

BIOGRAPHICAL SKETCH

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NAME: Cavanaugh, Joseph E.

eRA COMMONS USER NAME (credential, e.g., agency login): CAVANAUGHJ

POSITION TITLE: Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Montana Tech	B.S.	1986	Mathematics
Montana Tech	B.S.	1986	Computer Science
Montana State University	M.S.	1988	Statistics
University of California, Davis	Ph.D.	1993	Statistics

A. Personal Statement**B. Positions and Honors****Positions and Employment**

1993-1998	Assistant Professor, Department of Statistics, University of Missouri
1998-1999	Assistant Professor and Director of Graduate Studies, Department of Statistics, University of Missouri
1999-2000	Associate Professor, Department of Statistics, University of Missouri
2000-2003	Associate Professor and Director of Undergraduate Studies, Department of Statistics, University of Missouri
2003-2008	Associate Professor, Department of Biostatistics, College of Public Health, University of Iowa
2003-2008	Associate Professor, Department of Statistics and Actuarial Science, University of Iowa (Secondary Appointment)
2008-2012	Professor, Department of Biostatistics, College of Public Health, University of Iowa
2008-	Professor, Department of Statistics and Actuarial Science, University of Iowa (Secondary Appointment)
2012-2014	Professor and Director of Graduate Studies, Department of Biostatistics, College of Public Health, University of Iowa
2014-2015	Professor, Director of Graduate Studies, and Interim Head, Department of Biostatistics, College of Public Health, University of Iowa
2015-	Professor and Head, Department of Biostatistics, College of Public Health, University of Iowa

Honors

1997	Provost Outstanding Junior Faculty Teaching Award, University of Missouri
1998	Gold Chalk Award (for the training & mentoring of graduate students), University of Missouri
2000	William T. Kemper Fellowship for Excellence in Teaching, University of Missouri
2006	College of Public Health Faculty Teaching Award, University of Iowa
2013	College of Public Health Faculty Service Award, University of Iowa
2013	Chancellor's Medallion Recipient, Montana Tech

2014 Fellow of the American Statistical Association
2017 Hancher-Finkbine Faculty Medallion, University of Iowa

Professional Memberships

American Statistical Association
Institute of Mathematical Statistics
International Biometric Society
American Academy for the Advancement of Science

C. Contributions to Science

My methodological research interests can be loosely grouped into two main areas: model selection and diagnosis, and time series analysis. My work on model selection and diagnosis has focused on the development and investigation of model selection criteria and case-deletion diagnostics, particularly those based on discrepancy measures such as the Kullback (1968) directed and symmetric divergence.

I. Model Selection: Variants of the Akaike Information Criterion. The well-known Akaike (1973) information criterion (AIC) is derived as an estimator of the Kullback directed divergence. Some of my work has dealt with the construction and characterization of improved variants of AIC. The resulting publications include [1] and [2], which propose AIC variants based on bootstrapping and Monte Carlo simulation for use in the state-space time series modeling framework. These two AIC variants are now both available in the popular MARSS (Multivariate Autoregressive State-Space) R package.

1. **Cavanaugh JE** and Shumway RH. A bootstrap variant of AIC for state-space model selection. *Statistica Sinica*, 7:473-496, 1997.
2. Bengtsson T and **Cavanaugh JE**. An improved Akaike information criterion for state-space model selection. *Computational Statistics and Data Analysis*, 50:2635-2654, 2006.

II. Model Selection: Criteria Based on Kullback's Symmetric Divergence. In 1999, I published a paper [3] that introduces the idea of developing model selection criteria based on Kullback's symmetric divergence, and provides a rationale for favoring the symmetric over the directed divergence. This highly cited paper led to the development of a new class of model selection criteria that have come to be known as Kullback information criteria (KIC). I followed up this work in several publications, including [4], yet a number of other authors have also contributed to the expansion of this criterion class. To date, over 20 methodological papers have been published on KIC and its variants. The criterion class has met with particular success in signal processing applications.

3. **Cavanaugh JE**. A large-sample model selection criterion based on Kullback's symmetric divergence. *Statistics & Probability Letters*, 44:333-344, 1999.
4. **Cavanaugh JE**. Criteria for linear model selection based on Kullback's symmetric divergence. *Australian and New Zealand Journal of Statistics*, 46:257-274, 2004.

III. Modeling Diagnostics. The problems of model selection and model diagnosis frequently intertwine, and discrepancy measures are often used in the development of tools to address both problems. My work on model diagnosis has focused on the construction and investigation of a case-deletion diagnostic called the predictive influence function, which characterizes the impact of a case on the prediction of latent or missing data. The publications that have resulted from this work include [5] and [6], the former which develops a diagnostic for state-space modeling applications.

5. **Cavanaugh JE** and Johnson WO. Assessing the predictive influence of cases in a state-space process. *Biometrika*, 86:183-190, 1999.
6. **Cavanaugh JE** and Oleson JJ. A diagnostic for assessing the influence of cases on the prediction of missing data. *Journal of the Royal Statistical Society, Series D*, 50:427-440, 2001

IV. Time Series Analysis: State-Space Modeling. My work in time series analysis has primarily focused on the state-space framework, and include the previously mentioned contributions [1], [2], and [5]. My time series contributions also include [7] and [8], which develop modeling framework for the modeling of zero-inflated count time series. The methodology in this paper has been implemented in a recently published R package ZIM (Zero-Inflated Models).

7. Yang M, Zamba GKD and **Cavanaugh JE**. Markov regression models for count time series with excess zeros: A partial likelihood approach. *Statistical Methodology*, 14:26-38, 2013.

8. Yang M, **Cavanaugh JE** and Zamba GKD. State-space models for count time series with excess zeros. Statistical Modelling, 15:70-90, 2014.

V. Interdisciplinary Collaborations. I have an active applied, interdisciplinary research agenda. My contributions span a wide range of fields, including cardiology, critical care, dentistry, ergonomics, gerontology, health services utilization, hospice care, hospital epidemiology, immunology, infectious diseases, injury prevention, periodontology, pharmacy, psychiatry, psychology, pulmonary care, and sports medicine.

D. Additional Information: Research Support and/or Scholastic Performance

Current Research

R49 CE002108 (PI: Peek-Asa, Corinne)
CDC

8/1/12-7/31/19

Iowa Injury Prevention Research Center

Established in 1990, the University of Iowa Injury Prevention Research Center (IPRC) is organized within the College of Public Health, supporting interdisciplinary research to control and prevent injuries, especially in rural communities. Specific aims include 1) translation of an evidence-based teen driving program into the workplace; 2) testing the effectiveness of a novel program to prevent domestic violence among high-risk men; 3) implementation and outcome evaluation of Iowa's anti-bullying legislation; and 4) improved surveillance for determining control measures for poisoning.

Role: Co-Investigator

R01 CE002913 (Subcontract PI: Cavanaugh, Joseph)

9/1/17-8/31/20

University of Minnesota / Centers for Disease Control & Prevention

Anti-Bullying Laws and Youth Violence in the United States:

A Longitudinal Evaluation of Efficacy and Implementation

The specific aims of this project are as follows. First, to evaluate the effectiveness of anti-bullying laws in reducing multiple forms of violent behaviors, and to identify potential mechanisms linking anti-bullying laws to youth violence outcomes. Second, to determine the effectiveness of anti-bullying policies in reducing disparities in multiple forms of youth violence. Third, to examine whether implementation moderates the effectiveness of anti-bullying laws on youth violence outcomes.

Role: Subcontract PI

D43 TW007261 (PI: Peek-Asa, Corinne)

5/26/05-8/31/21

NIH

iCREATE: Increasing Capacity in Research in Eastern Europe

The global injury burden is disproportionately concentrated in low and middle income countries (LMIC). This project introduces injury and violence training to the LMIC countries of Armenia, Georgia, and Moldova, which are strategic global priorities due to their political and economic ties to the Middle East, Russia, and Europe. Capacity for medical and public health education in these countries has been growing, but injury and violence is not currently addressed.

The aims of our training program are: (1) to train a critical mass of researchers from Armenia, Georgia, and Moldova to conduct innovative research; (2) to facilitate the transition of trainees to positions of leadership; (3) to develop our partner institutions as sustainable centers of excellence in injury research and education; and, (4) to engage partners to translate research into effective prevention and treatment programs.

Role: Co-Investigator

R01 OH010928 (PI: Casteel, Carri)

9/30/15-9/29/19

West Virginia University/CDC

Understanding Workplace Violence among Young Workers in the U.S.

The specific aims of this study are as follows. First, to estimate the prevalence of workplace violence victimization among workers and to characterize cases with regard to worker, employment, and event attributes. Second, to identify risk factors for workplace violence victimization among young workers. Third, to characterize employer-provided workplace violence prevention and response training received by young workers. Fourth, to describe the employment and educational consequences of workplace violence victimization among young workers and examine associations between these outcomes and worker and event characteristics.

Role: Co-Investigator

UL1 TR002537 (PI: Winokur, Patricia)

3/30/18-2/28/23

NIH

University of Iowa Clinical and Translational Science Award.

Specific aims: To create a definable academic home for the discipline of clinical and translational science and to encourage the development of novel methods and approaches to clinical and translational research, enhance informatics and technology resources, and improve training and mentoring to ensure that new investigators can navigate the increasingly complex research system.

Role: Biostatistician

U01 CE002961 (PI: Casteel, Carri)

9/30/18-2/29/22

Centers for Disease Control & Prevention

Implementation of a Medication Care Plan to Reduce Unintentional Injury among Rural Older Adults

Role: Biostatistician

R25 HL147231 (Zamba, Gideon)

3/1/19-2/28/22

NIH

Iowa Summer Institute for Research Education in Biostatistics (ISIREB)

This is a proposal to the National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI), from the University of Iowa, in response to RFA-HL-19-019 for an Iowa Summer Institute for Research Education in Biostatistics (ISIREB), Summer Programs 2019, 2020, & 2021.

Role: Co-Investigator

Completed Research

2016-CK-BX-0006 (PI: Heimer, Karen)

1/1/17-12/31/20

US Dept. of Justice / Public Policy Center

Link for Schools: A System to Prevent Violence and its Adverse Impacts

Research study on the effects of violence on students.

Role: Biostatistician

R25 HL131467 (PI: Zamba, Gideon)

2/15/16-1/31/19

NIH

Iowa Summer Institute for Research Education in Biostatistics

This is a proposal to the National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI), from the University of Iowa, in response to RFA-HL-16-017 for a Summer Institute for Research Education in Biostatistics. The ultimate vision of our proposed research education program is to increase the number of undergraduates who enter graduate programs in Biostatistics and to maintain a solid underrepresented minority pipeline into Biostatistics graduate programs. The proposal is for the University of Iowa (UI) Department of Biostatistics to recruit a diverse group of 18 trainees each year, from 2016 to 2018, with focus on minority, underrepresented and disadvantaged students who wouldn't have otherwise been exposed to the field of Biostatistics.

Role: Co-Investigator

U54 OH007548 (PI: Anthony, T. Renee)

9/30/01-9/29/21

DHHS/CDC

Great Plains Center for Agricultural Health & Safety

This Center develops and implements programs of research, intervention, translation, education, and outreach to prevent occupational injury and illness among agricultural workers and their families in Iowa, Missouri, Kansas, Nebraska, Illinois, Wisconsin, Minnesota, South Dakota, and North Dakota. New projects: Peek-Asa Roadway Study, Ramirez/Casteel Surveillance Study.

Role: Co-Investigator