

## Message from the President

Dear reader, 2017 has begun and soon, on the 23<sup>rd</sup> of March, we will celebrate the annual meeting of our society. In the preparation of the organisation of that meeting, the daily board of the VvS+OR took the initiative to meet with the boards of the individual VvS+OR sections as well as with societies dedicated to statistics and OR that are not part of the VvS+OR (e.g. Chemometric Society and Dutch Society for Ordination and Classification). The agenda for these meetings was as follows: 1. What does the section want to achieve, what are its main objectives?; 2. To which extent can the section achieve its objectives on its own, that is, independently of the VvS+OR?; 3. How can the VvS+OR help the section to achieve its objectives, does the VvS+OR have added value for the section?; 4. What should be the objectives of the VvS+OR in the near future? As can be read, the meetings were intended to clarify the role of the VvS+OR in relation to the sections and other societies.

An important conclusion of the meetings described above was that the annual meeting of the VvS+OR should, as much as possible, reflect joint interests and involve joint efforts. The annual meeting should also be a networking event where many statisticians and OR people from various backgrounds can meet and inform themselves about developments in their own field as well as in neighbouring fields, both for theory and practice.

Some further meetings and discussions between board and sections led to the topic of *Health Care for the Future* as a central theme for the annual meeting in 2017. This was considered to be an actual theme that elicits discussion at many levels in society, to name a few: politicians, policy makers, insurance companies, medical centres, citizens, etc. At this moment, the Dutch government spends 85 billion Euros per year on health care and it doesn't look as if this budget is open to strong increases while the demands do increase because of the aging of the population. Doctors did ask the politicians to make choices (*de Volkskrant*, 21 January 2017), for

example, do the Dutch want to improve general care for the elderly for a longer period of their life, or do they want to invest in the development of cures for relatively rare diseases?

Statistics + OR can contribute in important aspects to this debate on where to go with health care. New medical techniques require new statistical + OR methods for improving the medical practice or to make that practice more efficient. Quantitative methods are also important for the assessment of the quality of medical interventions and protocols; they help in evaluating and comparing scenarios. Furthermore, statistics + OR can develop indicators for monitoring the quality and efficiency of health care.

It is obvious that health care is a theme that touches on the interests of many people and any contribution to improving its quality and efficiency will attract the attention of a diverse audience. Therefore, health care is a theme by which the VvS+OR can show the Dutch audience that statistics + OR are highly relevant to science and society. The VvS+OR wants to increase the recognition and visibility of statistics + OR as a field and simultaneously of the involved scientists. As a consequence, additional funds may go to research for statistics + OR and more students may enroll in training and education programs, which in the end should lead to a higher level of statistics + OR in The Netherlands.

On the 23<sup>rd</sup> of March, thanks to the contributions of the sections of the VvS+OR, we can present an excellent program for our annual meeting. The important role of statistics + OR in the development and evaluation of health care will be demonstrated convincingly, thereby giving ample attention to scientific and policy aspects. Elsewhere in *STATOR* you can find the speakers, titles and abstracts. I hope to welcome many of you on the 23<sup>rd</sup> of March.

FRED VAN EEUWIJK

# HEALTH CARE FOR THE FUTURE

Thursday, March 23<sup>th</sup> 2017

## Annual meeting of the Netherlands Society for Statistics and Operations Research (VvS+OR)

### LOCATION

Jaarbeurs Utrecht

Jaarbeursplein 6, 3521 AL Utrecht (adjacent to Central Station)

### PROGRAM

- 09:15 – 09:45 Registration and coffee | tea
- 09:45 – 10:00 Opening
- 10:00 – 10:45 MAX WELLING (UvA)
- 10:45 – 11:15 HARWIN DE VRIES (Insead)
- 11:15 – 11:30 Break
- 11:30 – 12:00 ONNO VAN HILTEN (CBS)
- 12:00 – 12:30 Annual General Meeting (ALV, in Dutch)
- 12:30 – 13:30 Lunch break (at your own expense)
- 13:30 – 14:00 JOHAN LINSSEN (GGZ Momentum)
- 14:00 - 14:30 ELS GOETHGEBEUR (Ghent University)
- 14:30 – 15:15 Ceremony of the VAN ZWET AWARD  
Ceremony of the HEMELRIJK AWARD  
Final DATA SCIENCE HACKATHON
- 15:15 – 15:45 Break
- 15:45 – 16:30 MARK VAN DER LAAN (UC, Berkeley)
- 16:30 Snacks and drinks

# 1

## SELF LEARNING ALGORITHMS IN HEALTH CARE

**Max Welling**

*University of Amsterdam*

### ABSTRACT

After the sensational loss of the world champion GO against a computer algorithm, more and more people become aware of the fact that in many areas artificial intelligence could prove to be superior to human intelligence and intuition. Similarly in health care. After all, the human mind can process only a limited amount of information and can only detect simple patterns in data. Algorithms perform already better, for example, in analysing MRI images for predicting Alzheimer's disease, analysing histological images for predicting the gradation of a tumor, or analysing dermatological images for detecting melanomas. We are on the verge of a revolution where algorithms will enable the diagnosis and recommend the best treatments.

What does it take to make this revolution in health care to become reality? In this talk, I will highlight some developments in my discipline, machine learning, that are relevant for this process. For example, what is this technology that can analyse medical images so accurately? Can we train algorithms on patient data in such a way that they ensure privacy? Can we discover causal relationships from data without carrying out double-blind randomized studies? Can we automatically monitor patients and make recommendations 'on the fly'? What does it take to let physicians actually embrace this technology?

MAX WELLING has a research chair in Machine Learning at the University of Amsterdam and secondary appointments as full professor at the University of California Irvine and as a senior fellow at the Canadian Institute for Advanced Research (CIFAR). He is co-founder of Scyfer BV, a university spin-off in deep learning.

# 2

## OPTIMIZING POPULATION SCREENING FOR INFECTIOUS DISEASES

**Harwin de Vries**

*INSEAD School of Business, Fontainebleau*

### ABSTRACT

Population screening by mobile units is crucial to control several infectious diseases. We consider the following planning problem: given a set of populations at risk, the expected evolution of the epidemic in these populations, and a fixed number of mobile units, which populations should be screened when? We present descriptive models for the development of the burden of disease over time which take screening explicitly into account, use these to develop planning policies and solution methods, and numerically analyze them in the context of sleeping sickness control in D.R. Congo.

HARWIN DE VRIES studied econometrics at EUR. He received the Best Econometrics Thesis Award 2012. After earning his Ph.D. under Albert Wagelmans he now works for Technology and Operations Management, INSEAD School of Business, Fontainebleau, France.

# 3

## HEALTH (CARE) STATISTICS IN THE NETHERLANDS

**Onno van Hilten**

*Statistics Netherlands | CBS*

### ABSTRACT

Statistics Netherlands (SN) produces statistical information for the whole Dutch society, in particular for policy makers and researchers. In the field of health statistics, the classic examples are: causes of death statistics (since 1900), statistics on health, lifestyle and health consumption based on a national Health Interview Survey (since 1981), and statistics on health care expenditures (since 1972). In the last 15 years many new, very detailed statistics have been developed, based on 'statistical re-use' of administrative data which are generated by the primary processes in health care.

In the presentation examples will be given of the best long time series SN has on the one hand, and the new possibilities of all these recently developed statistics based on administrative data on the other hand. Furthermore, the question will be addressed to what extent all this statistical information enables researchers and policy makers to draw conclusions on accessibility, quality, effectiveness, efficiency and affordability of health care, and to compare health care in the Netherlands to other countries? Finally, the opportunities and challenges of the use of new big data sources for better health care statistics will be discussed.

ONNO VAN HILTEN graduated in mathematics in 1986, at the University of Groningen. He completed his PhD in mathematical economics in 1990, at the University of Maastricht. After working for 11 years at the Dutch National Energy Centre (ECN), he joined Statistics Netherlands (CBS) in 2001. Currently he is program manager 'health and health care statistics'.

# 4

## OPERATION SUCCEEDED, PATIENT DIED

**Johan Linssen**

*GGZ Momentum, Nijmegen*

### ABSTRACT

Momentum is a specialized psychiatric hospital group based in The Netherlands and South Africa. Momentum treats patients with psychiatric problems such as trauma and personality disorders. It also focuses on research & education, working closely together with Universities in Western Europe and Sub-Saharan Africa.

For a long time, researchers and mental healthcare specialists have upheld a hate-love relationship; 'protecting' patients from those *research nerds*. They also faced difficulties of coming up with classification of statistical methods in psychiatric care that are both simple and precise and that are able to address the complexity and unruly reality of mental health care problems. Regardless: protocols and manuals came forth from statistical research – incentivizing research on illnesses, rather than the patient itself – and thus created a larger distance to the patient's complaints and more importantly has not led to 'more health'. Every mental illness has a personal story and patient experience. Understanding that context is key to understanding how statistical research can improve the future of health care.

In essence, what will be discussed are not only the opportunities and challenges of using statistical research with innovating mental health care, but also the threats it poses to draw the wrong conclusions for those who seek help during their darkest hour.

JOHAN LINSSEN is a Member of the Board at GGZ Momentum. Previous to that he was Country Director at consulting firm Berenschot in South Africa. He started his career at Capgemini and the European Commission. During his career he has consulted a large number of public and private organizations (such as Philips Healthcare and Departments of Health) on their organizational development. Johan has a background in economics. He is slightly claustrophobic and thus would hate to be a Pokémon.

# 5

## COST EFFECTIVE MONITORING OF QUALITY OF CARE: THE GOLDMINE OF DISEASE REGISTERS AND HOW MORE CAN BE LESS

**Els Goethgebeur**

*Ghent University*

### ABSTRACT

Public health infrastructure is under pressure. The gap between what is theoretically possible and practically affordable widens. Care centers receive populations of an increasingly advanced age, suffering from comorbidities. An evidence base for generalizable (average) effects of varying drug combinations requires causal inference and creative designs – including randomization within cohorts – but still leaves imprecise effect measures. Beyond this, there is a call for personalized medicine.

Informed by both general and local statistics from electronic health records, new directions for dynamic treatments are taken aiming at the right balance between quality of life, affordability and longevity. To evaluate varying strategies implemented in different care centers, outcomes that matter to patients should be monitored and point to center performance and room for improvement. Confounder adjustment and standardized outcomes per center will need the right balance of number and sophistication of patient specific covariates. Beyond standard statistical issues of bias and precision, one must account for the associated cost including registration fatigue with more measurement error and more missing data as a result. We discuss an approach for a cost-effective selection of covariates and the bias trade off balancing more confounders against additional measurement error and selectivity due to missing data.

ELS GOETGHEBEUR is professor of Statistics at Ghent University (B). After her graduate training in mathematics (KUL) and statistics (LUC) she held faculty positions at the London School of Hygiene and Tropical Medicine and Maastricht University. She taught at the Harvard School of Public Health and at Stanford University. Her research focuses on causal inference generally, on survival analysis and missing data problems, and more recently on big data problems in genetics.

# 6

## TARGETED MACHINE LEARNING FOR CAUSAL INFERENCE: HARNESSING THE POWER OF BIG DATA TO IMPROVE HEALTH

**Mark van der Laan**

*University of California*

### ABSTRACT

We review targeted minimum loss estimation (TMLE), which provides a general template for the construction of asymptotically efficient plug-in estimators of a target estimand for infinite dimensional models. TMLE involves maximizing a parametric likelihood along a so-called least favorable parametric model through an initial estimator (e.g., ensemble super-learner) of the relevant functional of the data distribution. The asymptotic normality and efficiency of the TMLE relies on the asymptotic negligibility of a second-order term. This typically requires the initial estimator to converge at a rate faster than  $n^{-1/4}$ . We propose a new estimator, the Highly Adaptive LASSO (HAL), of the data distribution and its functionals that converges at a sufficient rate regardless of the dimensionality of the data/model, under almost no additional regularity. This allows us to propose a general TMLE that is asymptotically efficient in great generality. We demonstrate the practical performance of HAL and its corresponding TMLE for the average causal effect. We also provide a review of some of the many applications of TMLE we have been involved in, involving the analysis of complex observational and experimental longitudinal studies, such as evaluation of impact of different treatment rules for controlling glucose level for diabetes patients.

MARK J. VAN DER LAAN is the Hsu/Peace Professor of Biostatistics at the University of California, Berkeley School of Public Health. He is the recipient of the 2005 COPSS Presidents' and Snedecor Awards, as well as the 2004 Spiegelman Award. His methodological research interests include censored data, causal inference, machine learning, multiple testing, semiparametric estimation theory, and targeted learning.

# 7

## THE HACKATHON

**Daniel Oberski**

*Utrecht University*

### ABSTRACT

A new activity in the VvS+OR is a hackathon. This hackathon has been inspired by the theme *Health care for the future*, with special thanks to prof. dr. Folkert Asselbergs, MD, from Utrecht University and University College London. Heart attacks are a major cause of mortality and we can therefore do a lot of good to society if we're able to prevent them. One of the main ways this is currently done is with medication such as statins; however, these pills, while preventing heart attacks, have the unfortunate side-effect of increasing the risk of diabetes. A highly important question is therefore 'can we prevent heart disease without increasing the risk of diabetes?'. To look at this, we will have at our disposal a dataset, cleverly constructed from publicly available sources by Asselbergs and his team, that combines negative health outcomes with genetic information. At the hackathon, teams will be invited to answer a few targeted questions formulated by the experts. These teams will be as mixed as possible, aiming to combine academic statisticians and computer scientists with data scientists working at companies and subject matter experts. During the awards ceremony, the jury will then discuss the work of the teams for all attendees of the Statistical Day. Thanks to the gracious support of the VvS+OR board, all hackathon participants will receive a free membership of the Society and the Section Data Science. (<http://sectiedatascience.nl/>)

DANIEL OBERSKI is associate professor of data science methodology at the department of Methodology & Statistics, Utrecht University. From 2006–2011 he worked at the ESADE business school and Pompeu Fabra University, Barcelona, on the European Social Survey. After obtaining his PhD from Tilburg University (2011) he became visiting assistant professor at the University of Maryland, US (2011), and subsequently postdoc and assistant professor at Tilburg University's (2012–2016). He is president of the VvS+OR Section on Data Science. Together with Katrijn Van Deun, Alessandro Di Bucchianico, Arend Oosterhoorn, Maarten Joosen and Erik-Jan van Kesteren, he hopes you will join this section and contribute to making it a succes for data lovers everywhere!

## REGISTRATION (BEFORE MARCH 17th)

### Members VvS+OR

The lectures and annual meeting are open to members of the Society, speakers and invited guests, but registration through the society's website is required: [www.vvs-or.nl](http://www.vvs-or.nl). Register before March 17th and bring the confirmation e-mail to show it at the registration desk at the entrance of the lecture room.

### Non-members

Interested non-members can access the day and pay the amount of € 50 (bank account: NL42 INGB 0000 202091, BIC/ SWIFT: INGBNL2, VvS+OR 'registration annual meeting 2017') before March 17th and bring proof of payment (copy of bank statement) to show at the registration desk at the entrance of the lecture room. Alternatively, non-members can become an ordinary member for € 70 (go to [www.vvs-or.nl](http://www.vvs-or.nl)) and click 'Become a Member' in the top menu (young applicants will obtain a special rate), and have free access immediately after registration.

## GENERAL INFORMATION

### Language

The talks at the annual meeting will be in English, the Annual General Meeting (ALV) will be in Dutch.

### Annual General Meeting (Algemene Ledenvergadering)

The Annual General meeting (ALV) is scheduled at the end of the morning. The relevant documents will be provided on the website two weeks before the meeting. You can also get them by e-mail if you send a request to [info@vvs-or.nl](mailto:info@vvs-or.nl).

### Coffee, tea and drinks after the meeting

Coffee/tea during the breaks and drinks afterwards are offered by the Society.

### Lunch

Lunch is at your own expense. The restaurant of the Jaarbeurs is usually quite busy, but within walking distance of just a few minutes (e.g. in the direction of Central Station) you will find many alternatives.

## ORGANIZING COMMITTEE

The annual meeting is organized by the board of the VvS+OR. For questions, contact the administration by e-mail at [info@vvs-or.nl](mailto:info@vvs-or.nl).