Fifth Annual
Red River Valley
Statistical Conference

North Dakota State University
Department of Statistics

Friday, May 1, 2015

Fifth Annual Red River Valley Statistical Conference

Session 1:   Chair: Dr. Ron Degges   Location: Morrill 105

10:05 am *Loss Reserving Ladder Methods Applied to a Small Midwestern Insurance Company*, Peter Martin
10:20 am *Estimating Return on Initial Public Offering Using Mixtures of Regressions*, Xiyuan Liu
10:35 am *Analysis of Bootstrap Techniques for Loss Reserving*, Taryn Chase

Session 2:   Chair: Dr. Gang Shen   Location: Morrill 101

10:05 am *Modeling and Forecasting Monthly Milk Production*, Anqing Zhang & Ekua Bentil
10:20 am *Predicting ConocoPhillips Daily Price*, Feifei Huang
10:35 am *Forecasting the S&P 500 and XOM Stock Prices,* Joshua Hugen & Andrew Lexvold
10:50 am *Crude Oil Price Analysis and Prediction,* Qiang Li & Qi Wang
11:05 am *Forecasting Seattle's Violent Crime Rates,* Eugene Stepan
11:20 am *Modeling Major League Baseball Games,* Stephen Anderson
11:35 am *What Does It Take to Win a Super Bowl?,* Sebastien Benzi

Session 3:   Chair: Dr. Yarong Yang   Location: Morrill 107

12:05 pm *Examination and Short-Term Forecasting for S&P 500 Market Using Mixtures*, Tatjana Miljkovic (*Keynote Speaker*)
12:35 pm *k-Component Mixture Modeling*, Joshua Hugen

Session 4 (Poster Session with Refreshments)   Location: Morrill 217/212

1:00-1:45pm
Evaluating Fungicide Chemistries for the Management of Oat Crown Rust, Samuel Haugen
A UFO (Unidentified Flying Object) Analysis, John Paul Lauman-Beltz
Impact of Past and Present Family Rituals on Family Identity, Shweta Sharma
Baseline Sensitivity of Alternaria *Species Associated with Foliar Diseases of Potato in Response to SDHI Fungicides,* Thakshayni Thevathasan
A Multi-Trait Mixed-Model for Genome-Wide Association Study in Barley, Qiang Li

Session 5:   Chair: Dr. Megan Orr   Location: Morrill 101

1:45 pm *Capital Investment Needs of the Short Line Railroads in the United States*, Anne Campbell
2:00 pm *Boundary Estimation,* Yingfei Mu
2:15 pm *A Comparison of the False Discovery Rate Method with Dunnett's Test for a Large Number of Treatments*, Kayeromi Gomez
2:30 pm *Student Evaluations: A Gender Comparison*, Luke Huebner

Session 6:   Chair: Dr. Seung Won Hyun   Location: Dunbar 152

2:00 pm *Comparing Several Modeling Methods on NCAA March Madness,* Su Hua
2:15 pm *A Study of Influential Statistics Associated with Success in the National Football League*, Joseph Roith
2:30 pm *Efficiency of DT-Optimal Designs for Probit Models in Clinical Trials*, Andrew Lexvold

Refreshment Break: 2:45-3:00pm

Session 7:   Chair: Dr. Rhonda Magel   Location: Dunbar 152

<u>3:05 pm</u> *Identifying Significant Factors Influencing Metabolic Syndrome in China,* Xiaoxue Gu
<u>3:20 pm</u> *Reducing Surgical Patients Overall Costs and Lengths of Stay,* Blake Huebner
<u>3:35 pm</u> *Blood Loss Prevention Treatment Comparison for Health Outcomes of Knee Replacement Patients*, Kevin Soderholm

Author: Stephen Anderson

Title: Modeling Major League Baseball Games

Baseball is America's pastime. Millions of passionate fans follow the Major League each year. This love for the game, and its storied history make it an interesting topic for analysis. Baseball statistics have been recorded for over a hundred years, from batting averages and ERAs in the early days, to advanced sabermetrics of today, so there is an abundance of data available. We want to make this data useful. By using a variety of team statistics, both offensive and defensive, in a regression model, we hope to accurately model the number of runs scored for each team. With this model we can determine the important factors in scoring runs, so teams can set goals and target the right statistics as a team. In addition, we hope to be able to use the model to predict the number of runs to be scored in a game using expected values for those team statistics from previous games in the season. That way we can predict the outcome of the game by comparing the predicted scores of each team.

Author: Sebastien Benzi

Title: What Does It Take to Win a Super Bowl?

The NFL is the largest football organization. Each year they decide the World's greatest football team in an event called the Super Bowl. What does it take to win a Super Bowl? Using data collected by the NFL there are endless variables to analyze. A logistic regression model will be used to calculate the probability for a team to win a playoff game. Since the playoffs are "sudden death", winning a playoff game is just as important as winning the Super Bowl. Overall, the significant variable will be a good indication of who will win the game.

Authors: Anne Campbell, Rodney Traub, & Ronald Degges

Title: Capital Investment Needs of the Short Line Railroads in the United States

Considerable research has addressed the cost benefits that railroads provide to the logistical infrastructure in the United States. Unfortunately, very little research has covered if the small railroads would be able to meet financial expenses for improvements in infrastructure. The small railroads in terms of this research covers the Class II and Class III railroads, as defined by the Surface Transportation Board based on their respective annual revenues. Class II railroads have an annual

operating revenue less than $467.0 million but greater than $37.4 million. Class III railroads revenue falls at or below $37.4 million per year.

This research examines the capital investment needs of the Class II and Class III railroads in the United States. These railroads have investment needs for track and bridge maintenance, reconstruction, and purchase/lease of rail cars and locomotives. Their financial needs are an important aspect of the future of small railroads in US, as well as the services they provide for the Class I railroads. To address these questions, an electronic survey was administered to 470 small railroads and yielded a 53% response rate. This survey asked questions about the past, present and near future capital investment needs of the Class II and Class III railroads.

Author: Taryn Chase

Title: Analysis of Bootstrap Techniques for Loss Reserving

It is necessary for insurance companies to have an appropriate method of estimating future reserve amounts. These values will directly influence the rates that are charged to the customer. One of the most common and trusted methods is the deterministic chain ladder technique. The main drawback of using this method is that there is no way to estimate the variability of the predicted losses. Many stochastic loss reserving techniques have been developed in order to estimate variability. The goal of these stochastic methods is also to come up with loss predictions that are similar to those found using the chain ladder method. Bootstrapping techniques are of interest because they usually do not require advanced statistical software to implement. Bootstrap methods involve re-sampling from the data to create multiple "pseudo" data sets. Some bootstrap techniques have incorporated generalized linear models in order to produce results. This thesis focuses on analyzing how well different bootstrap techniques perform. Data with known future losses was obtained from the National Association of Insurance Commissioners (NAIC) and was used to compare actual losses with those predicted by bootstrap procedures. It is found that the bootstrap technique is comparable to the chain ladder method and thus can be used to estimate the variability of future losses with general accuracy.

Author: Kayeromi Gomez

Title: A Comparison of the False Discovery Rate Method with Dunnett's Test for a Large Number of Treatments

It has become quite common nowadays to perform multiple tests simultaneously in order to detect differences of a certain trait among groups. This often leads an inflated probability of Type I Error, a rejection of a null hypothesis when it is in fact true. This inflation generally leads to loss of power of the test especially in multiple testing and multiple comparisons. In this study, we compare the False Discovery Rate method to Dunnett's test, a method mostly used to control familywise error rate when a control group is compared to other groups.

The aim of the research is to use simulation to address what a researcher should do to determine which treatments are significantly different from the control when there is a large number of treatments and the number of replicates in each treatment is small. We examine two situations in this simulation study where the number of replicates per treatment is 3 and also when it is 5. The total number of simulated treatments was progressively increased from 50 to 100 then 150 and finally 300. The goal is to measure the change in the performances of the two tests in terms of type I error and power as the total number of treatments increases.

We reported two ways of examining type I error and power: first, we look at the performances of the two tests in a relative measure, i.e. in relation to all the other comparisons in our simulation study. Secondly, we assess their actual performances for the comparisons per simulated sample. In the first assessment, the False Discovery Rate method appears to have a higher power while keeping its type I error in the same neighborhood as Dunnett's test while in the latter, both tests have similar powers and the False Discovery rate method has a higher type I error. Overall, the results show that when the objective of the researcher is to detect as many of the differences as possible, then FDR method is preferred. However if error is more detrimental to the outcomes of the research, Dunnett's test offers a better alternative.

Author: Xiaoxue Gu

Title: Identifying Significant Factors Influencing Metabolic Syndrome in China

The Metabolic Syndrome (MetS) is a disorder disease that occurs when a person's body does not properly use and store energy. Complications attributed to MetS include increased risk of diabetes and cardiovascular disease. The diagnosis of MetS involves assessing a person with the following criteria: abdominal obesity, insulin resistance, hypertension, dyslipidemia, and impaired glucose regulation.

Categorization into three or more of these criteria indicates a person has MetS. There is a high prevalence of Metabolic Syndrome in United State, 21.8% for age-unadjusted and 23.7% for age-adjusted. In recent decades, tremendous economic development in China had multifarious effects on the Chinese population. These effects occur in many areas of life including education level, work status and lifestyle habits, such as amount of physical activity, dietary choices, smoking, and alcohol consumption. These areas may have effects on people's health status and the disease of Metabolic Syndrome. The purpose of this study was to develop a model that explains the relationship between behavioral changes (independent variables) and MetS (the dependent variable). The aim is to identify significant factors to MetS. To achieve this aim, a generalized estimating equation model for repeated measurement is used. Based on the findings, we determined which lifestyle choices had a significant influence on the onset of MetS.

Author: Su Hua

Title: Comparing Several Modeling Methods on NCAA March Madness

The NCAA March Madness is a phenomenon that grips the national sports psyche from the second week of March through the first week of April. This presentation will focuses on bracketing the NCAA Men's Division I Basketball Tournament using self - consistent method. The method is based on binomial generalized linear model with Logit link and Cauchy link on the conditional probability of a team winning a game given its rival team. Also the comparison of this method and some other popular rating systems or methods like RPI and Restricted OLRE model proposed by West (2006) will be conducted is this talk.

Author: Feifei Huang

Title: Prediction ConocoPhillips Daily Price

Background: The plummeting price of oil is still the biggest energy story in the world. It's bringing back cheap gasoline to the United States while wreaking havoc on oil-producing countries like Russia and Venezuela. Back in June 2014, the price of Brent crude was up around $115 per barrel. As of January 23, 2015, it had fallen by more than half, down to $49 per barrel. How the oil price is going to is an interesting topic to me. And I believe most of the people are also curious because it is consumption of our daily life.

Objective: Forecast the daily oil close price of ConocoPhillips based on its historical price. I will analyze whether the data is stationary; detect the trend in the data; fit a model using ConocoPhillips' daily price

data from 1/2/2001 to 1/29/2015; diagnose the model; use this model to forecast the price and use data from 2/1 2015 to president to check the accuracy of the model.

Author: Blake Huebner

Title: Reducing Surgical Patients Overall Costs and Lengths of Stay

Reducing costs and lengths of stay for surgical patients is not only important to the patients, but also to the hospital. A low average length of stay indicates a hospital is running efficiently and effectively, so it is no wonder that reducing this summary statistic has become a hospital priority. This thesis explores decreasing these measurements by analyzing different drug combinations administered during surgery. Data was collected on patients undergoing hip replacement surgery from multiple locations of one hospital chain. Three possible anticoagulants were administered: warfarin, enoxaparin, rivaroxaban, or combinations of the three. Age, gender, and occurrence of adverse reactions were also recorded. Least squares regression models were formed and residual analysis performed to improve upon those models. Tukey's HSD and Dunnett's test were used for multiple comparison testing. Both a chi square test of independence and logistic regression model were used to test whether a certain drug combination yields higher probability of incurring adverse reactions. It is found that the anticoagulant combination administered has a significant effect on overall cost and length of stay, while having no significant effect on the occurrence of adverse reactions.

Author: Luke Huebner

Title: Student Evaluations: A Gender Comparison

This presentation will compare male and female instructor's ratings from student evaluations as well as create a model explaining the outcomes of the different questions. Data was collected from North Dakota State University's student rating of instructor's forms during the fall of 2013 and the spring of 2014. T-tests were performed comparing the means of male and female instructors for each question on the student evaluation. A least squares regression was used to create a model to show what demographic variables have an effect on a questions outcome. The demographic variables used were proportion of students required to take the course, percent male, percent freshman and sophomore, percent that expect an A or B, and the gender of the instructor used as an indicator variable. The significant variables found were the percent of males in the class and the percent of students expecting an A or B.

Author: Joshua Hugen

Title: k-Component Mixture Modeling

When insurance companies set premium rates, they look at both loss frequency and loss severity data. Loss frequency modeling is very important, but this paper will only discuss modeling loss severity data. Oftentimes insurance companies model these data with a well-known single distribution such as Lognormal, Weibul, Gamma etc. Alternatively, they may use a composite distribution, such as a Gamma-Lognormal distribution. Both of these approaches assume that the data are homogeneous. Unfortunately, real data is sometimes not homogeneous; it is heterogeneous. In other words, there may be several distributions within some data that are causing the behavior. In that case, in order to appropriately model the dataset, a model that is likewise a composite of several like distributions is needed. This thesis proposes use of the expectation maximization (EM) algorithm for mixing some number (k) Lognormal distributions together. The capability of this procedure is demonstrated through the use of a simulation study. For modeling the Danish Fire Losses dataset a K-component finite mixture model is proposed. A number of components is determined, K, such that an optimal fit for the data is achieved.

Authors: Joshua Hugen & Andrew Lexvold

Title: Forecasting the S&P 500 and XOM Stock Prices

Daily fluctuations in the stock market can have a significant effect on the economy and individual investor's financial profiles. Many people use the stock market to invest for retirement or to start a college fund for their children. For these reasons, forecasts of potential profits are important. Forecasting can be difficult, however, due to unforeseen and substantial dips and spikes in market prices, changes in variation, and change points, such as the recession starting in 2008. SARIMA, ARCH, and GARCH models were fit to the log returns data for XOM and S&P 500 adjusted closing prices for weekly and monthly data through 2014. The SARIMA model should account for any seasonality in the data while the ARCH and GARCH models will help with heteroscedasticity. We will also consider a combination ARMA-GARCH model. The corrected AIC criterion was used to select the best model within each model type. Finally, 95% confidence intervals were calculated for forecasts of the past three months. These forecasts were then compared to actual adjusted closing prices from those times.

Author: Andrew Lexvold

Title: Efficiency of DT-Optimal Designs for Probit Models in Clinical Trials

The type of design used in clinical trials depends greatly on the goals of the study. Two common goals are optimal parameter estimation and discriminating between competing models. D-optimal designs are used when the goal is to minimize the variance of parameter estimates. This is achieved by maximizing the determinant of the information matrix. When the goal is model discrimination, T-optimal designs are often used. In this case the design is optimal when the minimum distance between the competing models is maximized. D-optimal designs are not efficient when the goal is model discrimination and T-optimal designs do no perform well when the goal is parameter estimation. However, the fact that D and T designs have a common equivalence theorem structure allows them to be combined into a new design called a DT-optimal design. DT designs provide a balance between parameter estimation and model discrimination. The efficiency of DT-optimal designs relative to D and T-optimal designs can be calculated, showing that they good for both parameter estimation and model discrimination.

Authors: Qiang Li & Qi Wang

Title: Crude Oil Price Analysis and Prediction

The price of oil normally means the spot price of a barrel of benchmark crude oil. In North America this generally refers to the WTI Cushing Crude Oil Spot Price. West Texas Intermediate (WTI) is a type of crude oil used as a benchmark in oil pricing and the underlying commodity of New York Mercantile Exchange's oil futures contracts. Since January 2014, the price of benchmark crude oil dropped constantly and reached its lowest price since 2009 by January 2015. A major rise or decline in oil price can have both economic and political impacts. Therefore, it is important to make a prediction of the crude oil price for further days. In this study, daily crude oil price from January 2014 to March 2015 will be analyzed to predict the price of April 2015. Another price prediction of April 1st to 10th will use crude oil price from January 2015 to March 2015. The comparisons between the forecast price and the actual price will be used as an evaluation for the model performance.

Author: Xiyuan Liu

Title: Estimating Return on Initial Public Offering Using Mixtures of Regressions

Financial advisors working in a stock exchange market are often faced with a situation to convince a client of merits of investing in a company that just entered a stock exchange. In order to get a quick answer, a simple linear regression may be used to predict company's return based on its revenue. This

thesis finds that a model based on a mixture of linear regressions, for estimating company's return as a function of revenue, is superior over a simple linear regression. The error term in each regression component is assumed to follow standard Gaussian distribution. The data is tested on 116 companies which entered a stock exchange as Initial Public Offering (IPO) in period January 1 to June 1, 1998 as provided by *Regression modeling with actuarial and financial applications* (Frees, 2010). A two component mixture of simple linear regressions is found to provide the best fit for the data. A simulation study is conducted to verify the performance of this model. Optimum number of components is found using AIC and BIC criteria as well as the parametric bootstrapping of the likelihood ratio test statistics. Significance of this analysis may be relevant to a financial advisors, investors, and traders who are working with IPO companies in a stock exchange market and are currently using simple regression to model return as a function of revenue.

Author: Peter Martin

Title: Loss Reserving Chain Ladder Methods Applied to a Small Midwestern Insurance Company

Estimating future losses is integral to setting aside appropriate reserves in the insurance industry. This study analyzes different Chain Ladder reserving methods based on weighted-least square regression that consider different function of weights. These methods are tested on 78 NAIC fully developed loss triangles. While the best Chain Ladder method is selected based on its performance, this method does not to work well for a small number of NAIC companies that may have erratic changes in their loss trends. For these outliers, two other methods were explored for the early development years; the nearest neighbor technique and mixture of linear regressions. A recommendation is then made to a small Midwestern insurance company on the best methodology to use for estimating the loss reserves based on the actual data provided. These results can be useful to any other insurance company currently using Chain Ladder methods in loss reserving practices.

Authors: Tatjana Miljkovic & Indranil Sengupta

Title: Examination and Short-Term Forecasting for S&P 500 Market Using Mixtures

In this research a novel approach to the analysis of the S&P 500 market fluctuations is proposed using a K-component mixture of regressions model. Specifically, we model the market by Barndorff-Nelsen and Shepard stochastic process in which estimates of jumps of log returns are governed by Lévy subordinators. Daily VIX and VIX^2 close prices are analyzed as the indicators of log return volatility

and the corresponding variance of S&P 500 index using the mixture model. This approach correctly analyzes and forecasts the behavior of the S&P market from August 1, 2005 to December 31, 2009, including the market crash in September 2008. A set of rules are provided, based on the assumption of non-uniform jumps and mixing probabilities extracted from the K-component mixture, to predict monthly fluctuation in the S&P 500 market.

Author: Yingfei Mu

Title: Boundary Estimation
Research in geology, meteorology, forestry, marine science and epidemiology often need to determine the unusual environmental factors associated with a certain phenomenon, which challenges statisticians to find the spatial pattern or delineate an accurate boundary of area of hot spots for spatially reference data. This work provides a new computationally efficient method in this regard without presuming the shape of boundary. Following the convention of the literature of the boundary detection problem, we assume that the spatially referenced measurements are made at a lattice of n × n equally-spaced nodes which is re-scaled to a unit square, and an unknown boundary partitions the unit square into two regions. Moreover, we assume all the observations coming from a particular region share a common distribution, but the distributions, if they are different, differ only in their means. We will first construct a test for the existence of a change-curve; then, we will develop a test-based method to generate a change-curve that delineates the regions. We will also study the asymptotic properties of the new algorithm and compare it with other boundary estimation methods.

Author: Joseph Roith

Title: A Study of Influential Statistics Associated with Success in the National Football League
This talk considers the most important aspects of success in the National Football League (NFL). Success is defined as winning individual games in the short term, and making the playoffs over the course of a season in the long term. Data was collected for 750 different regular season games over the course of five seasons in the NFL, and used to create models that identify those factors which are most significant towards winning at both the short term and long term levels.

A point spread model was developed using an ordinary least squares regression method, and stepwise selection technique to reduce the number of variables included. Logistic regression models were also created to state the probability a team will win an individual game, and also the probability a team will make the playoffs at the end of the season. Discriminant analysis was performed to compare

the significant variables in our models, and determine which had the largest influence. We considered the relationship between offense and defense in the NFL to conclude whether or not one area had a significant advantage over the other. We also fit a proportional odds model on the data set to categorize blowout games, and those that are close at the end.

The overwhelming presence of turnover margin, passing efficiency, first down margin, and sack yardage in all of our models is clear evidence that there are a handful of statistics that can explain success in the NFL. Using the statistics from games, we were able to correctly identify the winner around 88% of the time. Finally, we used simulations and historical team performances to forecast future game outcomes, our models classified the actual winner with a 73% accuracy rate.

Analytics are slowly gaining momentum in football, and the advantages are clear. Quantifying success in the NFL can benefit both individual teams, and the league as a whole, to present the best possible product to their audiences.

Author: Kevin Soderholm

Title: Blood Loss Prevention Treatment Comparison for Health Outcomes of Knee Replacement Patients

For knee replacement surgeries, blood loss is a major concern. In the event of excessive blood loss during surgery, a blood transfusion can save a life. However, blood transfusions come with extra hospital costs and potential health complications for the patient. As such, there is an incentive for medical providers to prevent blood transfusions by administering drug treatments that prevent excessive blood loss. The purpose of this research is to evaluate the prevalence and effectiveness of blood loss prevention drug treatments for knee replacement surgeries. Data was obtained from a Midwest population of knee replacement patients. Analysis was conducted to measure the effect of this type of drug treatment on health outcomes such as: overall hospital cost, length of hospital stay, proportion of early readmissions, and proportion of patients requiring blood transfusions.

Author: Eugene Stepan

Title: Forecasting Seattle's Violent Crime Rates

Safety has always been a major concern for most people. This past year, a North Dakota State University student was murdered here in Fargo. A few months prior, a student attending Seattle Pacific University was shot and killed on campus while three others were injured. These stories make the headlines because of the circumstances, but the reality is that these types of instances occur frequently

throughout the nation. Using the statistical software R, I will examine violent crime rates in Seattle and attempt to develop time series models for forecasting Seattle's future rates. The monthly data, collected from January 2008 to December 2014, was obtained from the Seattle Government website. This type of time series analysis shows potential in providing a police department with a necessary future budget.

Authors: Anqing Zhang & Ekua Bentil

Title: Modeling and Forecasting Monthly Milk Production

Demand for milk has increased rapidly in recent years. Cows produce the majority of milk around the world. For our research, we are interested in studying the trend of the monthly milk production by cows with 14 years from 1962 to 1975. A good time series model will be generated to fit the data and used to forecast a short term of milk production.

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ABSTRACTS FOR POSTERS

(in alphabetical order by first author's last name)

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Author: Sam Haugen

Title: Evaluating Fungicide Chemistries for the Management of Oat Crown Rust

Over the past 45 years, oat production in the upper Midwest has fallen 90%, with a 50% decline occurring since 2003. There a variety of factors that have led to the decline from economics to production methods. One of the largest problems that has been a determinant of the decrease of oat production is a devastating disease called oat crown rust (*Puccinia coronata*). In an effort to develop management information for this disease, trials have been conducted evaluating fungicide chemistries. During the summer of 2014, a study was conducted at NDSU to evaluate two chemistries for the management of *Puccinia coronata.* A randomized block design was used with three treatments and four replications. The two chemistries that were studied included Pyraclostrobin and Pyraclostrobin + Fluxapyroxad. For a comparison of the two treatments a non-treated control was also used. Treatments were applied to plots at the flag leaf stage, (feekes 9). Each plot was then rated 15 days later for the disease by taking 10 visual ratings of flag leaf from each plot. At maturity the plots were harvested with post-harvest information recorded. Analysis of variance (ANOVA) was used in the general linear models procedure for comparison of yield and disease ratings of the respective treatments. The results revealed that there was a significant difference between plots applied with the fungicides to the untreated control plots. Plots applied with fungicide had very minimal to no crown rust present while the untreated control had significant crown rust present and lower average yield.

Author: John Paul Lauman-Beltz

Title: A UFO (Unidentified Flying Object) Analysis

Are UFO's real? How often do these sightings take place? Is there a pattern to these sightings? We will be conducting an investigation into the North Dakota UFO phenomenon using simple linear regression and ANOVA. We will show that indeed they are real and there is a pattern to these sightings.

Author: Qiang Li

Title: A Multi-Trait Mixed-Model for Genome-Wide Association Study in Barley Population

Genome-wide association study (GWAS) is a standard approach for studying the genetics of natural variation, typically focusing on association between single-nucleotide polymorphisms (SNPs) and traits. For GWAS, if multiple traits are also correlated, some essential and important information among multi-traits can be lost in marginal analysis. Therefore, fully parameterized multi-trait mixed-model is emerged as a flexible approach that considers both the within-trait and between-trait variance components simultaneously for multiple traits. The phenotype data used in this research is 1100 barley entries with reaction of leaf spot diseases. In this dataset, there are two different traits, RATE (reaction of spot form net) and RATING (reaction of spot blotch). 3941 SNPs makers dataset is used as genotype data. A multi-trait mixed-model was applied for genome-wide association study. The results show that the multi-trait mixed model can detect much more associations between single-nucleotide polymorphisms (SNPs) and traits than single-trait analysis can do.

Author: Shweta Sharma

Title: Impact of Past and Present Family Rituals on Family Identity

Family rituals are regarded as important communication artifacts that contribute towards formation and maintenance of family identity. In today's world when young adults move away from home it is hard for them to continue practicing the old rituals and new rituals are born. Theoretically the memories of old rituals should still impact family identity. Hence in this research we test the hypothesis that old ritualistic behaviour has a higher impact on family rituals.