to re-consider this percentage level of athletes, it could result in even higher economic impact in the region (see correlation and regression, section 4).

The distribution of employment status is showns in Figure 4:

Figure 4: Histogram: Employment

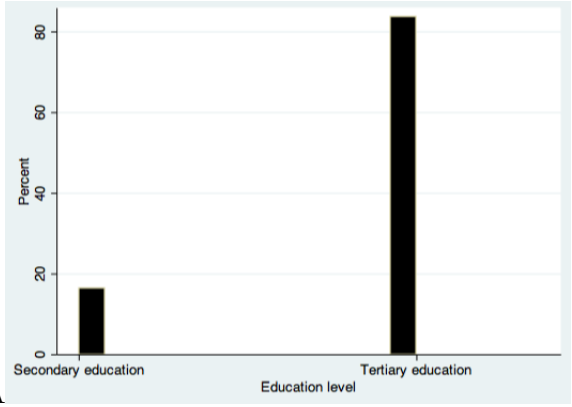


A

A. The histogram shows that most of the athletes are full time employed, about 88 % are full time employed. This reflects their economical status and limitations due to expenditure which I mentioned before. Most of the athletes are Norwegians, full time employed men about the age of 37.

The distribution of education level are as follows:

Figure 5: Histogram: Education

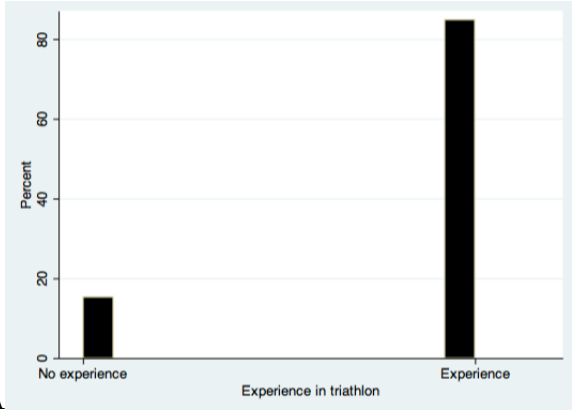


A

A. 84% of the athletes have tertiary education. The fact that this many of the athletes have completed an education at university level illustrates their ability to complete a structured long time plan, which is highly transformable to extreme sports. In a sport like triathlon, the preparation phase is more important than the actual race. Athletes need to be structured to follow a training plan, and motivated to complete the plan to reach the main goal.

The distribution of experience is shown in Figure 6:

Figure 6: Histogram: Experience

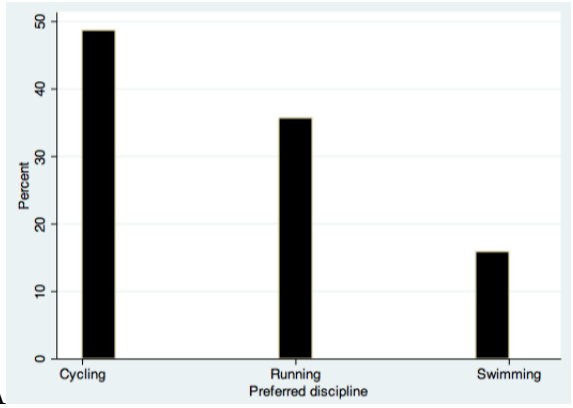


A

A. Most of the athletes have experience from a triathlon race before they participate in Norseman XT. 84% of the athletes have previous triathlon experience. It is not uncommon that many participants have done other triathlons before Norseman XT as previous experience is beneficial. Norseman XT consists of a maraton distance in each of the disciplines, and it is known to be the most extreme triathlon in the world.

The distribution of the preferred discipline is shown in tFigure 8:

Figure 7: Histogram: Preferred discipline

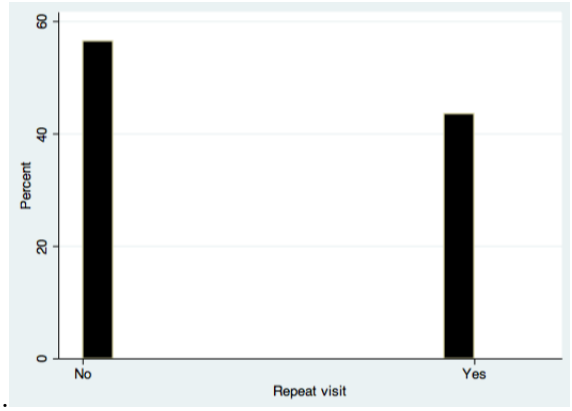


A

A. The results from the histogram show that 49% of the athletes prefer cycling, that is half of the athletes, 36 % of the athletes prefer running, and only 16 % prefer swimming. Swimming is the discipline with the most technical difficulties, and it is not easy to learn how to swim with an efficient technique, it is a time consuming process and most of the athletes use the preparation time to learn how to swim crawl with the right technic.

The distribution of repeat visit is shown in Figure 8:

Figure 8: Histogram: Repeat visit



A.

A. The results from the histogram show that most of the athletes have never visited the region before. It is an advantage to have visited the area in the competition area. The athletes are better prepared, if they try to run the steep hills, cycle over the mountains and swim in the cold fjord, mentally and physically.

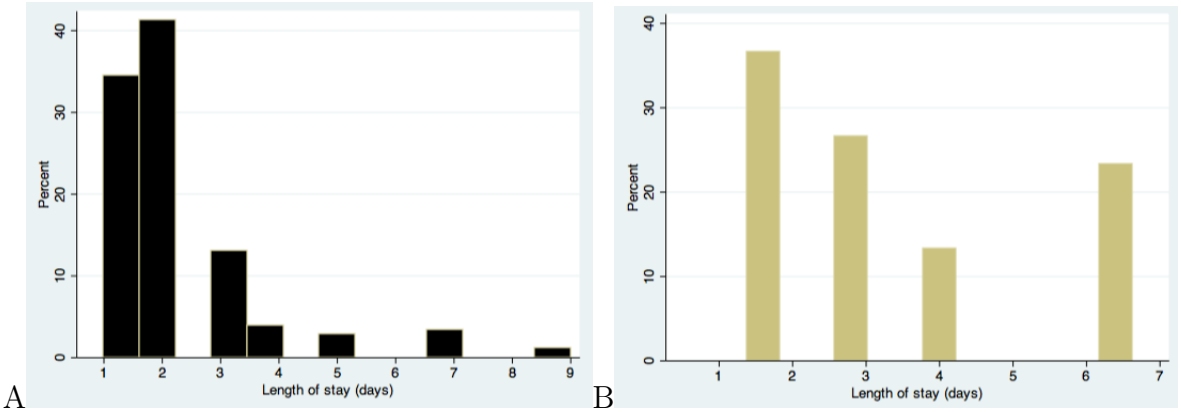
I would now like to sum up the characteristics of athletes in the sample from the

results above. Most of the athletes are males and since this race is a demand race of extreme sports it is not rare to see that the male athletes dominate. The mean age of the athletes is approximately 37 years. 88% of the athletes have higher education and they are fully employed. If the athletes were not full time employed, they would not have the same budget for expenditure at site. There are more Norwegian athletes participating than international athletes. The athletes prefer cycling to running and swimming. Most of the athletes have experience from other triathlon events. However, few of them have have visited the region of Eidfjord before.

In the following section I will present the variables that can be effected by preferences due to the characteristics of the athletes. The histograms below show expenditure from both surveys: A (black) representing the expenditure from the athletes, and B (khaki) representing the expenditure by visitors, spectators, media and organizers.

The distribution of length of stay is shown in the histogram below:

Figure 9: Histogram: Length of stay



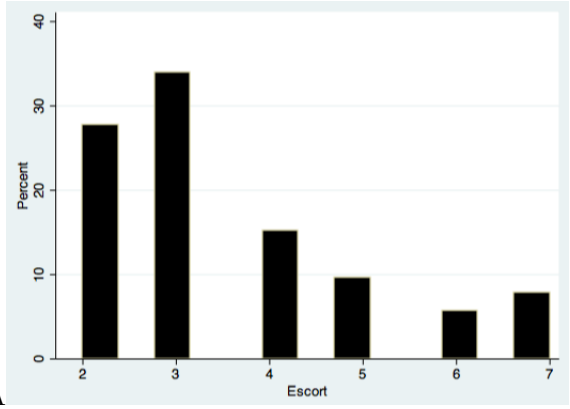
A. The y-axis gives the interval of length of stay from 1 to 9 days, with a gap of 1. The mean of length of stay for the athletes is 2.19. The athletes stay for more than 2 nights at site.

B. The y-axis gives the interval of length of stay from 1 to 7 days. The mean of length of stay for the visitors is 3.62. This result is higher than the atlethes‘ length of stay . The explanation behind this figure can be that the organizers of the race, who are included in the sample group, are at site up to one week in advance to help prepare and organize. There is a large “to do -list” for the Norseman XT crew. They have to mark the route with banners, secure the roads, prepare the starting area, the transition zones, do the registration process of every athlete and their escort. They

also have to make sure the spectators do not disturb the athletes during the race. It can be that some of the random selected visitors arrived the day of the race to observe without knowing the athletes. The study by Raya used length of stay as the dependent variable for generating expenditure in the study of Raya (2012) , and it is an important indicator for a successful event.

The distribution of the number of escorts the athletes bring at site are shown in Figure 10:

Figure 10: Histogram: Escorts

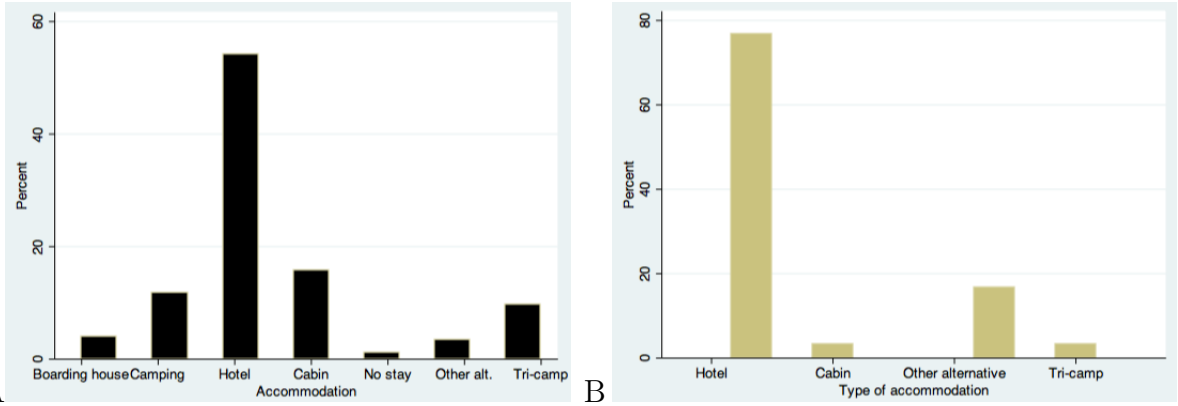


A

A.The y-axis represents the interval of the number of escorts the athletes bring and the range is from 2 to 7 escorts. The mean of escorts is 3.55. This result is a considerable figure, and the more escorts the athletes bring at site, the better for the event and the region of Eidfjord. The more escorts, the more food and drinks are sold, hotels booked and face-to-face marketing made. As mentioned in the literature review the number of escorts is an important indicator for measuring economic impact and for arranging an successful event. Wilson (2006) studied the average expenditure each day per visitor, which makes it clear that one more escort results in more expenditure. In the study by Baade *et al.* (2008) , the number of visitors was the main indicator for determining economic impact of college football games, which is a spectator sport.

The distribution of preferred type of accommodation is given in Figure 11:

Figure 11: Histogram: Accommodation

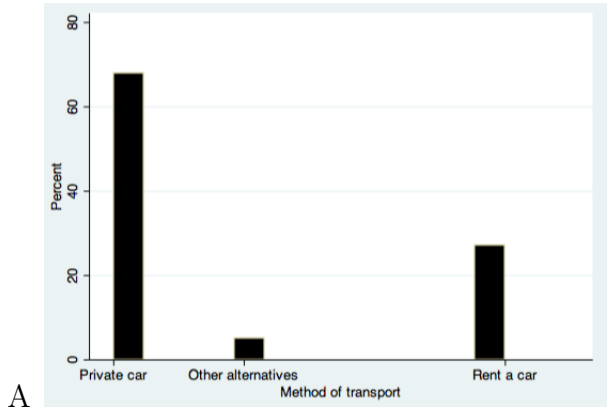


A. The data coding is 1 for boarding house, 2 for camping, 3 for hotel, 4 for cabins, 5 for those athletes who did not stay the night, 6 other alternatives and 7 for tri-camp. The most preferred type of accommodation for the athletes is to stay at a hotel. This is understandable since it would be wise to have a good night sleep before a competition like this.

B. The data coding is 1 for hotel, 2 for cabins, 3 for other alternatives and 4 for tri-camp. Most of the visitors, or about 77% of the sample, prefer to stay the night at a hotel. If the athletes stay at a hotel, it is likely that their escorts stay in the same location.

The distribution shows the preferred transport method for the athletes, Figure 12:

Figure 12: Histogram: Method of transport



The results from the histogram show that the athletes prefer to use their private car. Every athlete has to have an escort with a car for support during the race.

There is limited public transport to Eidfjord.

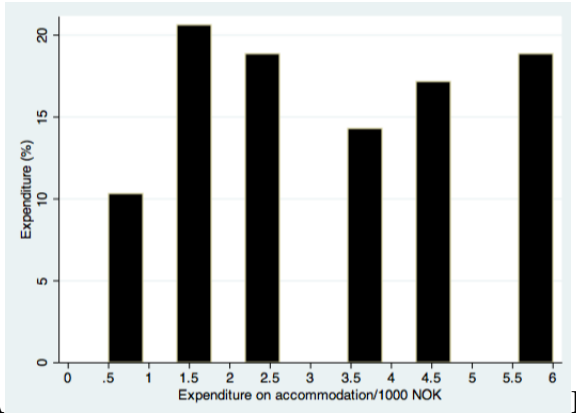
By now, I can interpret the result in such a way that the athletes prefer to travel to Eidfjord in their private car, that they prefer to stay overnight in a hotel for more than two nights and that the majority of the athletes bring more than three escort to the event.

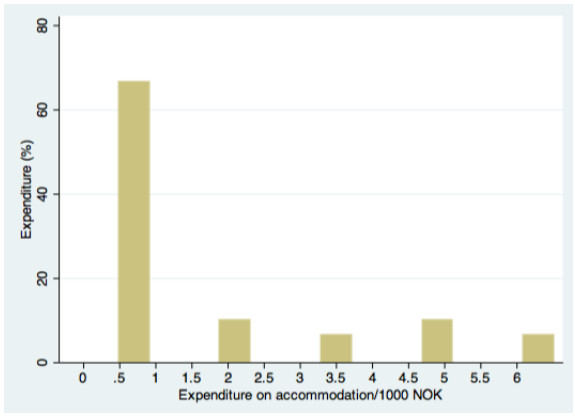
4.2 Expenditure

In this section I will present the expenditure pattern of the athletes and the vistıors . The x-axis presents the percentage of expenditure, and the y-axis presents the different expenditure categories. Expenditure is given in whole figures between 0 and 42. Earlier we divided expenditure by 1000, remember that the numbers stated are in 1000 NOK, this holds for standard deviation to.

The histograms below show the expenditure on accommodation:

Figure 13: Histogram: Expenditure

A 

B 

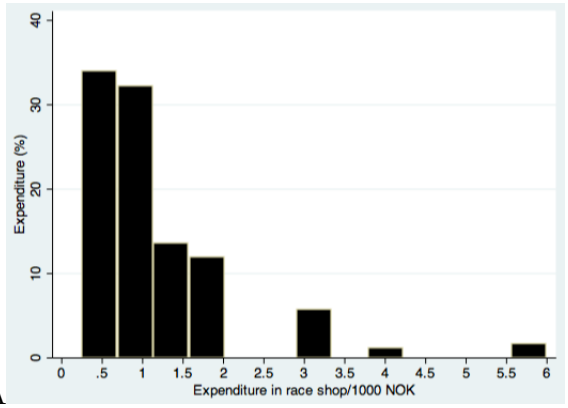
A. The x-axis gives the value of expenditure between 0 and 6, with a gap of 0.5 and the y-axis shows percentage of the expenditure generated (this holds for both histograms above). Most of the atlethes‘ use 1.5 (1500 NOK) on accommodation expenditure. The mean expenditure on accommodation is 3.234286.

B. The mean expenditure on accommodation for the visitors is approximately 1.40. This number is significantly lower than the athletes‘ expenditure, and the reason for this can be that the group is mostly represented by organizers of the event. These organizers get coverage for their accommodation expenditure by Norseman XT. They might have stated that they had no expenditure on accommodation in the questionnaire. The other reason for low expenditure on this category can be that the athletes they travel with cover their accommodation expenses. An athlete who

travels with the whole family would state higher expenditure based on the expenses of the whole family.

The histogram below shows the expenditure in race shop:

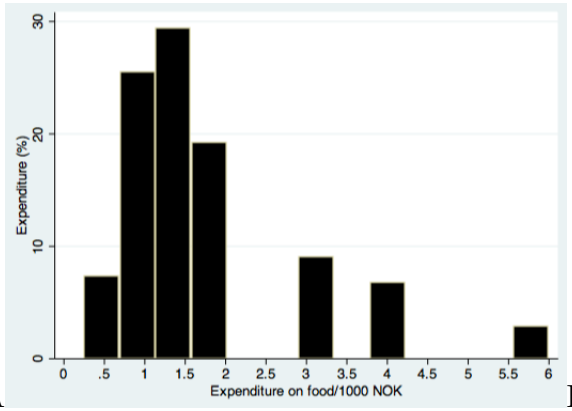
Figure 14: Histogram: Race shop

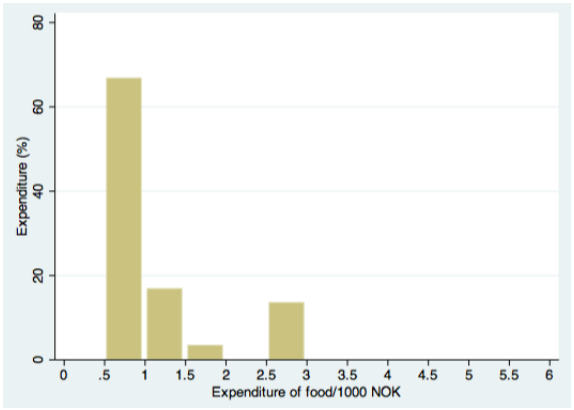
A 

A. The x-axis gives the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis shows the percentage of the expenditure generated. The mean of expenditure in the race shop is 1.1638, that is approximately 1600 NOK per athlete. This expenditure goes directly to the organization of Norseman XT, as stated in the budget (see appendix). This expenditure goes back to the region of Eidfjord to some extent. Since the goal of this study is to find the direct expenditure generated by the athletes, this variable will be omitted later in the calculations, but it is important to see that the athletes are willing, and that they have the opportunity to finance this expenditure. The standard deviation of race shop expenditure is 1.03.

The histograms below shows the expenditure on food and non-alcoholic drinks:

Figure 15: Histogram: Accommodation

A 

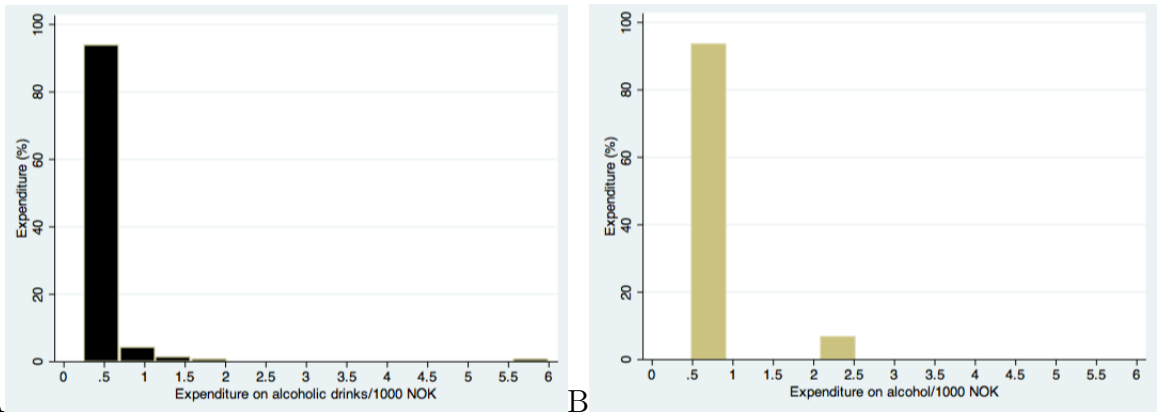
B 

A. The x-axis gives the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis shows a percentage of the expenditure generated (this holds for both histograms). The mean expenditure on food and non-alcoholic drinks is approximately 1.80, that is 1 800 NOK per athlete. Most of the athletes stay for 2.19 days, which results in a mean expenditure on food and drinks per day to 1800/2.19 = 821.92 NOK. The standard deviation of expenditure on food and non-alcoholic drinks is 1.15644.

B. The expenditure on food and drinks generated by the visitors results in a mean of 0.92, that is 920 NOK per visitor. The standard deviation is 0.78.

The histograms below shows the expenditure on alcoholic drinks:

Figure 16: Histogram: Alcoholic drinks

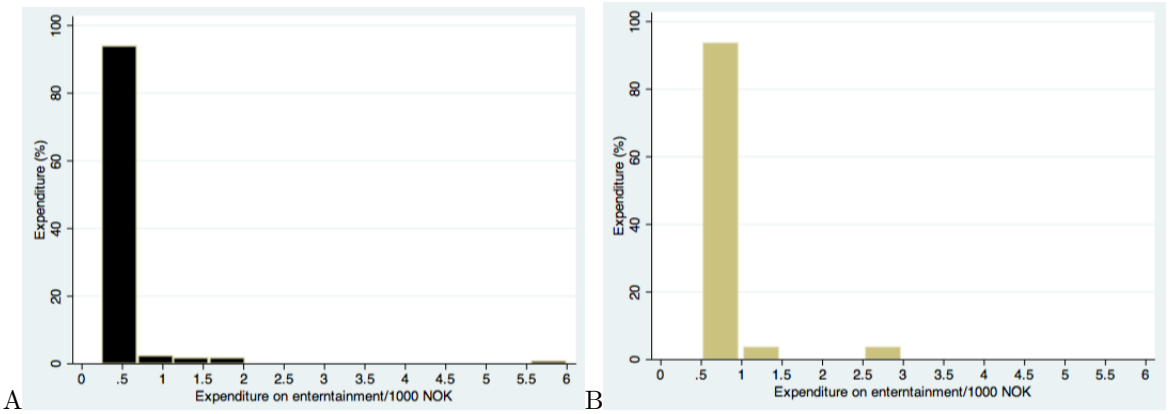


A.The x-axis gives the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis show a percentage of the expenditure generated (this holds for both histograms). The mean expenditure on alcoholic drinks is 0.34, that 340 NOK. The standard deviation is 0.488.

B. The mean expenditure generated by the visitors is 0.63, that is 630 NOK per visitor, which is more than twice of the expenditure of the athletes. Alcoholic drinks are more expencive than soft drinks in Norway due to the taxes.The visitors have more time to enjoy themselves compared to the athletes who use the time to compete. At least one of the escorts need to stay sober to be able to drive the support car.

The histograms below shows the expenditure on entertainment:

Figure 17: Histogram: Enterntainment



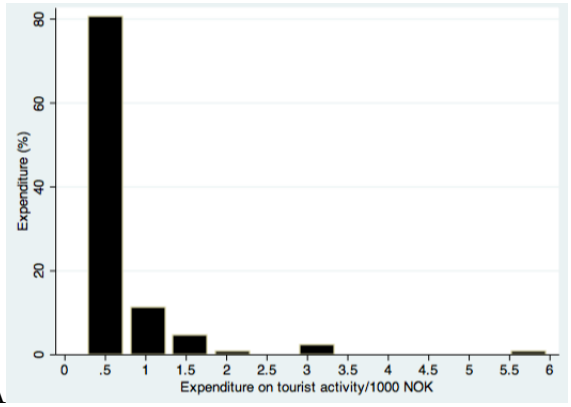
A B

A.The x-axis gives the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis shows a percentage of the expenditure generated (this holds for both histograms). The mean of expenditure on entertainment by the athletes are 0.35, that is 350 NOK per athlete, and the standard deviation is 0.52. This expenditure is generated in advance of the race, since there are no entertainment provided by the Norseman XT after the race. The histograms show that this expenditure is significant, but the organizers of the event need to use this information sufficiently.

B. The mean provided by the visitors is 0.6, that is 600 NOK per visitor. and the standard deviation is 0.46. The visitors have more time to be entertained than the athletes.

The histogram below shows the expenditure on tourist activities:

Figure 18: Histogram: Tourist activities



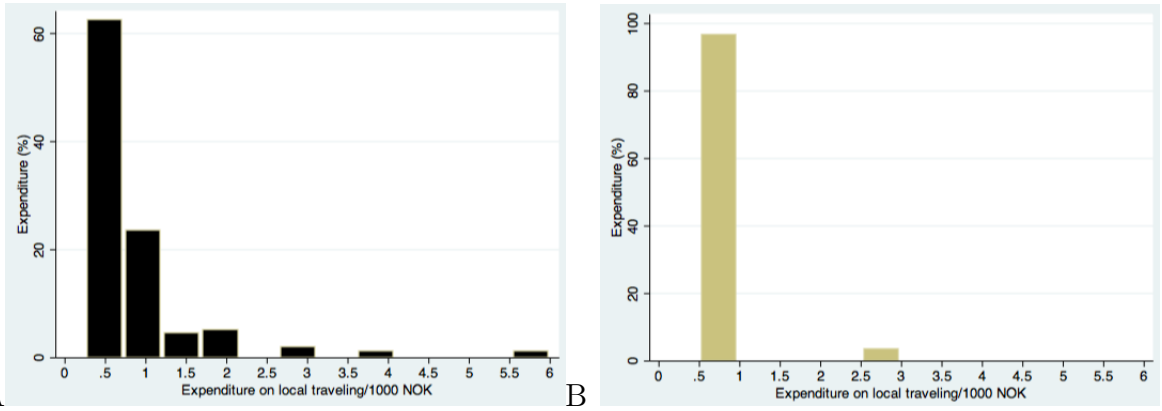
A

A. The x-axis gives the value of the expenditure on tourist activities between 0 and 6, with a gap of 0.5 and the y-axis shows a percentage of the expenditure generated. The mean of the expenditure on tourist activities is approximately 0.5,

that is 500 NOK per athlete, and the standard deviation is 0.72. Like the entertainment category, this is one of the expenditure categories that have the potential for generating more expenditure. If the organizers of the event improved their communication and relationship with the local authorities, they could have worked together and promoted more tourist activity in the region. This would have affected the local direct economic impact.

The histograms below show the expenditure on local traveling and parking:

Figure 19: Histogram: Local traveling

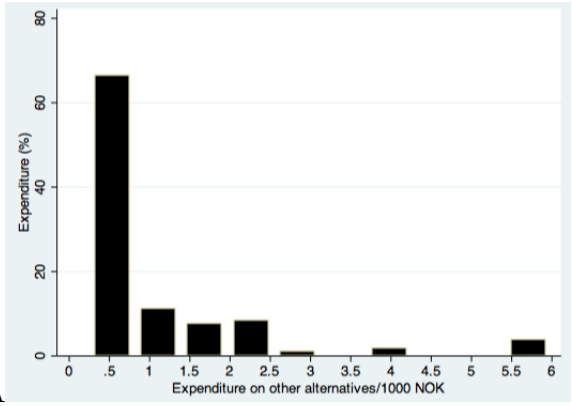


A.The x-axis give the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis show a percentage of the expenditure generated (this holds for both histograms). The mean of expenditure on local traveling and parking is approximately 0.750, that is 750 NOK per athlete, and the standard deviation is 0.93. There is only one gasoline station at site.

B. The mean of expenditure on local traveling and parking generated by the visitors is 0.58, that is 580 NOK per visitor, and the standard deviation is 0.46.

The histogram below shows the expenditure on other alternatives (not locally relevant):

Figure 20: Histogram: Other alternatives

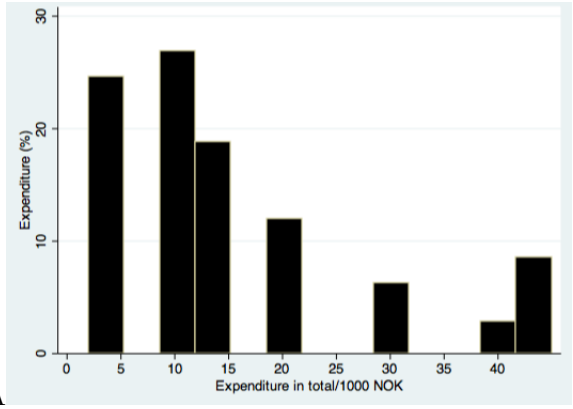


A

A. The x-axis gives the value of the expenditure between 0 and 6, with a gap of 0.5 and the y-axis shows a percentage of the expenditure generated. The mean expenditure on other alternatives is 0.9, that is 900 NOK per athlete, and the standard deviation is 1.27. In the questionnaire the researcher should have specified that the other alternatives should be in the local region, this would have increased the total direct economic impact. Since the researcher did not include this specification it is uncertain which categories in the local region the expenditure is spent on, and it must be omitted from the total expenditure.

The histogram below shows the expenditure on total expenditure (stated by the athletes):

Figure 21: Histogram: Total expenditure



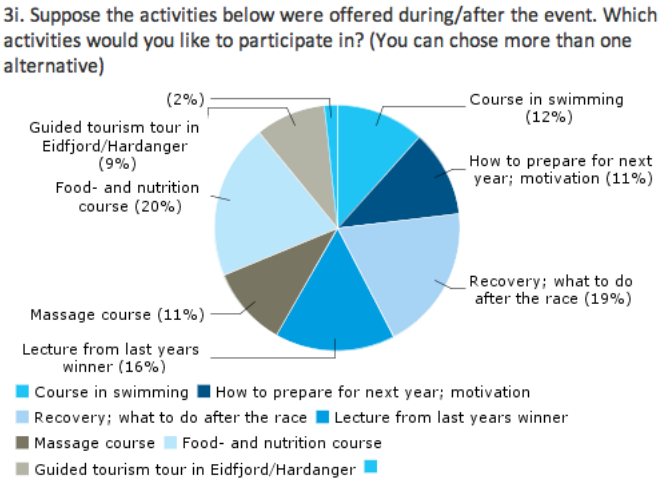
A

A. The x-axis give the value of the expenditure between 0 and 42, with a gap of 5 and the y-axis show a percentage of the expenditure generated. The mean of total expenditure per athlete is approximately 15.6, that is 15 600 and the standard deviation is 12.2. This total is submitted by the athletes themselves, and in some

situations the numbers did not add up and there were missings in the data set. In my calculations of total expenditure I generate a new variable where expenditure in total were other alternatives and total expenditure are left out. I could had included this variable where the calculations of total expenditure (exp), but it is unclear what the athletes stated as a total of their expenditure. It should had been clarified in the questionnaire that by total expenditure it was meant at site only. Athletes can have included plan tickets, food, gasoline and other alternatives on their way to Eidfjord. The histogram above gives high expenditure in total, which could have increased the direct impact significantly.

To increase expenditure in the local region, the crew officials could arrange more than one activity for the visitors. There is a mini-triathlon event the day before Norseman XT, but they could arrange more than this if they opportunity yo arrange more than this. In the questionnaire several suggestions of various events were included by the researcher and Line Amlund Hagen. These included arrangements of a swimming course, massage course, lecture from last year's winner, recovery course and food and nutrition course. The aim was to see whether or not this is something the visitors like to spend money at. Some of the respondents even gave own suggestions of interesting arrangements they would like to participate in. The results are shown below:

Figure 22: Sector diagram: Activities



This sector diagram shows the activities the organizers could use for increasing activity in Eidfjord.

The sector diagram above shows that 20 % of the visitors would like a food and nutrition course, 19% would like a recovery "what to do after the race" course and 16% would like a lecture from last year's winner. The arrangements of these courses

would give expenditure in the form of lending a place to hold the course, and they could actually take a fee for the course which will increase the income of the organizers of Norseman XT. There were suggestions of kayaking course and training camp at site one month before the race.

The expenditure on the different categories mentioned above generate direct economic impact in the local region of Eidfjord. There might be some degree of expenditure due to the inhabitants of Eidfjord. Since I concentrate on the direct economic impact only, this factor is not of interest.

The descriptive statistics from the sample data is summarized in the table above.

Table 7: Descriptive Statistics: a summary

Survey	Atlethes		Visitors	
Variables	*μ	**σ	μ	σ
Gender	1.86	0.35	1.43	0.50
Age	37.2	8.32	36	10.9
Origin	2.25	0.93	2.8	0.55
Education	1.84	0.37		
Prefered disiplin	1.67	0.74		
Employment	1.29	0.82		
Experience	1.85	0.36		
Repeat visit	1.44	0.50		
Escort	3.55	1.52		
Length of stay	2.19	1.50	3.62	2.04
Type of accomodation	3.47	1.45	1.5	0.90
Methode of transportation	1.85	1.32		
Accommodation	3.23	1.8	1.42	2.19
Race shop	1.16	1.04		
Food/drinks	1.81	1.16	0.92	0.78
Alcohol	0.34	0.49	0.63	0.51
Enterntainment	0.35	0.52	0.6	0.46
Tourism activity	0.51	0.72		
Local traveling/parking	0.75	0.93	0.58	0.46
Other alternatives	0.89	1.27		
Total expenditure (by athletes/etot)	15.65	12.18		

*The table shows the descriptive statistics. *The μ shows the sample mean. **The σ shows the standard deviation.*

4.3 Correlations and regression analysis of the variables

In this section of the thesis I will state the results carried out from a correlation analysis computed in STATA. These correlations are used to see if there is any relationship between the different variables. In the correlations below I use the exp variable generated in STATA. This variable (exp) include only all expenditure generated in the local region, including the race shop expenditure variable.

The correlations of the variables in the questionnaire of the athletes are shown in the following table:

To understand these correlations it is necessary to take a closer look at the data in the data set. Some of the variables include more than one value in the coding, which makes the interpretation of the correlation more advanced. I use the *tabulate* command in STATA to understand the depth of these variables.

The gender variable results in a positive correlation with age, and a negative

Table 8: Correlation-Athletes

VARIABLE	gendernc	AGE	orignc	empnc	expnc	rvisitnc	LOSTAY	ESCORT	accomnc	motnc	exp
1. gendernc	1.0000										
2. AGE	*0.1653 **0.0279	1.0000									
3. orignc		-0.151 0.0392	1.0000								
4. empnc	-0.1912 0.0108	-0.448 0.0000	0.1637 0.0294	1.0000							
5. expnc			-0.300 0.0000		1.0000						
6. rvisitnc			0.3904 0.0000			1.000					
7. LOSTAY	-0.1629 0.0303		-0.444 0.0000		0.1712 0.0227	-0.221 0.0030	1.0000				
8. ESCORT		-0.184 0.0120						1.0000			
9. accomnc									1.0000		
10. motnc			-0.398 0.0000			-0.369 0.0000	0.2622 0.0004			1.0000	
11. exp			-0.398 0.0000			-0.332 0.0001	0.4838 0.0000			0.4583 0.0000	1.000

*This table show a pairwise correlation matrix for the variables in the dataset. The result show only those correlations that are statistically significant at the 0.05 (5%) level. **The added line to each row of the matrix is reposting the significance level of the variables. The level of significance is at 95% (0.05). The stata command is as follows: *pwcorr genderd AGE orignc empnc expnc rvisitnc LOSTAY ESCORT accomnc motnc exp eother etot, sig print(0.05)*

correlation with employment and length of stay. There are more females over the age of 30, compared to the male athletes, the number of females with full time employment is lower than the male athletes‘ and the number of females that stay at site between 1-4 days is lower than the length of stay of the males. The variable AGE results in a negative correlation with origin, employment status and number of escorts. The younger the athletes are the more likely it is that they come from Norway, and the older the athletes are, the more likely it is that they are full time employed. This correlation is highly significant. 100% of the athletes who are 60 years old are full time employed. The younger the athletes are, the more escorts they bring.

Then there is the variable of origin. Origin correlates positive with employment and repeated visit, and negatively with experience, length of stay, methods of transport and expenditure pattern. Most of the athletes from outside of Norway are full time employed. Furthermore, they have not visited Eidfjord before, they seem to be more experienced in triathlons compared to the Norwegian athletes and they tend to stay longer at site. The correlation between origin and method of transportation shows that Norwegian athletes travel with their private car, while the other athletes travel with a rental car.

Most of the athletes with previous experience from triathlon tend to stay longer. Repeat visit to the region of the event correlates negatively with length of stay, method of transportation and expenditure. Those athletes who have visited the Eidfjord region before, stay for a shorter period than those atlethes who have not visited, they prefer to travel with their private car and they seem to spend less money compared to the athletes who visited the region for the first time. Length of stay correlates positively with method of transportation and expenditure. If the athletes stay for a short time, they prefer to travel with their private car. The correlation with length of stay and expenditure is highly significant as it shows that longer stays results in higher expenditure. Method of transport and expenditure correlates positively, and it is highly significant. That is, athletes whom do not travel with their private car have higher expenditure.

To highlight information that is considered to attribute to the direct economic impact, I would like to point out that the younger the athletes are, the more escorts they bring. It is more impressing for young athletes to accomplish such a race, and they would prefer to bring more escorts since this race might be their first. It is more likely that older athletes have a similar race before, and therefor they might not have to bring as many escorts compared to the young athletes. International athletes tend to stay longer than the Norwegians at site, and they tend to have a higher expenditure pattern. If you travel to Eidfjord all the way from the United

States, and this is your first time in Norway, it is normal to have a higher expenditure pattern, compared to a Norwegian athlete who has visited the region before. It is also more likely that international athletes travel to see more of Norway. Experienced triatlethes stay longer at site. This is probably because they arrive some days in advance to get familiar with the location and area. Athletes with experience might value the feeling of knowing what to expect. All these characteristics can affect the level of economic impact and if the organizers want to maximize income they could take this information into consideration.

The correlation of the variables in the questionnaire of the visitors are shown in the table 9:

Table 9: Correlations- Visitors

Variables	gendernc	AGE	orignc	LOSTAY	accomnc	exp
gendernc	1.0000					
AGE		1.0000				
orignc			1.0000			
LOSTAY				1.0000		
accomnc			*-0.7794 **0.000		1.0000	
exp			-0.4022 0.0276		0.5660 0.0011	1.0000

**This table show a pairwise correlation matrix for the variables in the dataset. The result show only those correlations that are statistically significant at the 0.05 (5%) level. **The added line to each row of the matrix is reposting the significance level of the variables. The level of significance is at 95% (0.05).*

Only origin and type of accommodation results in a significant correlation. All the visitors who stay in a hotel, are not from Europe, and the visitors who stay in a hotel have higher expenditure compared with the others. The visitors with the highest expenditured are not from Europe. These results are based on a sample group of only 30. The perfect visitor from an economiic point of view is a visitor who stays in a hotel and who are a non- European or a Norwegian.

Now I would like to present the regression analysis carried out in STATA. This regression analysis is used to see which of the independent variables that effect the locally relevant expenditure. The difference between the regression analysis and the correlations are that correlation on measures the degree of association between the variables, but it is not implied that a change in one of the independent variables causes a change in the dependent variable exp. Regression is a more flexible and a powerful tool than the correlations.

The expenditure variable is defined as for the athletes and the visitors:

$$exp = eaccom + ershop + efood + ealc + eent + etour + eltp$$

This variable is the dependent variable, and I tested based on every possible variable in the data set that could affect the results of expenditure. The dependent variable *exp* (y) is assumed to be random or stochastic in some way, and the x variables are assumed to have fixed "non-stochastic" values. I reduce the model to find those variables that are significant on a 95% level to have an affect on the expenditure. This process starts by eliminating the variable with the smallest absolute t-value (t) and stops when parameters are significant (all p-values less than 0.05). The full model for the athletes is: *regress exp AGE LOSTAY ESCORT genderd edud expd rvisitd prdisd1 prdisd2 motd1 motd2 empd1 empd2 empd3 accomd1 accomd2 accomd3 accomd4 accomd5 origd1 origd2.* The results of the process of reducing the model are shown in the table 10:

Table 10: Reducing the model-Athletes

[1]Model	[2]Variable	AIC	BIC	Adj. R^2
1	empd3	*707	**767	***0.4774
2	origd2	705	763	0.4818
3	AGE	704	758	0.4857
4	ESCORT	702	753	0.4895
5	accomd4	700	749	0.4923
6	empd1	699	744	0.4951
7	rvisitd	697	740	0.4971
8	motd2	696	736	0.4973
9	genderd	696	733	0.4966
10	expd	695	729	0.4951
11	edud	696	727	0.4891
12	accomd2	697	726	0.4794
13	accomd3	698	724	0.4707
14	origd1	700	723	0.4617
15	prdis2	702	722	0.4498
16	prdis1	701	718	0.4489

[1] *is the number of regression model after reducing the variables one by one.* [2] *is the variables from the data set. I choose the model which minimizes * AIC and **BIC, and maximizes ***adj.* R^2.

The table shows that based on the R^2 I should had stopped at model 8. It is clear that the criterion decrease with every additional elimination. If I base the process on AIC criterion I should have stopped at model 10, eliminating two more variables (gender and experience). The R^2 decreases very little when those two variables are taken out. Based on BIC criterion the last model, model 16, I eliminate more variables (edud, accomd2 accomd3 origd1 prdis2 prdis1) and R^2 is now more

decreased. If I would only take this R^2 criterion under calculations, I should stop at model 10. All the variables need to be significant to stop the process. The last model is when all the variables left in the regression becomes significant.

A total of 16 dummy variables were taken out of the model before the remaining variable were significant. The final result of the variables remaining in the reduced model is: *regress exp LOSTAY motd1 empd2 accomd1 accomd5* at a 5% level. The results are stated in the STATA output table below:

Figure 23: Reduced model: Athletes

```
. regress exp LOSTAY motd1 empd2 accomd1 accomd5
```

Source	SS	df	MS		
Model	1357.78994	5	271.557987	Number of obs =	130
Residual	1529.63506	124	12.3357667	F(5, 124) =	22.01
				Prob > F =	0.0000
				R-squared =	0.4702
				Adj R-squared =	0.4489
Total	2887.425	129	22.3831395	Root MSE =	3.5122

exp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LOSTAY	1.081458	.2316266	4.67	0.000	.6230045	1.539912
motd1	3.159036	.7285008	4.34	0.000	1.717129	4.600943
empd2	9.401864	2.112594	4.45	0.000	5.220449	13.58328
accomd1	-2.378373	.8732725	-2.72	0.007	-4.106824	-.6499217
accomd5	-4.894676	1.49762	-3.27	0.001	-7.858885	-1.930468
_cons	5.098583	.5628056	9.06	0.000	3.984633	6.212532

Coef. is equal to the β parameters in the regression and _ cons is the α constant.

The regression computed above can be defined as:

$$exp = \alpha + \beta_1 LOSTAY + \beta_2 motd1 + \beta_3 empd2 + \beta_4 accomd1 + \beta_5 accomd5 + \varepsilon \quad (10)$$

where, α is the constant coefficient 5.09 and ε is the error term of the model.

This regression shows that the expenditure variable is affected by the remaining five variables. These variables are length of stay, method of transport (rental car), employment status (not employed), type of accommodation (cabins) and type of accommodation (other alternatives). If one athlete stays one more night at site, then the expected additional expenditure will increase with 1.08, given that the other variables are constant. If one athlete travel with a rented car then the expected increase in expenditure would be 3.16 given that the other variables are constant. Based on this, it is important to remember that the athletes who are more likely to travel with a rented car are the international athletes. The athletes who are not employed have an expected increase in expenditure of 9.40 given that the other variables are constant. This result is due to this model only. In the data set there

are some athletes with special expenditure pattern and the results in this model reflects their expenditure. The athletes who are not employed, students, athletes above the age of 56 and professional athletes, have to use savings or they must be financed by others as a team or parents. It is stated that athletes who spend the nights in cabin have an expected decrease in expenditure of 2.38 given that the other variables are constant. If the goal is to increase expenditure in the local region they can expand the possibilities to rent a hotel room or some other alternative that will generate income during the whole year and not only during this event in particular. If all the hotel rooms are booked they might prefer not to stay at site and then their expenditure will be absent. It is not likely to build a new hotel only for this event, but if the region wish to increase the flow of tourist they can expand the portfolio of events or happenings that attract more visitors. Athletes who stay in a hotel and athletes who stay for a longer period are the ones with the highest expenditure. If the athletes spend the night in other alternatives, then there is an expected decrease in expenditure of 4.89 given that all the other variables are constant.

The regression analysis for the visitors is similar with the athletes, the same process is equally computed. The full model for the visitors is: *regress exp AGE LOSTAY genderd accomd1 accomd2 accomd3 origd1 origd2.* The results from reducing the model is shown in the table 11:

Table 11: Reducing the model-Visitors

[1]Model	[2]Variable	AIC	BIC	adj. R^2
1	genderd	132	143	0.5785
2	accomd2	130	140	0.5965
3	AGE	128	137	0.6041
4	origd1	127	134	0.6118
5	accomd1	126	131	0.6183
6	origd2	125	129	0.6151
7	LOSTAY	130	132	0.5403

[1] *is the number of regression model after reducing the variables one by one.* [2] *is the variables from the data set.*

I choose the model which minimizes * AIC (defined in the theory section) and **BIC, and maximizes ***adj. R^2.

Model 5 gives the highest R^2 measure, but it is not drastically changed when I take out one more variable (origd2) of the model. The results from the reducing process where all the variables are significant is model 7, and the dependent expenditure variable is only effected by type of accommodation 3, that is visitors who prefers to stay in other alternatives. It is clear that model 6 is the best, based on AIC and BIC criterions, but the length of stay variable is not significant. The final result of

reducing the model: *regress exp accomd3.* The results are shown in the table below:

Figure 24: Reduced model: Visitors

```
. regress exp accomd3
```

Source	SS	df	MS	Number of obs =	30
				F(1, 28) =	35.08
Model	147.044701	1	147.044701	Prob > F =	0.0000
Residual	117.367218	28	4.19168637	R-squared =	0.5561
				Adj R-squared =	0.5403
Total	264.411919	29	9.11765238	Root MSE =	2.0474

exp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
accomd3	5.9406	1.002998	5.92	0.000	3.886052	7.995148
_cons	3.1594	.4094722	7.72	0.000	2.320634	3.998166

Coef. is equal to the β parameters in the regression and _cons is the α constant.

The regression computed above can be defined as:

$$exp = \beta_0 + \beta_1 accomd3 + \epsilon$$

The α is equal to 3.1594. If the visitors stay in other alternatives then there is an increase of 5.9 in the expected additional expenditure, given that all the other variables are constant. Everyone in the crew stayed the nights in other alternatives, and this might have an effect on the regression results.

4.4 Modeling expenditure

I compute the sum of all expenditure which are locally relevant to analyze the direct impact in the local area. In this definition the "race shop" variable is included in the computations as mentions above. Since the race shop expenditure does not directly effect the local region (see figure 2), I generate a variable that exclude this expenditure.

$$exp\_rs = exp - ershop$$

These new variables makes it easier to compute the locally relevant expenditure in total.

4.4.1 Analysis of total expenditure:

Figure 25: Summary: Expenditure

. summarize exp,d

exp

Percentiles		Smallest		
1%	2	2		
5%	3.5	2		
10%	4	2.75	Obs	177
25%	5.5	2.75	Sum of Wgt.	177
50%	7.75		Mean	8.351695
		Largest	Std. Dev.	4.369181
75%	10	17.75		
90%	13	19	Variance	19.08974
95%	14.75	22.5	Skewness	3.012705
99%	22.5	42	Kurtosis	21.89205

A

. summarize exp, d

exp

Percentiles		Smallest		
1%	2	2		
5%	2	2		
10%	2	2	Obs	30
25%	2	2	Sum of Wgt.	30
50%	2		Mean	4.1495
		Largest	Std. Dev.	3.019545
75%	6	7.4		
90%	8.95	10.5	Variance	9.117652
95%	11.5	11.5	Skewness	1.266441
99%	11.5	11.5	Kurtosis	3.484122

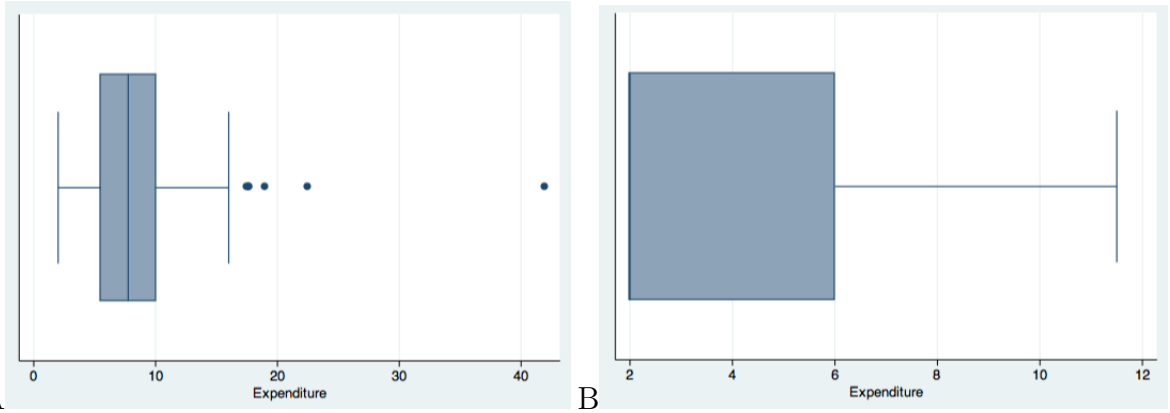
B

The tables above shows the details of the variable expenditure

A. Expenditure by athletes: This is a summary of the information on locally relevant expenditure. The variable is defined as the sum over all locally relevant expenditure categories for the entire Norseman XT experience. Among the 177 athletes who responded to the survey, the minimum overall expenditure response was 2, that is 2 000 NOK. The maximum was given as 42, that is 42 000 NOK. Half of the athletes spent less than 7. 75, that is 7 750 NOK on accommodation, food, race shop, entertainment, tourism and parking. On average, athletes spent approximately 8 300 NOK on those expenditure categories. Standard deviation around the mean is approximately equal to 4. 37. The interquartile range (IRQ) (10-5.5= 4.5) gives the length of that subset of the range in which half of the expenditure responses can be found. Half of the athletes spent between 5.5 and 10 (1000 NOK). The value of the skewness statistics of 3.0 implies that the underlying distribution is positively skewed (skewed to the right). This apparent lack of symmetry together with the large kurtosis measure of 21 implies that the sum of the five expenditure categories is a normally distributed phenomenon.

B. Expenditure by organizers, spectators, media and visitors: among the 30 respondents, the minimum expenditure was 2000 kr and the maximum expenditure was 11 500 NOK. Half of the athletes spent less than 2000 NOK on the expenditure variables. On average the visitors spent 4 150 NOK. Standard deviation around the mean is 3.02 The density of the expenditure variable can also be analyzed by generating a box-and-whiskers plot (short:box-plot). By means of this tool I can also identify special observations.

Figure 26: Box-plot: Expenditure



A. Box-plot athletes. The line inside the box indicates the median expenditure 7.75. The width of the box equals the IQR 4.5. The whiskers are indicative of the data point which comes closest to 75%-percentile + 1.5 IQR (=10+1.5*4.5) = 16.750. The right whisker gives the largest expenditure which is smaller than or equal to 16.750. The left whisker is given by that data point larger or equal to 25%-percentile-1.5 IQR (=5.5-1.5*4.5) = -1.25. Since the minimum expenditure equals 2 the left whisker is indicated at expenditure level 2. Data points outside of the whiskers are classified as special observations. These special observations are all observed in the right hand side of the interval indicated by the whiskers. A list of those special cases:

Table 12: Special observations

Observation	exp>16
20	17.5
23	17.5
72	17.5
121	22.5
133	42
155	19

This table shows the special observations in the data set, with expenditure over 16

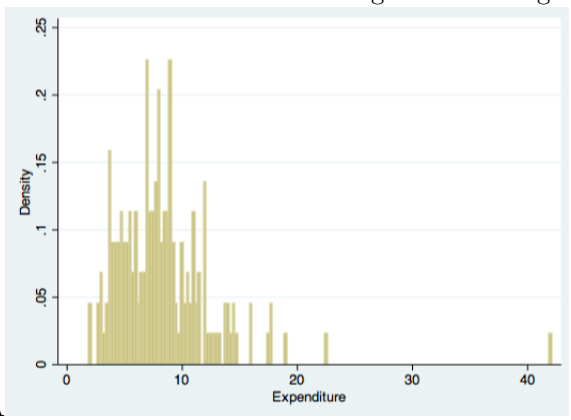
Too many special observations in the data set will result in s skewed distribution.

B. Box-plot organizers, visitors, media and spectators. The mean is 4.15. The width of the box equals the IQR of 4. The right whisker gives the largest expenditure which is smaller than or equal to 11.5. The left whisker gives the minimum expenditure which is smaller than or equal to 2. There are no special observations.

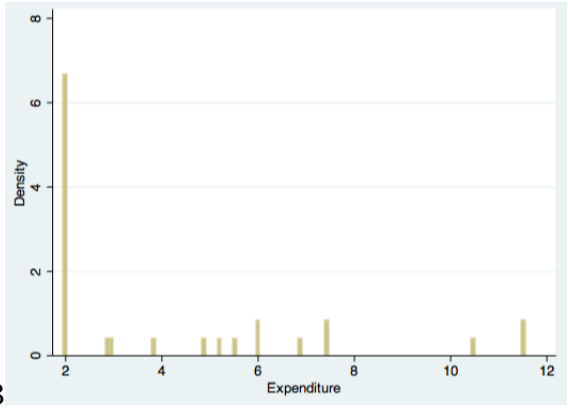
A more detailed result concerning the underlying density becomes visible in the histogram for a discrete variable exp. The expenditure is shown in the two histograms

below:

Figure 27: Histogram: Discrete exp



A



B

```
. cii 177 8.351695 4.369181
```

Variable	Obs	Mean	Std. Err.	[95% Conf.	Interval]
	177	8.351695	.3284078	7.703571	8.999819

A1

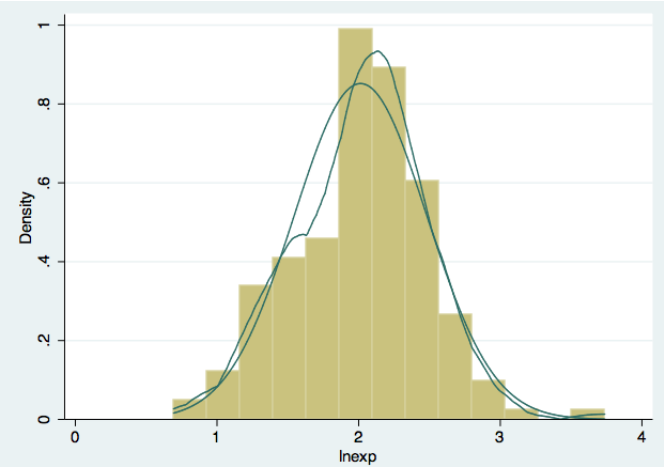
```
. cii 30 4.1495 4.355461
```

Variable	Obs	Mean	Std. Err.	[95% Conf.	Interval]
	30	4.1495	.7951947	2.523144	5.775856

B1

A.The 95% confidence interval for the expected expenditure of an athlete equal (7.70357,8.99982). With high probability (0.95), the expected athletes‘ locally relevant expenditure lies between 7 703 and 8 999 NOK. It is important to remember that this confidence interval is based on the assumption that the locally relevant expenditure is normally distributed. This normal distribution do not hold for the variable exp. To transform the expenditure variable toward normality, I use the Box-Cox transformation stated in the methodology part.

Figure 28: Box-Cox transformation



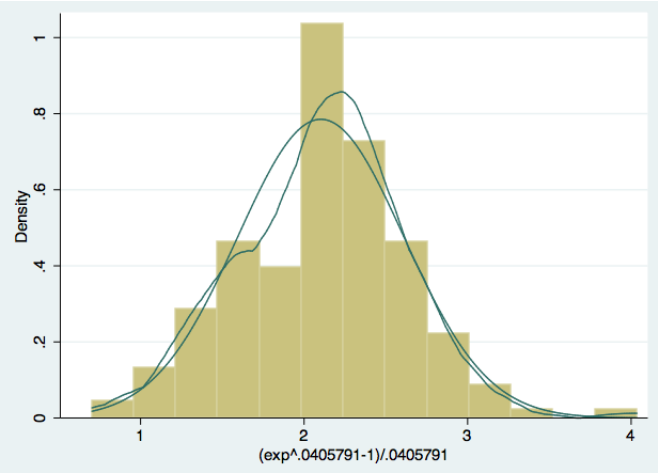

```
. bcskew0 lnexpcbox= lnexp, level(95)
```

Transform	L	[95% Conf.	Interval]	Skewness
(lnexp^L-1)/L	**1.08119**	**.699029**	**1.459322**	**.0000296**

**The graph illustrates the transformed data set by using Box-Cox transformation.*

These are the results from the transformation. The ln estimator of λ together with the 95% confidence interval for the parameter. The ml estimator equal $\hat{\lambda}$=0.0405791. The confidence interval contains 0. The ln function is used to transform the athlete‘s expenditure towards normality. The histogram of normal distribution and kernel-density estimator superimposed shows that the transformation has been successful.

Figure 29: Histogram: Kernel-density




```
. bcskew0 expbcox=exp,level(95)
```

Transform	L	[95% Conf.	Interval]	Skewness
(exp^L-1)/L	.0405791	-.1604141	.2173122	.0000103

From a statistical point of view, the difference is not significant, ln exp is easier to interpret.

B. The 95% confidence interval for the expected expenditure of a visitor equals (2.52,5.77). With high probability the expected expenditure of a visitor lies between 2 535 and 5 775 NOK.

4.4.2 Analysis of the expenditure corrected for race shop

As mentioned before, the income from race shop does not effect the local region directly. To measure the athlete‘s expenditures which have a direct effect on the local economy, it is done by removing the race shop component from the variable exp: *gen exp_rs=exp-ershop this* variable now represents the locally relevant expenditure, that is the sum over expenses for accommodation, food, entertainment, tourism and parking. This process is only necessary for the athletes expenditure since it includes the race shop expenditure. The visitors expenditure did not include this expenditure variable.

Figure 30: Locally relevant expenditure-descriptive

```
. summarize exp_rs,d
```

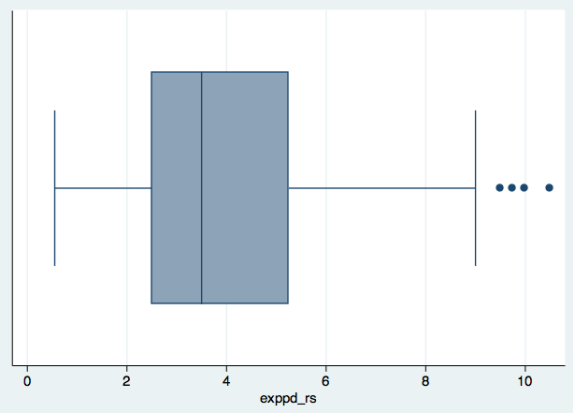
exp_rs

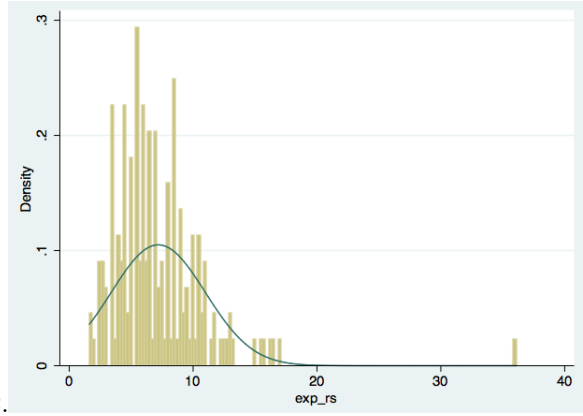
	Percentiles	Smallest		
1%	1.75	1.75		
5%	2.75	1.75		
10%	3.5	2.5	Obs	131
25%	4.25	2.5	Sum of Wgt.	131
50%	6.25		Mean	6.89313
		Largest	Std. Dev.	4.093855
75%	8.5	16.25		
90%	11	16.5	Variance	16.75964
95%	13.5	17	Skewness	3.212707
99%	17	36	Kurtosis	21.32662

A.The study reveals that athletes have spent between 1.75, that is 1750 NOK, and 36, that is 36 000 NOK on accommodation, food, enterntainment, tourism and parking. The expected expenditure of a randomly selected athlete is 6 893 NOK, while 50% of the athletes in the sample have spent less than or equal to 6 250 NOK. The standard deviation of locally relevant expenditure equals 4 009 NOK, which is less than the IQR (8.5-4.25= 4.25), that is 4 250 NOK. About half of the athletes spent between 4 250 and 8 500 NOK during the triathlon event. The total expenditure, corrected for race shop expenditure, is significantly skewed to the right, 3.21.

Locally relevant expenditure:

Figure 31: Locally relevant expenditure

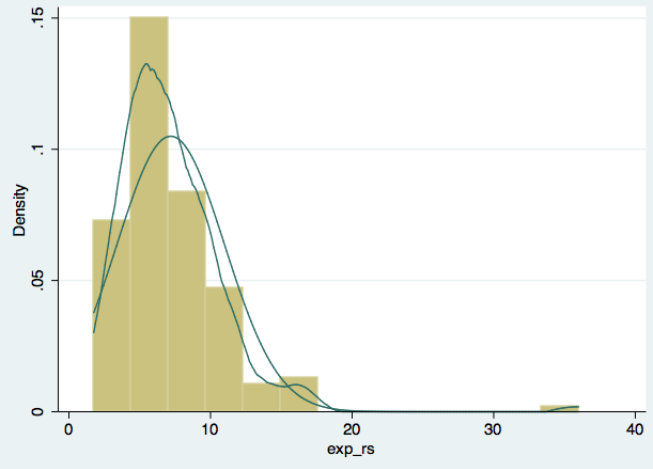
A1. 

A2. 

A1. The box-plot of the total expenditure. A2. The x-axis shows the expenditure in the range of 0 to 40 (1000 NOK) and the y-axis show the density. The normal density is superimposed on the plots of the histogram and the kernel density estimator.

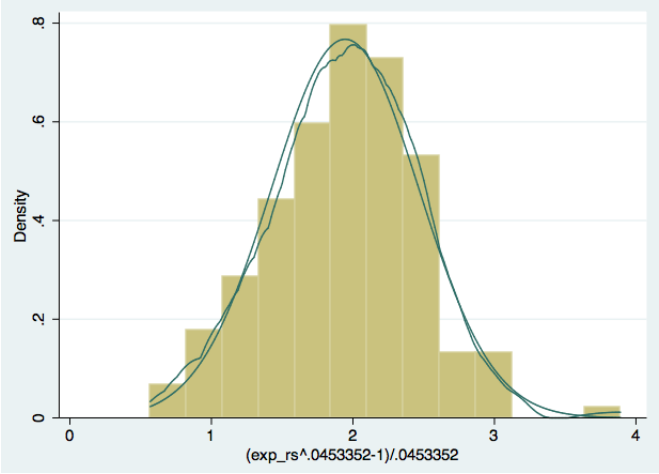
The normal density is superimposed on the plots of the histogram, and the kernel density estimator is shown in the histogram below:

Figure 32: Normal density: superimposed



This graph clearly visualizes that the non-normality of the raw expenditure data

Figure 33: Normal-density of expenditure



$\lambda = 0.045$

Histogram and kernel density estimator for exp_rs argumented by normal density. The descriptive analysis of the transformed data reveals a kurtosis estimate of 3.57

Figure 34: Descriptive transformed data

```
. summarize exp_rs_bcox,d

                (exp_rs^.0453352-1)/.0453352
-------------------------------------------------------------
      Percentiles      Smallest
 1%     .566775       .566775
 5%     1.035156      .566775
10%     1.289021      .7041529       Obs                 177
25%     1.614496      .9355885       Sum of Wgt.         177

50%     1.953516                     Mean           1.94492
                      Largest        Std. Dev.      .5198995
75%     2.310385      2.971963
90%     2.533086      2.989294       Variance       .2702955
95%     2.720031      3.023215       Skewness       8.00e-06
99%     3.023215      3.891032       Kurtosis       3.569655
```

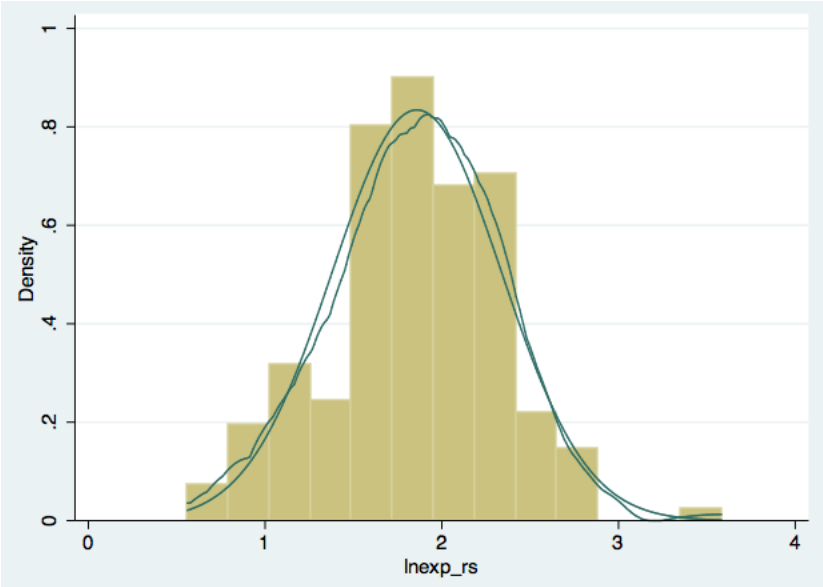
```
. summarize lnexp_rs,d

                          lnexp_rs
-------------------------------------------------------------
      Percentiles      Smallest
 1%     .5596158      .5596158
 5%     1.011601      .5596158
10%     1.252763      .6931472       Obs                 177
25%     1.558145      .9162908       Sum of Wgt.         177

50%     1.871802                     Mean           1.858754
                      Largest        Std. Dev.      .4781058
75%     2.197225      2.788093
90%     2.397895       2.80336       Variance       .2285852
95%     2.564949      2.833213       Skewness      -.0816451
99%     2.833213      3.583519       Kurtosis       3.491794
```

If we set lambda equal to zero, then I get ln exp_rs.

Figure 35: Transformed expenditure



The variable exp_rs can be effectively transformed towards normality.

To compute to direct economic impact of the event race shop expenditure, other alternatives and the total expenditure stated by the athletes are taken out. This calulations are for both the data sets.

A summary of the local expenditure is shown in table 14:

The table above shows that the total direct economic impact is estimated to be 7 135 106 NOK. This expenditure is only based on the information from the two surveys. The budget from Norseman XT includes income and expenditure which could had been taken into these calculations above. Since it is not clear where the expenditure is spent, locally or out of the region, it is not taken into calculation. The total entry fee income of 638 655 NOK is covered in the survey were the questions are specified as " the total expenditure of the Norseman experience". They have also expenditure of renting location, this expenditure do effect the direct impact (3 204 NOK), this holds for the race shop results too (see results: histogram race shop). It is important to clearify that there are some more expenditure that do effect the direct expenditure, but this percentage is difficult to calculate.

Table 13: Direct economic impact

Event Title	Norseman Xtreme Triathlon			
Venue and Date	Eidfjord, 3th August 2013			
Host Economy	Eidfjord Commune			
Economic Impact Summary				
	Visitors/Media/Crew	Athletes	Calculations	Tot.
Total Number	[1,*]415	[2]234	A	[3]649
Mean expenditure:			B	
Accommodation	1 416	3 234		4 650
Food and Drink	917	1 809		2 726
Alcoholic drinks	633	336		969
Enterntainments	462	350		812
Tourism activities	-	509		509
Local Travel/Parking	583	745		1 328
Total Expenditure	4011	6983	C	10 994
Mean length of stay	3.53	2.19	D	
Direct Economic Impact			E	7 135 106

A:[1] This number consist of all the visitors at site, excluded the athletes. * The number of escort were stated by the athletes, 395 escorts, number of media representatives is approximately 20 according to L.A.Hagen. Other spectatores are not taken into the calculation. Sum 415.[2] This is the total number of athletes who were registrated to compete. [3] The total number of visitors and atheltes: (1+2=3) 415+234=649 visitors.
B: These numbers are the mean expenditure taken from the data set, and it holds for every expenditure category in the table. The total is simple computed by adding the athletes and the visitors expenditure.
C: Total expenditure by adding the means from B.
D: Mean length of stay from the data set
E: The total: AxC (649x10994)= 7 135 106

5 Discussion

The aim of this study is to derive the direct economic impact of Norseman Xtreme Triathlon in the local region of Eidfjord in Norway. Economic impact generated by sporting events is good for the local authorities and the organizers of the event to use for evaluations and improvement of events. This paper is meant to highlight the expenditure categories that generate most economic impact. Using data taken from two surveys carried out by the researcher to ascertain the characteristics of the local visitors, spectators, athletes, media and organizers of the Norseman XT event. The estimation of the results show that the expenditure on accommodation is the most relevant expenditure category, close followed by race shop, food and drinks and local traveling and parking.

The region of Eidfjord can use Norseman XT as a catalyst for economic growth. Compared to other economic impact studies, Eidfjord offers an interesting case study because of the beautiful Norwegian scenery and the location of the starting area, which makes it easy to isolate the impact of hosting the event. The study of Baumann *et al.* (2009) is a similar study compared with the isolation of economic impact. Their study took place on Hawaii were analyzed the daily arrival data from Hawaii‘s Department of Business. The found that the three events analyzed generated a positive and significant net impact on the arrivals and the overall Hawaii‘s economy.

Raya (2012) used length of stay as the dependent variable in the research, and stated that length of stay is an important indicator for an successful event. Results suggested that satisfaction of the destination, being a foreign participant, and the participants‘s expenditure had an significant effect on the length of stay. These findings are similar to this research. I find that foreign participants of the event stay longer at site and they use more money, (see results: histogram for origin). The correlation showed that international athletes tend to stay longer than the Norwegians at site, and they tend to have a higher expenditure pattern. If you travel to Eidfjord all the way from the United States, and this is your first time in Norway, it is normal to have a higher expenditure pattern, compared to a Norwegian athlete who has visited the region before. It is also more likely that international athletes travel to see more of Norway. The longer the visitors and the athletes stay at site the more expenditure generated. I confirm the findings of Raya (2012) about elite athletes. These athletes effect the results positively since they tend to stay longer before and after the race, and they travel with more escorts. I would like to point out that the younger the athletes are, the more escorts they bring at site. It is more likely that older athletes have completed a similar race before, and therefor might not have to bring as many escorts compared to the young athletes. Experienced triatlethes stay longer at site, this is probably because they arrive some days in advance to get

familiar with the location and area as this is an adventage for the competition.

Using similar research questions as Wilson (2006) , my findings confirm that the size of the event is an indicator of what category the spectators use money on the most. Small events generates more expenditure on food, drinks and accommodation. Norseman XT is defined as a special event, compared with the Olympic games and world championships this event is small. The studies of the researcher confirm my findings.

Gibson *et al.* (2012) looked closer on the three pillars for sustainable development by examining economic, social and environmental indicator. The indicators of this study reflects and confirms my finding when it comes the length of stay, expenditure pattern, their activity at site and the use of local facilities. This results confirm that events is a viable as a for of sustainable development. If the environment where the event is arranged is in an attractive area for tourist it can effect the economic impact.

6 Conclusion

The total direct economic impact of visitor spendings in Eidfjord is 7 135 106 NOK. The variables that do have an effect on the total expenditure in the Eidfjord are length of stay, employment status, method of transport and type of accommodation chosen. Based on the correlations I can state that the foreign athletes have higher expenditure compared to the Norwegians, age reflects the number of escorts and those who have visited Eidfjord on another occasion earlier do not have the same expenditure pattern as the athletes who have never visited Eidfjord before.

The direct total expenditure of the athletes range from 1 750 to 36 000 NOK . The mean is 6 893 per athlete during their stay. Half of the athletes spent between 4 250 and 8 500 NOK. The total expenditure of the visitors range from 2000 NOK and 11 500 NOK. The mean is 4 150 NOK. Half of the visitors spent between 5 500 and 10 000 NOK.

The event Norseman Xtreme Triathlon has a significant direct effect on the local economy of Eidfjord.

A Appendix

A.1 Survey I

Welcome.

This is a survey about Norseman Xtreme Triathlon 2013.

This survey is developed as a part of a master thesis, for University of Agder, based on event research and economical impact.

Your answers will be anonymous.

Thank you in advance for your time and input, it is most appreciated.

Press "next" to get started.

1.About you

1a. Gender

- ☐ Female
- ☐ Male

1b. Age

- ☐ under 20
- ☐ 20-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65
- ☐ 66 or older

1c. Nationality:

- ☐ Norway
- ☐ Sweden
- ☐ Denmark
- ☐ Germany
- ☐ France
- ☐ United Kingdom
- ☐ Europa
- ☐ South America
- ☐ North America
- ☐ Asia
- ☐ Africa
- ☐ Oceania

1d. How did you finance your Norseman Xtreme Triathlon experience?

- ☐ I am employed full time
- ☐ I am employed part time
- ☐ I am unwaged
- ☐ I am a student
- ☐ I am an Old Age Pensioner (OLP)
- ☐ I am financed through my sportsclub
- ☐ I am a profesional 3athlete

1e. Latest level of completed education (or planned completed):

- ☐ University/College
- ☐ Secondary school
- ☐ Work certificate
- ☐ I have no form for education

1f. Number of travel campanions to Norseman XT (included your self):

- ☐ Two
- ☐ Tree
- ☐ Four
- ☐ Five
- ☐ six
- ☐ six or more

2. About Norseman 2013

2a. How did you hear about Norseman XT

- [ ] through a friend
- [ ] through media (Radio, newspaper, internet etc.)
- [ ] own interest and research
- [ ] through my sportsclub

2b. Have you competed in triathlons before?

- [ ] Yes
- [ ] No

2c. Which of the following fields is your strongest field?

- [ ] Swimming
- [ ] Biking
- [ ] Running

3. About the organizing and use of money

3a.
1. Have you been to Eidfjord before?

- [ ] Yes
- [ ] No

3a.
2.
If yes, what was your reason for travelling:
(if no, please continue to the next question)

- [ ] I have competed in Norseman XT before
- [ ] I have been here on a training camp
- [ ] I have been here as a tourist
- [ ] I have family in Eidfjord
- [ ] Other reasons

3b. Where did you stay during Norseman XT?

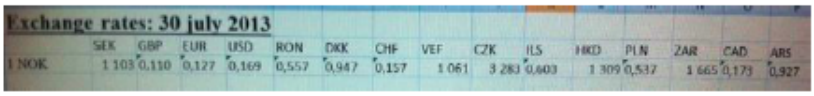
- [ ] TriCamp
- [ ] Hotel/Motel
- [ ] Huts
- [ ] Boarding houses
- [ ] Camping
- [ ] other alternatives
- [ ] I did not stay over night

3c. How did you travel to Eidfjord?

- [ ] rent a car
- [ ] use of own car
- [ ] Other

3d. How long did you stay in Eidfjord before the raceday?

- ☐ I arrived the day before
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ one week
- ☐ more than one week



Exchange rates: 30 july 2013

	SEK	GBP	EUR	USD	RON	DKK	CHF	VEF	CZK	ILS	HKD	PLN	ZAR	CAD	ARS
1 NOK	1 103	0,110	0,127	0,169	0,557	0,947	0,157	1 061	3 283	0,603	1 309	0,537	1 665	0,173	0,927

3e. How much did you use on accommadation (in Norwegian kroners):

- ☐ 0-1000
- ☐ 1001-2000
- ☐ 2001-3000
- ☐ 3001-4000
- ☐ 4001-5000
- ☐ more than 5000
- ☐

3f. Witch of the following alternatives did you use most of your money during Norseman XT (you can chose more than one alternative):

- ☐ Race shop
- ☐ Food and non-alchoholic drinks
- ☐ Alcoholic drink
- ☐ Entertainment
- ☐ Tourist attractions
- ☐ Local travel/parking
- ☐ Other

3g. How much (in kroners) do you expect to use on these alternatives

	less than 500 kr	1000 kr	1500 kr	2000 kr	3000 kr	4000 kr	more than 5000 kr
Race shop	☐	☐	☐	☐	☐	☐	☐
Food and non-alcoholic drinks	☐	☐	☐	☐	☐	☐	☐
Alcoholic drinks	☐	☐	☐	☐	☐	☐	☐
Entertainment	☐	☐	☐	☐	☐	☐	☐
Tourist attractions	☐	☐	☐	☐	☐	☐	☐
Local travel/parking	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐

3h. In Norwegian kroners (kr); how much did you use during the Norseman XT experience in total?

- ☐ 1 000
- ☐ 2 000
- ☐ 3 000
- ☐ 5 000
- ☐ 10 000
- ☐ 12 000
- ☐ 15 000
- ☐ 20 000
- ☐ 30 000
- ☐ 40 000
- ☐ more than 40 000

3i. Suppose the activities below were offered during/after the event. Which activities would you like to participate in? (You can chose more than one alternative)

- ☐ Course in swimming
- ☐ How to prepare for next year; motivation
- ☐ Recovery; what to do after the race
- ☐ Lecture from last years winner
- ☐ Massage course
- ☐ Food- and nutrition course
- ☐ Guided tourism tour in Eidfjord/Hardanger
- ☐

If you have some other alternatives for avtivites, please state:

Than you for your help, it is most appreciated.

A.2 Survey II

NORSEMAN

XTREME TRIATHLON

I am undertaking an evaluation of Norseman Xtreme Triathlon 2013. This is a part of a master thesis in cooporation with University of Agder.

I would be grateful if you could spare a few minutes to answer some questions relating to your attendance at the event and your event experience. Please make one X in the box where appropriate or write your answers in the spaces provided.
The information you provide will be used only for event evaluation purpose.

1. What is your reason for attending Norseman XT 2013?

- ☐ I am crew/volunteer
- ☐ I am a relative or friends with one of the athletes participating
- ☐ I am support person
- ☐ I am a spectator and I am considering to participate some time in the future
- ☐ I am media representative
- ☐ I am here for other reasons

2. Sex?

- ☐ Male
- ☐ Female

3. Age?

4. Where do you stay?

- ☐ TriCamp
- ☐ Hotel/Motel
- ☐ Huts/Guest house
- ☐ Other alternatives

5. How many nights (on this trip) are you staying in your accomodation?

6. How much are you spending on accomodation in total?

7. How much have you spent or intended to spend on the following items during your stay:

	500	1000	1500	2000	2500	3000 or more
Food/Non-alcoholic drinks	☐	☐	☐	☐	☐	☐
Entertainment	☐	☐	☐	☐	☐	☐
Local traveling/Parking	☐	☐	☐	☐	☐	☐
Alcoholic drinks	☐	☐	☐	☐	☐	☐
Souvenirs	☐	☐	☐	☐	☐	☐

8. Is Norseman XT 2013 your main reason for being here during this week?

☐ Yes

☐ No

9. Suppose the activities listed below were offered during/after the event. Which activities would you like to participate in? (You can tick off more than one alternative)

☐ Course in swimming

☐ How the prepare for next year; motivation

☐ Recovery, what to do after the race

☐ Lecture from last years winner

☐ Massage course

☐ Food -and nutrition course

☐ Other alternatives, please state:

10. Where are you from, country and hometown;

Thank you for your help, it is most appreciated.

A.3 Comments on the surveys

As a researcher I have experienced that the questions in the questionnaire should be carried out in a more specified and developed method/tool to ensure all necessary information needed to calculate the correct direct locally relevant expenditure. The answer categories for expenditure should be open, and not limited by the researcher. This would force the respondents to give a responsible answer of expenditure. This can also give more missing indicators, since this process demands more of the respondents, but overall the process of converting the data set would be more exact. It would have been a advantage to give the same questionnaires to both the athletes

and the visitors.

The second questionnaire has a respondent group of 30 random selected visitors. If I had more time during the race to survey the visitors, these results could have been more sufficient and reliable. I worked as an volunteer during the race, and therefore time was a limited source. On the other hand, I managed to gather information about other parts of the race, which gave me more insight to the process of arranging. This gave me, as a researcher, more insight in their process of the arrangement the event itself. Since the sample group is small, I chose to focus on the results of the athletes.

A.4 Budget Norseman XT 2011

	Ikke fordelt	2 Butikk	1 Løp	3 Crew	4 Administrasjon	Hele 2011
SALGSINNTEKT						
3120 - SPONSORINNTEKTER AVGIFTSFRIE			-10,800.00			-10,800.00
3200 - STARTKONTINGENTER			-638,655.00			-638,655.00
3210 - SALG BUTIKK		-193,829.00				-193,829.00
3220 - TRICAMP			-10,200.00			-10,200.00
3420 - SPONSORINTEKTER			-274,578.00			-274,578.00
Sum SALGSINNTEKT		-193,829.00	-934,233.00			-1,128,062.00
ANNEN DRIFTSINNTEKT						
3920 - MEDLEMSKONTINGENTER		-20.00		-22.00	-3.00	-45.00
3999 - MVA - REFUSJON					-24,581.00	-24,581.00
Sum ANNEN DRIFTSINNTEKT		-20.00		-22.00	-24,584.00	-24,626.00
SUM DRIFTSINNTEKTER		-193,849.00	-934,233.00	-22.00	-24,584.00	-1,152,688.00
VAREKOSTNAD						
4000 - INNKJ.MATERIALER ELLER VARER			37.00			37.00
4230 - REKVISITA/KONTORUTSTYR						
4300 - INNKJØP VARER FOR VIDERESALG		189,793.00				189,793.00
4390 - BEH. ENDRING HANDELSVARER		-35,116.00				-35,116.00
Sum VAREKOSTNAD		154,677.00	37.00			154,714.00
ANNEN DRIFTSKOSTNAD						
6100 - FRAKT TRANSP.KOST.FORSIKRINGER						
6300 - LEIE LOKALER			3,240.00			3,240.00
6440 - LEIE TRANSPORTMIDLER			31,950.00			31,950.00
6540 - INVENTAR						
6570 - ARBEIDSKLÆR OG VERNEUTSTYR			32,625.00	56,495.00		89,120.00
6571 - FILM / FOTO			6,938.00			6,938.00
6572 - MEDIA			1,872.00		6,500.00	8,372.00
6790 - ANDRE FREMMEDE TJENESTER			25,385.00	1,200.00	131.00	26,716.00
6791 - LEIE KONSULENTTENESTER					310,500.00	310,500.00
6800 - KONTORREKVISITA					2,073.00	2,073.00
6820 - TRYKKSAKER						
6860 - MØTER, KURS, OPPDATERING O.L.				58,222.00		58,222.00

6940 - PORTO		160.00	160.00		1,463.00	1,783.00
7140 - REISEKOSTN.IKKE OPPGAVEPLIKTIG		3,055.00	51,246.00	128,913.00	12,465.00	195,679.00
7210 - SPONSORKOSTN. IKKE OPPGAVEPL.						
7320 - REKLAMEKOSTNADER					3,000.00	3,000.00
7410 - KONTIGENT IKKE FRADRAGSBERET.						
7510 - FORSIKRING					1,966.00	1,966.00
7770 - BANK-OG KORTGEBYRER			50.00		292.00	342.00
7790 - ANDRE KOSTNADER		3,481.00	176,308.00	19,500.00	30,330.00	229,620.00
7830 - TAP PÅ FORDRINGER		1,721.00				1,721.00
Sum ANNEN DRIFTSKOSTNAD		8,417.00	329,774.00	264,330.00	368,719.00	971,241.00
SUM DRIFTSKOSTNADER		163,094.00	329,811.00	264,330.00	368,719.00	1,125,955.00
DRIFTSRESULTAT		-30,755.00	-604,422.00	264,308.00	344,135.00	-26,733.00
ANNEN RENTEINNTEKT						
8040 - RENTEINNTEKTER					-29,574.00	-29,574.00
Sum ANNEN RENTEINNTEKT					-29,574.00	-29,574.00
ANNEN FINANSKOSTNAD						
8170 - ANDRE FINANSKOSTNADER					174.00	174.00
Sum ANNEN FINANSKOSTNAD					174.00	174.00
ORDINÆRT RESULTAT FØR SKATTEKOSTNAD		-30,755.00	-604,422.00	264,308.00	314,735.00	-56,133.00
ORDINÆRT RESULTAT		-30,755.00	-604,422.00	264,308.00	314,735.00	-56,133.00
ÅRSRESULTAT		-30,755.00	-604,422.00	264,308.00	314,735.00	-56,133.00
OVERFØRT ANNEN EGENKAPITAL						
8960 - OVERF. ANNEN EGENKAPITAL	56,133.00					56,133.00
Sum OVERFØRT ANNEN EGENKAPITAL	56,133.00					56,133.00
SULTAT	56,133.00	-30,755.00	-604,422.00	264,308.00	314,735.00	

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