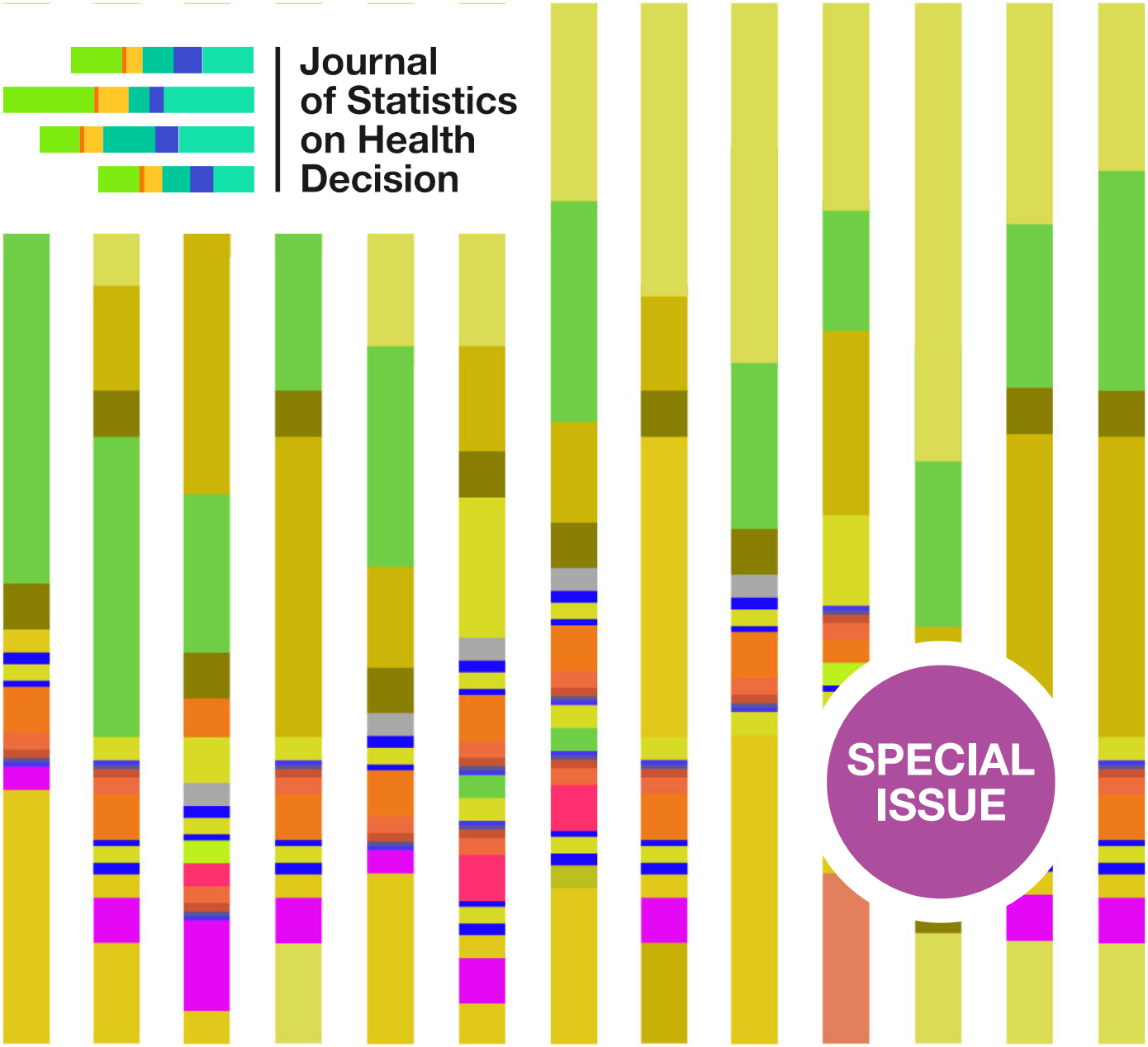
Journal of Statistics on Health Decision



7th Statistics on Health Decision Making: Epidemiology

July 10 › 11, 2025 | University of Aveiro

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2025 | Volume 7 | Issue 1

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INVITED SPEAKERS

BIOMETRY SESSION of SPE

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INVITED SPEAKERS

SESSION 1

S1.01
Missing data and causal inference

Kate Tilling[1]

[1] University of Bristol, UK

Causal inference can be attempted using different statistical methods, each of which require some (untestable) assumptions. Common methods include multivariable regression, propensity scores, g-methods (no unmeasured confounding) and instrumental variables (no association between instrument and outcome, other than via the exposure). Less attention has been given to the impact of selection (e.g. selection into a study, analysis of cases only) or missing data (e.g. dropout from a study, death due to other causes) on different methods for causal inference. Using directed acyclic graphs (DAGs) I will discuss some of the ways in which bias can occur due to missing data, and methods that might be used to detect or mitigate against this bias. Applied work shows evidence of non-random selection into and dropout from studies including ALSPAC and UK Biobank, and I will discuss how this might impact causal analyses using these datasets.

S1.02
Dealing with Multiple Mediators in Causal Mediation Analysis

Beatrijs Moerkerke Ghent[1]

[1] Ghent University, Belgium

Mediation analysis is a key tool for understanding how an exposure affects an outcome through intermediate variables. In many real-world applications, multiple mediators are involved, whether due to interest in different causal pathways, the presence of confounders that also act as mediators, or repeated measurements of the mediator over time.

In this talk, we will explore causal mediation analysis in settings with closely linked mediators. We will discuss how progress can be made by considering different conceptualizations of causal effects, including the controlled direct effect and interventional direct and indirect effects. These alternative effect definitions allow for meaningful causal interpretations under weaker assumptions than natural effects, even in the presence of exposure-induced confounding.

This reflects joint work with Stijn Vansteelandt, Wen Wei Loh and Tom Loeys

SESSION 2

S2.01
Directed acyclic graphs as a causal inference tool: from principles to applications

Andreia Leite[1]

[1] National School of Public Health, NOVA University Lisbon, INSA, Portugal

Epidemiologic studies often address causal questions, which require considering confounding issues. Identifying and adjusting for confounders is challenging and various methods have been proposed. Directed acyclic graphs (DAGs) are a causal inference tool, being simultaneously qualitative and quantitative. They offer us a representation of the relationship between variables and support the selection of confounders to consider. In this talk, main issues with previous approaches will be presented, followed by an overview of DAGs, alongside with its main applications and developments.

S2.02
Robust Indirect Treatment Comparisons: Addressing Unmeasured Confounding with Quantitative Bias Analysis

Kate Ren[1]

[1] University of Sheffield, UK

Health technology assessment (HTA) plays a critical role in healthcare decision-making by evaluating the clinical and economic value of medical interventions. A key component of HTA is the estimation of treatment effects, often relying on randomised controlled trials (RCTs) as the gold standard. However, when direct RCT evidence is unavailable, indirect treatment comparisons (ITCs) are used to synthesise evidence from separate trials. Population-adjusted methods, such as matching-adjusted indirect comparisons (MAIC) and simulated treatment comparisons (STC), help address differences in trial populations. However, in unanchored ITCs, where no common comparator is available, these methods assume that all relevant prognostic factors and effect modifiers are accounted for, an assumption that is often unrealistic and can lead to biased estimates.

This talk presents a sensitivity analysis algorithm for unanchored ITCs by extending quantitative bias analysis techniques traditionally used in epidemiology. Our approach treats the mean of the marginal distribution for unmeasured confounders as sensitivity or bias parameters. We also demonstrate how this method can support more robust, reliable, and informative decision-making in healthcare through a case study.

SESSION 2

S3.01
Epidemiology in the Data Era

Nuno Lunet[1]

[1] Institute of Public Health of the University of Porto (EPIUnit / ITR), Portugal

Epidemiological studies are expected to yield both valid and precise results. Different methodological options differ regarding their potential to reach valid conclusions for distinct research questions, and on their efficiency in the use of resources for achieving the precision needed. The current trends towards the availability of massive amounts of routinely produced data, as well as sharing of de-identified individual participant data from research projects, along with the ability to analyze such datasets, brings relevant opportunities and challenges to epidemiological research.

This presentation will address some of the trade-offs between validity, precision and feasibility of epidemiological studies based on primary and secondary data from different sources, and in distinct research settings.

S3.02
Local Epidemiology in Action: Turning Data into Public Health Impact

Rui Pedro Leitão[1]

[1] Public Health Unit, Local Health Unit of the Aveiro Region (ULS-RA), Portugal

This talk explores the crucial role of epidemiology as a decision-making tool in local public health. It highlights how Public Health Units (Unidades de Saúde Pública) use epidemiological methods in their daily activities—from disease surveillance and monitoring population health status and determinants to managing outbreaks and public health emergencies. The presentation will examine how local epidemiological data are collected, analyzed, and transformed into actionable insights that support health protection, disease prevention, and health promotion. Emphasis will also be placed on the practical contributions of epidemiology in proximity-based contexts, where effective communication and community engagement are essential for the success of local public health interventions.

S3.03
Informed policies using national epidemiological information systems

André Peralta Santos[1]

[1] Directorate-General for Health (DGS), National School of Public Health, NOVA University Lisbon, Portugal

Translating epidemiological evidence into effective public policy remains a critical challenge. National epidemiological information systems play a key role in bridging this gap. In a rapidly changing world, timely and accurate data are essential for informed decision-making. This presentation explores how epidemiological insights have shaped policy in vaccination, COVID-19 response, and health promotion. Real-world examples will illustrate the pathways from data to impactful health policy.

BIOMETRY SECTION SPE

Bio01
Bayesian spatial joint modelling of hospitalizations due to respiratory cancer in Portugal – a disease mapping approach

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Keywords: Bayesian spatial joint models, Count data, Disease mapping, INLA, Respiratory cancer.

In the public health field, understanding the spatial pattern of hospitalizations is crucial for healthcare practitioners and administrators. Although (classical) joint models have been traditionally motivated by associating longitudinal biomarkers and time-to-event data, their applicability extends far beyond this, for instance in spatial analysis. The Bayesian spatial joint model offers enhanced insight integrating multiple related outcomes, by sharing their underlying latent structure to capture unexplained variations common to all response variables.

In this work, we propose a Bayesian spatial joint model for analyzing multiple count outcomes related to respiratory cancer (RC) using data from the Portuguese Hospital Morbidity Database (BDMH) between 2010 and 2018. Based on BDMH, RC is the second leading cause of cancer related hospitalizations and deaths in Portugal (23% of cancer deaths in public hospitals). Thus, we jointly model the number of hospitalizations due RC, number of hospitalizations with high disease severity, and in-hospital deaths using Poisson regression models, allowing us to explicitly capture shared spatial latent structure and interdependence among outcomes. The model was fitted using integrated nested Laplace approximation (INLA). The specification includes shared spatial and unstructured random effects and is described as follows:

- $\log(\theta_{i1}) = \beta_{01} + \beta_1 x_i^T + u_{i1} + v_{i1}$
- $\log(\theta_{i2}) = \beta_{02} + \beta_2 x_i^T + u_{i2} + v_{i2} + \varphi_1(u_{i1} + v_{i1})$
- $\log(\theta_{i3}) = \beta_{03} + \beta_3 x_i^T + u_{i3} + v_{i3} + \varphi_2(u_{i1} + v_{i1})$

Here, $\mathbf{x_i}$ are covariates including patient's gender, patient's age $\geq$60, NO_2 exposure, and average length of stay. $\mathbf{u_i}$ represents spatially structured effects (BYM model), and $\mathbf{v_i}$ denotes unstructured random effects. The inclusion of shared random effects in the second and third equations captures latent effects and their impact is measured by $\boldsymbol{\varphi_1}$ and $\boldsymbol{\varphi_2}$ parameters.

The posterior means summaries of fixed effects show significant associations across the three outcomes. For instance, age $\geq$ 60 is positively associated with all outcomes; NO_2 exposure shows negative effect across the three models; gender effects are small but significant in the first and second models; average length of stay has a negative effect on hospitalizations, but a positive effect on severe cases and deaths, indicating extended stays correlate with undesirable outcomes.

The random effects shared were considered to transfer spatial information between response variables, with scaling coefficients estimated as $\boldsymbol{\varphi_1} = 1.66$ and $\boldsymbol{\varphi_2} = 1.56$, reinforcing the presence of shared latent spatial variations.

Model hyperparameters show large variances in the spatial component, especially for hospitalizations, suggesting notable geographic variability. Our analysis of RC shows the value of Bayesian spatial joint modeling in public health. The model enables more precise risk estimation, detection of high-risk areas, and improved understanding of how environmental and demographic variables impact various stages of disease progression.

Bio02
Cutoff-Free Estimation of Seroprevalence: A Mixture Model Approach

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Keywords: Sero-epidemiology

Sero-epidemiological studies of infectious diseases often aim to estimate seroprevalence—the proportion of a population with detectable antibodies against a specific pathogen. This metric reflects the degree of population exposure to the pathogen in question. However, estimating seroprevalence presents a major statistical challenge: an individual's serological status (seronegative or seropositive) cannot be directly observed but must be inferred. The conventional approach uses an optimal cutoff value in the antibody density distribution. Individuals with antibody levels above this threshold are classified as seropositive; those below are considered seronegative. While this method simplifies analysis, it results in imperfect serological classification—a situation analogous to diagnosing disease with an imperfect diagnostic test. Accurate seroprevalence estimation therefore requires correcting the observed prevalence based on the classification's sensitivity and specificity. However, such corrections are rarely performed in practice, leading to widespread bias in published seroprevalence estimates. In this talk, I argue that the cutoff-based approach is unnecessary. Instead, I propose fitting a two-component mixture model and interpreting the mixing weight associated with the seropositive population as the seroprevalence estimate. This interpretation enables direct modeling of seroprevalence through regression approaches. I will demonstrate these concepts using data from a sero-epidemiological study of malaria caused by Plasmodium vivax.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** This work is funded by the European Union (Horizon Europe, project 101057665). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HADEA. Neither the European Union nor the granting authority can be held responsible for them.

Bio03
A Bayesian joint model for multiple (un)bounded longitudinal markers, competing risks, and recurrent events

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Keywords: Bounded outcomes, Competing risks, Joint model, Multivariate longitudinal data, Recurrent events.

Background: Joint models are commonly used to investigate associations between longitudinal biomarkers and time-to-event outcomes. However, most existing frameworks assume Gaussian-distributed markers and focus on single event types, which limits their applicability in complex settings involving bounded markers, recurrent events, and competing risks. These limitations can lead to biased estimates and the omission of clinically relevant information, particularly in analyses of patient registry data such as those used in cystic fibrosis (CF) research.

Methods: We propose a Bayesian shared-parameter joint model that simultaneously accommodates multiple (possibly bounded) longitudinal markers, a recurrent event process, and competing risks. The model employs the beta distribution for bounded outcomes, ensuring predictions remain within feasible biological limits, and without compromising interpretability of their associations. It allows flexible association structures between markers and event processes, supports discontinuous risk intervals, and permits both gap and calendar timescales. A simulation study evaluates model performance under correct specification and when the Gaussian distribution is inappropriately used for a bounded marker. We apply the proposed model to the US Cystic Fibrosis Foundation Patient Registry to assess the impact of percent predicted FEV_1 ($ppFEV_1$) and body mass index (BMI) on the risks of recurrent pulmonary exacerbations (PEx), lung transplantation, and death.

Results: Simulation results show that the proposed model accurately recovers true parameter values and yields unbiased estimates, while Gaussian models fitted to bounded outcomes introduce substantial bias in associations. In the application to 23,543 individuals from the CF registry, our model reveals that lower and declining $ppFEV_1$ and lower BMI are significantly associated with increased risks of PEx, transplantation, and death. For instance, a one-unit increase in the rate of $ppFEV_1$ decline increases the hazard of death by 9.15% (95% CI 7.51–10.83). A one-unit increase in the standardized cumulative effect of BMI increases the hazard of PEx by 7.06% (95% CI 5.42–8.70). The incidence of PEx is positively associated with transplantation and death. Modeling transplantation and death separately rather than as a composite outcome revealed distinct associations, offering greater clinical insight. The model implementation in C++ enables efficient computation despite the model's complexity and the large sample size.

Conclusions: Our flexible joint modeling framework extends existing approaches to accommodate complex data structures, providing more accurate inference and a deeper understanding of disease progression in CF. The model is publicly available in the R package JMbayes2 and can be adopted in other epidemiological applications.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** The authors would like to thank the Cystic Fibrosis Foundation for the use of CF Foundation Patient Registry data to conduct this study, as well as the patients, care providers, and clinic coordinators at CF Centers throughout the United States for their contributions to the CF Foundation Patient Registry. This research was supported by the NationalInstitutes of Health (R01 HL141286).

Bio04
THE PROBLEM OF BAYESIAN SCREENING FROM A MEDICAL POINT OF VIEW

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Keywords: screening problem, nonparametric Bayesian methods, discrimination between cancer subtypes.

Discrimination between different subtypes of a given disease allows for the use of differentiated therapy, contributing to the success of medical treatments. The screening problem, whose objective is to retain, usually for future observation, individuals with a (d-dimensional) vector of characteristics $x = (x_1, x_2, \cdots, x_d)$ belonging to a region C_x, plays an important role in this discrimination. In a medical context, screening involves determining the category (among a set of mutually exclusive categories) to be assigned to an individual with a specific set of characteristics x. There is a large literature that addresses the statistical problem of screening, both from a classical and a Bayesian point of view. From a Bayesian predictive perspective, the statistical problem consists of obtaining the diagnostic probability function $p(k|x, D)$, where $D = \{(x_1, k_1), (x_2, k_2), \cdots, (x_n, k_n)\}$ represents data on elements whose categories are known, in order to define the region C_x, optimal in a certain sense. The use of parametric distributions in obtaining the diagnostic probability function is the most common approach in the screening problem [1, 2], as this parametric specification allows for obtaining, with relative ease, closed-form expressions for the predictive quantities necessary for the adequate formulation of the screening problem. However, in many practical situations, it is not reasonable to expect that the conjectured families of distributions appropriately describe the data generating process, making it necessary to consider non-parametric alternatives.

In this work, a flexible modelling of the screening problem based on non-parametric Bayesian models is presented. The models were obtained for any dimension of the characteristic vector, thus extending the published results on the triage problem. To illustrate the developed models, the problem of discriminating individuals with different types of cancer is considered.

Acknowledgements: Work funded by Fundação para a Ciência e a Tecnologia, Portugal, within the projects UID/00006/2025, UIDB/00006/2020 e UIDP/00006/202

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CONFERENCE ABTRACTS

OC01
Dynamic Prediction of the Causal Effect of Transplantation on Survival to Prioritize Patients on Transplant Waiting Lists: A Case Study in Hepatocellular Carcinoma

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Keywords: Causal Inference, Dynamic Prediction, Hepatocellular Carcinoma, Joint Models, Time-Varying Confounding.

Background: Liver transplantation (LT) is the only curative treatment for selected patients with unresectable hepatocellular carcinoma (HCC). However, due to organ scarcity, patients must often wait for a suitable graft, during which they may become ineligible due to tumour progression or clinical deterioration. A predictive model identifying patients at highest risk of waitlist dropout and those who would benefit most from LT could improve organ allocation. Transplant-related survival benefit, defined as the additional survival time gained from LT compared to waitlist survival, provides a comprehensive metric to guide allocation. Estimating this causal effect requires addressing the observational nature of transplant data and time-varying confounders. To address these challenges, we developed a Bayesian shared-parameter joint model for longitudinal and time-to-event data that dynamically predicts individualised transplant-related survival benefit in HCC patients. Unlike alternative approaches, such as the G-formula, structural marginal models, targeted maximum likelihood estimation, our model makes stronger assumptions about the biomarker measurement process but remains non-parametric for competing processes like censoring and visit times.

Methods: We analysed data from 7,471 HCC patients listed in the US Scientific Registry for Transplant Recipients (SRTR) between 2012 and 2022, of whom 4,786 received a liver. The model jointly estimates three linear mixed-effects models for the longitudinal pre-transplant trajectories of serum level of tumour α-fetoprotein, tumour burden score, and model for end-stage liver disease score, while modelling mortality using a proportional-hazards model. We associate both the rate of change and the standardised cumulative effect of these predictors with the risk of death before and after transplantation. We defined the assumptions necessary to obtain unbiased estimates of the causal effect of transplantation using observational data. Our model predicts a patient's survival probabilities with and without transplantation, which are then used to estimate liver transplant survival benefit. Dynamic updates enable real-time refinement of the predictions and identification of the patients most likely to benefit from transplantation. The model is implemented in the freely available *R* statistical package *JMbayes2*.

Results: Our model provides individualised, unbiased estimates of the causal effect of transplantation on individual survival using observational SRTR data without explicitly modelling the transplant assignment mechanism.

Conclusions: By shifting focus from urgency to predicted survival benefit, this model supports more personalised, transparent, and equitable transplant decision-making in HCC, ultimately improving overall survival for waitlisted HCC patients. Future validation in non-US populations, such as European or Asian cohorts, is warranted to assess its generalisability across healthcare settings.

Conflicts of interest: The authors declare no conflict of interests.

OC02
Understanding the Trajectory over time of Kidney Transplants: A Risk Factor Analysis

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Keywords: Brain Death Donors, Glomerular Filtration Rate, Linear Mixed Model, Kidney Transplantation, Uncontrolled Circulatory Death Donors.

Introduction: This study evaluates the trajectory over time of the outcomes of kidney transplants (KTs) from uncontrolled donation after circulatory death (uDCD) over the first eight years of a new program in a Central Hospital (2016-2023), comparing them to brain-dead donor (BDD) transplants, including both standard criteria (SCD) and expanded criteria donors (ECD). The aim was to determine the efficacy of uDCD as a sustainable and effective source of renal grafts.

Methods: A retrospective analysis was conducted on 523 kidney transplant recipients who received a deceased donor organ, 142 KT from uDCD donors maintained by normothermic extracorporeal membrane oxygenation (nECMO) with those from 194 KT from SCD and 187 KT from ECD. The main outcomes studied were 8-year graft survival (uncensored and censored by death), recipient survival, and linear and multivariate mixed regression models of graft function over 8 years.

Results: The uDCD program increased the donor pool by 14% to 38%. Graft function and survival outcomes for uDCD KTs were comparable to those of SCD donors. Primary non-function (PNF) was similar in uDCD (16.9%) and ECD (13.4%, p=0.460) groups and more common than in SCD (4.6%) group (p<0.001 and p=0.005), with serum creatinine and warm ischemia time (WIT > 60 min) being key predictors of PNF. In addition, delayed graft function (DGF) differed among the groups, being higher in the uDCD group (69.7%), followed by ECD (43.9%) and SCD (37.6%) groups ($p \leq 0.05$). Despite a high delayed graft function (DGF) rate this did not affect long-term outcomes. At seven years, the estimated glomerular filtration rate (eGFR) and death-censored graft survival (79.9%, or 91.4% excluding PNF) in uDCD KTs were comparable to those from BDDs. Patient survival at eight years showed no significant differences between groups.

Conclusions: uDCD kidney transplantation demonstrates long-term functional and survival outcomes similar to those from BDDs, validating uDCD as a reliable and valuable donor source. These findings support the broader implementation of uDCD programs to enhance organ availability and address transplant demands.

Ethics committee and informed consent: The current research was approved by an ethics committee and subjects gave their informed consent before they were enrolled in the study. **Conflicts of interest:** The authors declare no conflict of interest. **Acknowledgements:** This work is partially financed by national funds through FCT – Fundação para a Ciência e a Tecnologia under the project UIDB/00006/2025 and UIDB/00006/2020. DOI: https://doi.org/10.54499/UIDB/00006/2020.

OC03
So Many Callers, So Little Truth: A Performance-Based Decision Guide

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Keywords: Positive Predictive Value, Sensitivity, Genomics, Variant Calling.

Background: Genomic data is increasingly integrated into clinical decision-making. Accurate variant detection is essential for identifying genetic risk factors, guiding diagnostics, and supporting personalized treatment strategies. However, the performance of variant calling (VC) tools, central to analyzing next-generation sequencing (NGS) data—varies significantly depending on their underlying statistical frameworks. Understanding these variations is key for researchers and health professionals selecting the right tools for genomic studies. This study aims to evaluate the performance of several widely used VC tools from a statistical modeling perspective, considering their precision, recall and computational efficiency. By comparing approaches, we facilitate methodological decisions in genomics-driven health research, contributing to better model selection in precision medicine and population health contexts.

Methods: The study was based on the well-characterized NA12878 sample (50× coverage, Illumina HiSeq 2000). Each tool was evaluated in two settings regarding the NA12878 sample: one using the chromosome 20 subset and the other using whole genome sequencing (WGS) data. Genome in a Bottle (GIAB) benchmark was used as gold standard to validate the variants identification. Performance was measured using precision, recall, F1 score and runtime. Tools were also categorized by their underlying statistical models: Bayesian inference (GATK, FreeBayes, Octopus), machine learning or deep learning (Strelka2, DeepVariant), and heuristic/probabilistic models (Varscan2, Samtools). Runtimes were measured under standardized conditions (Intel Core i7-1280P, 16 GB RAM, Windows 11), and categorized into time intervals.

Results: DeepVariant showed the highest F1 score and precision on chromosome 20, while Strelka2 achieved the best performance on whole genome data. Tools relying on Bayesian inference generally displayed higher recall, while machine learning-based tools presented higher in precision. However, deep learning approaches incurred the highest computational cost. Trade-offs between recall, precision, and efficiency were evident and influenced by both methodological approach and data scale.

Conclusions: This study highlights the importance of statistical strategy selection in variant calling, particularly when aligning computational efficiency with clinical objectives. The findings support informed decision-making in the implementation of VC pipelines in health-focused genomic research and contribute to the design of more effective and efficient tools for medical applications.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** This research was funded by FCT – Fundação para a Ciência e a Tecnologia through the Ph.D. grant UI/BD/153743/2022 (https://doi.org/10.54499/UI/BD/153743/2022), and was also partially financed by CEAUL through the strategic project UID/00006/2025 and UIDB/00006/2020 (https://doi.org/10.54499/UIDB/00006/2020).

OC04
Trends in initial pharmacological treatment for chronic obstructive pulmonary disease in Dutch primary care, 2010-21: a repeated cross-sectional study

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Keywords: Pulmonary Disease, Chronic Obstructive, Primary Health Care, Drug Therapy

Background: Pharmacological treatment plays an important role in the management of chronic obstructive pulmonary disease (COPD), with general practitioners (GPs) responsible for most initial prescribing. The absence of data on prescribing trends limits understanding of how scientific and technical developments have influenced primary care practices. This study aimed to analyse prescribing trends for newly diagnosed COPD individuals in Dutch primary care from 2010 to 2021.

Methods: A repeated cross-sectional study was conducted using data from the PHARMO GP Database. Adults aged ≥40 years with a GP-assigned COPD diagnosis within the study period were included. Pharmacological treatment, defined as the first GP prescription within 90 days of diagnosis, was classified as either reliever-only (SABA, SAMA, or SAMA-SABA) or maintenance (LABA, LAMA, LABA-LAMA, or ICS-based: LABA-ICS, LABA-LAMA-ICS). The annual proportion of individuals receiving each treatment was calculated by dividing the number of patients prescribed that treatment in a given year by the total number diagnosed in the same year. Proportions were age- and sex-standardised to the 2021 Dutch population, log-transformed, and analysed using joinpoint regression. Results are reported as annual rate of change.

Results: Among 54,628 included COPD patients (median age 65 [IQR 57-73]; 53.7% men), 36.4% received no prescription within 90 days of diagnosis. Of these, 82.5% had not received a prescription by 180 days, and 80.1% of those continued without one at one year. Another 4.2% received other treatments, mainly ICS monotherapy. The proportion of patients treated with LAMA monotherapy increased from 13.4% in 2010 to 15.1% in 2015 (annual rate of change: 2.2%; 95% CI 0.1, 6.9), then declined annually (-4.7%; -10.5, -2.7) to 11.0% by 2021. LABA monotherapy rose steadily from 2.6% to 5.7% between 2010 and 2021 (4.1%; 0.6, 7.3). LABA-ICS declined from 17.6% in 2010 to 8.5% in 2018 (-8.5%; -11.9, -7.1), then plateaued (6.5%; -5.5, 20.8). LABA-LAMA increased sharply from 0.6% to 4.9% in 2016 (47.6%; 39.5, 63.6), then continued to rise gradually to 9.6% in 2021 (12.1%; 3.2, 18.7). Triple therapy remained stable over time (-2.3%; -11.6, 1.8). SABA increased from 8.5% in 2010 to 14.3% in 2018 (7.6%; 6.6, 9.0), then stabilised (-3.7%; -11.9, 0.8). SAMA (0.7%; -1.5, 2.6) and SABA-SAMA (-2.6%; -3.3, 8.4) remained consistently low throughout.

Conclusions: Prescribing trends likely reflect updated management strategies and the introduction of single-inhaler therapies. However, the proportion of patients who remained without a GP prescription warrants further investigation.

Ethics committee and informed consent: This study is exempt from requiring informed consent under the European Union General Data Protection Regulation (EU-GDPR), which permits the use of secondary data for scientific research when appropriate safeguards are in place. Stichting Informatievoorziening voor Zorg en Onderzoek (STIZON) is responsible for the collection, processing, and deidentification of data in accordance with the Personal Data Protection Act under Dutch legislation, allowing its anonymous use by PHARMO and/or affiliated universities or projects for research purposes. Conflicts of interest: G.R., J.A., Q.D., and A.M. declare that they have no competing interests. B.N.B. is an employee of the PHARMO Institute for Drug Outcomes Research, an independent institute conducting financially supported studies for the government, healthcare authorities, and pharmaceutical companies. F.M.E.F. has received research grants from AstraZeneca; consultancy fees from Merck Sharp & Dohme; and speaker fees from AstraZeneca, Boehringer Ingelheim, GlaxoSmithKline, Chiesi, and Novartis. All these are outside the scope of the current study. M.A.S. has received research grants from the Netherlands Lung Foundation and Stichting Astma Bestrijding, as well as consultancy fees from AstraZeneca and Boehringer Ingelheim outside the scope of the current study. All research grants and consultancy fees were paid to Ciro. **Acknowledgements:** This work received financial support from AstraZeneca, Chiesi, TEVA, and Boehringer Ingelheim through the University of Aveiro/CIRO+ B.V. (BI/ESSUA/9841/2023; BI/ESSUA/9878/2021). It was also supported by FCT – Fundação para a Ciência e Tecnologia, I.P. under project references UIDB/04501/2020 (DOI: https://doi.org/10.54499/UIDB/04501/2020) and UIDP/04501/2020 (DOI: https://doi.org/10.54499/UIDP/04501/2020).

OC05
Prescribing patterns of general practitioners for initial asthma treatment between 2010 and 2021 in the Netherlands: a population-based study

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Keywords: Asthma, Primary Health Care, Drug Therapy, Joinpoint regression.

Introduction: A significant number of people with asthma remain uncontrolled despite existing guidelines and effective treatments. Suboptimal medical care has been identified as a reason for poor asthma control. However, few real-world studies have examined the prescribing practices of general practitioners. This study aimed to describe trends in the initial pharmacological treatment of asthma in Dutch primary care.

Methods: This was a repeated cross-sectional study of adults diagnosed with asthma between 2010 and 2021 from the PHARMO data network. Based on the first prescription within 90 days of diagnosis, patients were categorised into treatment groups: short-acting β2-agonists (SABA) without inhaled corticosteroids (ICS), ICS without long-acting β2-agonists (LABA), dual therapy with ICS and LABA, or triple therapy with ICS, LABA, and long-acting muscarinic antagonists (LAMA). Those who received other treatment combinations were assigned to the "other treatment" group. Patients who were not prescribed asthma-related medication were also analysed. Annual treatment proportions were standardised by age and sex and analysed with joinpoint regression to identify trend changes. Results are reported as annual percentage change (APC) with corresponding 95% confidence intervals.

Results: A total of 95,523 adults with asthma were included (40% male; median age 45 [Q1, Q3; 31, 59] years). The most prescribed initial treatment was SABA without ICS (25.2%), followed by ICS-LABA (23.9%), ICS without LABA (14.5%), and ICS-LABA-LAMA (0.7%). Other treatment combinations were prescribed to 5.9% of the patients, while 29.7% received no prescription for asthma-related medication within 90 days of diagnosis. SABA without ICS decreased after 2018, from 29.5% to 26.1% [APC: -3.4% (-7.2, -1.3)], while ICS-LABA increased significantly from 22.1% to 30.6% [APC: 12.0% (95% CI 8.3, 15.1)]. A shift in the proportion of patients prescribed ICS without LABA was observed in 2019, after which this treatment group began to decline [APC: −14.9% (−20.9, −8.0)]. The proportion of patients prescribed triple therapy remained stable at around 1% throughout the study period [APC: 2.8% (−0.9, 6.6)], while those without any asthma prescriptions decreased from 34.2% to 25.0% [APC: -3.4% (-4.1, -2.8)].

Conclusions: Initial asthma treatment has changed over the years, likely reflecting an update in recommendations; however, a significant number of patients were still prescribed SABA without ICS. Many patients did not receive prescriptions from their general practitioner within the first three months of diagnosis. The study, therefore, highlights opportunities to improve asthma pharmacological management and calls for strategies to bridge the gap between evidence-based recommendations and clinical practice.

Ethics committee and informed consent: No ethical approval or informed consent was required for this study under the Dutch Medical Research Involving Human Subjects Act, as anonymised data were used. **Conflicts of interest:** JA, GR, QD and AM declare no conflict of interest. BNB is an employee of the PHARMO Institute for Drug Outcomes Research. This independent research institute performs financially supported studies for government and related healthcare authorities and several pharmaceutical companies. LC has received honoraria from GlaxoSmithKline, Sanofi, AstraZeneca and Vertex, as well as travel support from TEVA and Novartis. FMEF has received research grants from AstraZeneca, consultancy fees from Merck Sharp & Dohme, and speakers' fees from AstraZeneca, Boehringer Ingelheim, GlaxoSmithKline, Chiesi, and Novartis. All these are outside the scope of the current study. MAS has received research grants from the Netherlands Lung Foundation and Stichting Astma Bestrijding, as well as consultancy fees from AstraZeneca and Boehringer Ingelheim, all outside the scope of the current study. Additionally, MAS has received research grants from AstraZeneca, TEVA, Chiesi, and Boehringer Ingelheim for the current study. All research grants and consultancy fees were paid to Ciro. **Acknowledgements:** This study was financially supported by AstraZeneca, Chiesi, TEVA, University of Aveiro/CIRO + B.V (BI/ESSUA/9878/2021; BI/ESSUA/9841/2023) and by FCT - Fundação para a Ciência e Tecnologia, I.P. by project reference UIDB/04501/2020 and DOI identifier https://doi.org/10.54499/UIDB/04501/2020 and project reference UIDP/04501/2020 and DOI identifier https://doi.org/10.54499/UIDP/04501/2020.

OC06
SLE-DAS: A Comprehensive and Reliable Measure of Lupus Disease Activity

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Keywords: Reliability, SLE-DAS, Validation.

Introduction: Systemic Lupus Erythematosus (SLE) is characterized by a high variability in disease manifestations both within and between patients, which makes assessment of disease activity a real challenge. Measures of disease activity are fundamental in both clinical practice and clinical trials. The SLE Disease Activity Score (SLE-DAS) is a recently developed composite index incorporating 17 clinical and laboratory parameters and has demonstrated to be a valid instrument with high performance in classifying disease activity categories and with high sensitivity in detecting meaningful improvements or worsening. Real-life data from clinical trials and multicentre cohorts have been used to define and validate SLE-DAS cut-offs for disease categories, remission, low, mild, moderate and severe disease activity. Reliability was also assessed in a study involving 19 experienced rheumatologists who rated 24 clinical vignettes on two occasions using SLE-DAS and two other common activity scores.

Methods: Receiver operating characteristic (ROC) curve analysis and bootstrap methodology were combined to determine the cut-off values for the disease categories. The validation of these cut-offs was performed with independent test sample data, using performance measures robust to imbalanced data, such as sensitivity, specificity, and G-mean. Furthermore, construct validity was supported by the association between disease activity categories and health-related quality of life (HR-QoL) patient-reported outcomes (PROs). Inter-rater and intra-rater reliability were estimated through the intraclass correlation coefficient (ICC) calculated with a two-way random-effects model.

Results: In validation cohorts, SLE-DAS category cut-offs demonstrated high sensitivity and specificity: 100% and 97.4% for remission (gold standard: DORIS clinical remission criteria); 97.1% and 97.7% for LDA (gold standard: Lupus Low Disease Activity State criteria); 82.6% and 99.2% for mild (gold standard: physician's classification); 100% and 98.6% for moderate-to-severe (gold standard: physician's classification); and 77.8% and 79.6% for severe (gold standard: BILAG -2004 index). Moreover, SLE-DAS disease category definitions were significantly associated to HR-QoL PROs, and the SLE-DAS showed good reliability with ICC interrater and intra-rater values of 0.83 and 0.92, respectively.

Conclusions: The SLE-DAS is a valid, reliable and easy-to-use score, exhibiting high performance in classifying patients according to established lupus disease activity categories and is associated with HR-QoL, supporting its use in treat-to target management of patients with SLE.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** Partially supported by the Centre for Mathematics of the University of Coimbra (funded by the Portuguese Government through FCT/MCTES, DOI 10.54499/UIDB/00324/2020) and CISeD of Instituto Politécnico de Viseu (project Ref. UIDB/05583/2020). **Supplementary material:** List of references. Available online

OC07
Assessing Forensic Sexual Diagnosis by Key epidemiological principles to redress Artificial Intelligence Limitations in Forensic Medicine

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Keywords: Epidemiology, Sex classification, Mandibular parameters, Artificial intelligence, Convolutional Neural Networks.

Introduction/Objective: Forensic epidemiology, a synergistic combination of epidemiology, forensics, and Artificial Intelligence (AI), holds immense potential for enhancing legal research and perception. This study explores the integration of forensic epidemiology tools with AI advancements to improve sex classification accuracy, a critical component of criminal investigations and medico-legal assessments. Recognizing the limitations of AI in contextual understanding and potential biases, we leverage key epidemiological principles to redress these shortcomings and ensure fairness in AI-driven analyses. Specifically, we investigate how epidemiological insights can enhance both traditional craniomandibular metric methods and convolutional neural networks (CNNs) for sex classification in skeletal remains, offering novel approaches for complex forensic cases.

Methods: This study employed two distinct methodologies. First, craniomandibular metric criteria were analyzed using 206 orthopantomographs (OPGs) from individuals aged above 25 years. Measurements were performed using ImageJ® software, and statistical analyses, including sensitivity, specificity, accuracy, ROC curves, area under the ROC curve (AUC), and cutoff point determination, were conducted using IBM SPSS® Statistics 29. Second, the accuracy of CNNs, specifically the VGG16 model, for forensic sex prediction was evaluated using 1050 OPGs from individuals aged between 16 and 30 years. The OPGs were pre-processed, resized, and augmented using Python, and the model's performance was assessed based on precision, sensitivity, F1-score, and accuracy.

Results: Significant differences between sexes ($p < 0.001$) were observed for all craniomandibular variables, except for angular variables ($p > 0.05$). The height of the right (0.861) and left (0.850) mandibular ramus exhibited the best area under the ROC curve. Left coronoid ramus height, right mandible body height, left mandible body height, and right mandibular ramus height emerged as the most significant predictors for sex determination. A classification model based on these variables achieved an accuracy of 83%, a sensitivity of 86.2%, a specificity of 78.9%, and an AUC of 0.887. The CNN training revealed a discrepancy between validation and training loss values. In the general test, the model demonstrated a balanced performance between sexes, with F1-scores of 0.89. Surprisingly, the model achieved the highest accuracy in the 16-20 age group (90%). The overall accuracy obtained was 89%.

Conclusions: Forensic epidemiology, by incorporating progress data analytics and AI techniques, significantly enhances sex estimation and classification, thereby improving forensic identification. Epidemiological principles are crucial for ensuring fairness and representativeness in AI algorithms, mitigating discrimination and bias in investigations. The CNNs demonstrated high accuracy in classifying human remains based on sex, supporting their use for medico-legal identification. Furthermore, specific mandibular measurements, including left coronoid height, right and left mandibular body heights, and ramus height, exhibit strong sexual dimorphism, making them reliable indicators for accurate sex classification in forensic analysis.

Ethics committee and informed consent: The protocols designed were approved by the Lisbon Academic Center of Medicine (CAML) and the Lisbon North University Hospital Center (CHLN) with approval number 216/23 and were approved and realized in accordance with the ethical standards specified by the Health Ethics Committee of the Faculty of Dental Medicine, University of Lisbon, Lisbon, Portugal. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT – Fundação para a Ciência e a Tecnologia under the project UIDB/00006/2025. This work is support by the Dental Forensic Sciences Research Group (FORENSEMED) integrated part of the Oral and Biomedical Sciences Research Unit (UICOB) at Faculdade de Medicina Dentária da Universidade de Lisboa. This work is partially financed for the project 2024.07444.IACDC, supported by measure 'RE-C05-i08.M04 - "RE-C05-i08.M04 – "Apoiar o lançamento de um programa de projetos de I&D orientado para o desenvolvimento e implementação de sistemas avançados de cibersegurança, inteligência artificial e ciência de dados na administração pública, bem como de um programa de capacitação científica", of the Recovery and Resilience Plan (Plano de Recuperação e Resiliência – PRR), under the funding contract signed between the Recovering Portugal Mission Structure (EMRP)) and the Fundação para a Ciência e a Tecnologia I.P. (FCT), as intermediary beneficiary. **Supplementary material:** List of references. Available online

OC08
Forensic Epidemiology in the courtroom: Bone Age Assessment

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Keywords: Forensic epidemiology, Forensic age estimation, Bone age assessment, Baccetti method.

Introduction/Objective: Forensic epidemiology plays an increasingly vital role in the legal system by providing evidence-based methodologies to assess and support judicial decisions across a broad spectrum of medicolegal issues. Bone age assessment, a critical tool within forensic epidemiology, aids in estimating an individual's age in both criminal and civil court proceedings. This study aims to evaluate the application of bone age assessment using cervical vertebrae, employing epidemiological parameters to determine its accuracy and reliability in estimating legal age. Specifically, we investigate the Baccetti method's effectiveness in assessing skeletal maturation through cervical vertebrae analysis, considering its potential limitations and variations across different age groups and sexes, under a specific population, in this case Portuguese population. Age estimation methods often rely on reference populations where known ages are correlated with developmental indicators, like skeletal maturation.

Methods: A retrospective analysis was conducted on 466 teleradiographs from individuals aged between 6 and 21 years, encompassing both sexes. Each teleradiograph was assessed for skeletal maturation stage according to the Baccetti method. A cephalometric analysis, based on the Baccetti 2005 study, was performed using ImageJ® software to quantitatively analyze the morphological characteristics of cervical vertebrae C2, C3, and C4 through reference point measurements. Classification trees were generated for each legal age, and the sensitivity and specificity of the models were evaluated. ROC curve analysis, with the area under the curve (AUC) as a measure of test reliability, was performed. Statistical data analysis was conducted using IBM SPSS® Statistics 29.

Results: The Baccetti method demonstrated excellent intra-observer (kappa = 0.987) and inter-observer (kappa = 0.977) reliability. The correlation coefficient for bone age regression was 0.907, with an adjusted determination coefficient of 0.822. The accuracy and reliability of the method varied depending on the age being classified. ROC curve analysis revealed that accuracy and sensitivity were highest at age 12 (95.0% and 94.4%, respectively) and lowest at age 18 (86.3% and 81.7%, respectively). The AUC values were highest at age 14 (0.981) and lowest at age 18 (0.887). Sensitivity at the legal age of 18 was considerably lower, particularly in females. The AUC remained high across all ages for both sexes, with its lowest value (0.859) occurring at age 18 in females. Accuracy was highest at age 14 (91.8% for females and 94.0% for males) and lowest at age 18 (74.5% for females and 84.6% for males).

Conclusions: Bone age assessment using the Baccetti method demonstrates high reliability, but its accuracy varies significantly with age, with greater precision observed between 12 and 16 years and a decline in accuracy from age 18 onwards. These findings underscore the importance of considering both behavioral analysis and physical maturity when defining legal ages thresholds. This study highlights the critical role of forensic epidemiology in providing evidence-based frameworks that enhance the accuracy, efficiency, and predictive power of bone age assessments in complex legal cases, particularly when evaluating the attainment of legal adulthood and presenting these findings as reliable evidence in court, for this reference population.

Ethics committee and informed consent: The current research was approved by the Lisbon Academic Center of Medicine (CAML) and the Ethics Committee of Local Health Unit (ULS) Santa Maria, with approval number 217/23. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT – Fundação para a Ciência e a Tecnologia under the project UIDB/00006/2025. This work is support by the Dental Forensic Sciences Research Group (FORENSEMED) integrated part of the Oral and Biomedical Sciences Research Unit (UICOB) at Faculdade de Medicina Dentária da Universidade de Lisboa. This work is partially financed for the project 2024.07444.IACDC, supported by measure 'RE-C05-i08.M04 - "RE-C05-i08.M04 – "Apoiar o lançamento de um programa de projetos de I&D orientado para o desenvolvimento e implementação de sistemas avançados de cibersegurança, inteligência artificial e ciência de dados na administração pública, bem como de um programa de capacitação científica", of the Recovery and Resilience Plan (Plano de Recuperação e Resiliência – PRR), under the funding contract signed between the Recovering Portugal Mission Structure (EMRP)) and the Fundação para a Ciência e a Tecnologia I.P. (FCT), as intermediary beneficiary. **Supplementary material:** List of references. Available online

OC09
Comparative Analysis of Facial Measurements in Normal vs. Trisomy 21 Fetuses: A Statistical Approach

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Keywords: Facial dysmorphism, Fetal Development, Prenatal screening, Trisomy 21, Ultrasound measurements.

Introduction: Prenatal assessment of facial morphology offers valuable insights into chromosomal abnormalities such as Trisomy 21 (T21), which is characterized by distinct craniofacial features, including midface hypoplasia. This study aimed to evaluate the reliability of facial measurements and investigate morphometric differences between T21 and euploid fetuses at 20-22 weeks of gestation. Additionally, we assessed the predictive value of cranial biometric parameters and analyzed intra- and inter-observer reproducibility, alongside distribution patterns through percentile analysis.

Methods: A cohort of 422 fetuses (400 euploid, 22 T21) was evaluated using obstetric records including twelve standardized facial measurements across upper, middle, and lower facial levels, selected based prior literature and clinical relevance. Biometric parameters such as biparietal diameter (BPD) and head circumference (HC) were also analyzed. Group comparisons were performed using statistical tests, followed by correlation analyses between each measurement and BPD/HC. Multiple linear regression models were constructed to evaluate the predictive value of BPD and HC. Measurement reliability was assessed using the intraclass correlation coefficient (ICC). To explore the distribution and variability of facial dimensions, percentiles were calculated using the empirical cumulative distribution function (ECDF), focusing on the 10th and 90th percentiles.

Results: Six facial measurements, predominantly within the upper and middle thirds, were significantly different between groups ($p < 0.05$). Correlation analyses revealed weak but significant associations ($r < 0.25$) between most facial variables and both BPD and HC, with BPD showing stronger and more consistent relationships. In regression models, BPD emerged as a significant predictor of facial dimensions in the upper and middle levels ($p < 0.001$), while HC showed fewer significant associations. Intra- and inter-observer ICCs exceeded 0.75 for most variables, indicating good to excellent reproducibility. ECDF analysis showed that the trisomy 21 group had fewer values in the extreme percentiles (P10 and P90), suggesting reduced dispersion and more centralized facial dimensions compared to the euploid group.

Conclusions: T21 fetuses exhibit distinct and less variable facial dimensions at 20-22 weeks, especially in the upper and middle facial regions, when compared to euploid fetuses. BPD appears to be a stronger predictor of these differences than HC. These findings support the potential use of facial morphometry as a complementary tool in prenatal screening for T21. Further validation in larger, prospective cohorts is recommended to confirm these associations and enhance clinical applicability.

Ethics committee and informed consent: The study has received approval from the Ethics Committees of ULSEDV and ULSG/E. The cases of Down syndrome (Trisomy 21) are sourced from three units: ULSEDV, ELS G/E, and ULS São João. As the study on Trisomy 21 was a retrospective analysis, no ethical approval request was submitted for this group. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** We would like to acknowledge Dr. Conceição Brito and Professor Inês Nunes (ULSG/E), as well as Dr. Teresa Carraca (ULS São João), for their valuable collaboration and support.

OC10
Impact of livestock-related air pollution on public health: a nationwide study on COVID-19 in the Netherlands

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Keywords: Air Pollution, Cohort Study, Covid-19, Livestock, Test-Negative Case-Control Study.

Background: Ambient air pollution has been linked to increased COVID-19 incidence and severity worldwide, but nationwide studies, particularly those focused on rural populations, are scarce. In the Netherlands, comprehensive research found that long-term exposure to PM10 and PM2.5, especially from livestock farming, was associated with increased risks of SARS-CoV-2 infection and COVID-19 hospitalization. Livestock-related air pollution has recently gained attention, with studies pointing to endotoxins as a major livestock-related air pollutant linked to adverse respiratory effects. This study aims to determine the nationwide airborne endotoxin exposure in the general population and to ascertain the role of endotoxin exposure in the increased COVID-19 risks observed in relation to air pollution from livestock farming.

Methods: We estimated annual-average PM10- and PM100-associated endotoxin exposure (overall and for poultry, pigs and cattle) for all Dutch residential addresses in 2020 using the STACKS-E model, an advanced Gaussian atmospheric dispersion modelling. We then assigned the resulting individual-level endotoxin exposure estimates to adults from the Dutch population register and linked these to national hospital data and the centralized nationwide COVID-19 tests register. In a cohort analysis (8.3 million persons), we applied interval-censored survival generalized additive models to estimate hazard ratios (HR) for SARS-CoV-2 infection and COVID-19 hospitalization risks. In a test-negative case-control analysis (1.7 million tests), we estimated odds ratios (OR) by comparing test-positive to test-negative individuals with respiratory symptoms using mixed-effects logistic regression. Both analyses were adjusted for individual- and area-level covariates, including local SARS-CoV-2 spatiotemporal variation circulation levels. We performed sensitivity analyses adjusting the models for PM10, PM2.5 and NO2.

Results: Increased risk of SARS-CoV-2 infection was associated with exposure to both PM10-associated endotoxins (HR = 1.131 (1.076-1.188) and OR = 1.163 (1.015-1.332)) and PM100-associated endotoxins (HR = 1.028 (1.016-1.039) and OR = 1.046 (1.016, 1.077)). Moreover, endotoxin exposures were associated with higher COVID-19 hospitalization risk (HR = 1.327 (1.154-1.527) and 1.058 (1.019-1.097), for PM10- and PM100-associated endotoxin respectively). Associations were robust to co-pollutant adjustment for PM10, PM2.5 and NO2. We observed statistically significant associations between pig-farm associated endotoxin exposure and increased risk of infection and between both pig- and poultry-farm associated endotoxin and risk of hospitalization.

Conclusion: Our findings are in line with current evidence of the adverse effects of air pollution on respiratory infections. Beyond the impact of chemical or particle components of air pollution, our results further highlight the important contribution of livestock-related microbial pollution in the mixture of air pollution. These effects are particularly relevant for populations living in less urbanized areas, for whom public health implications of livestock emissions warrant closer attention.

Conflicts of interest: The authors declare no conflict of interests.

OC11
Co-development of Epidemiology and Artificial Intelligence: Forensic Age Estimation

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Keywords: Artificial Intelligence, Convolutional Neural Networks, Forensic Epidemiology, Forensic Age Estimation.

Introduction/Objective: As emphasized by the FDI (World Dental Federation), artificial intelligence (AI) is rapidly revolutionizing dentistry, offering unprecedented opportunities for advanced data analysis and improved clinical practice, such as forensic age estimation. AI algorithms can efficiently process large epidemiological datasets to identify patterns, predict trends, and inform judicial courts policies, thereby enhancing the precision and efficiency of epidemiological studies. In line with the FDI's vision for responsible AI implementation, this study explores how epidemiological insights can be strategically integrated to improve the performance of Convolutional Neural Networks (CNNs) in forensic age estimation. We focus on accurate methods to address complexities in forensic age casework, while remaining mindful of the ethical considerations and governance frameworks outlined by the FDI, emphasize the application of AI and epidemiological data to judicial decision-making and the establishment of relevant policies within the court system.

Methods: A dataset comprising 1200 orthopantomographs (OPGs) from individuals aged 16 to 30 years, balanced across sexes, was utilized to evaluate the accuracy of CNNs, specifically the pre-trained VGG16 architecture, as a robust algorithm for forensic age estimation. The dataset was divided into two distinct age cohorts: "16 to 23 years" and "24 to 30 years", represented as binary classification classes, with the "16_23" cohort designated as the positive class (output 1) and the "24_30" cohort as the negative class (output 0). Employing Python scripting, OPGs underwent pre-processing, including image resizing, and data augmentation techniques to enhance model generalization. Moreover, based on Keras API from the TensorFlow library, early stopping based on validation data was applied, and hyperparameter tuning was performed, particularly with respect to the learning rate, optimization algorithm, and batch size. The performance of the VGG16 model was rigorously evaluated using precision, sensitivity, F1-score, and overall accuracy metrics.

Results: The age classification model exhibited promising performance during both training and validation phases, demonstrating a satisfactory initial learning trajectory. However, evidence of overfitting emerged as training progressed, necessitating careful regularization strategies. This was mitigated through early stopping and hyperparameter tuning. For the positive class "16_23", the model achieved an overall accuracy of 78%, a sensitivity of 96%, and an F1-score of 86%. The negative class "24_30" demonstrated an accuracy of 95%, a sensitivity of 73%, and an F1-score of 83%.

Conclusions: This study highlights the significant potential of synergistically integrating advanced data analytics and AI within forensic epidemiology to enhance the precision and reliability of age estimation, in agreement with FDI principles that are being implemented in the AI era. These include frameworks that promote fairness, representativeness, and ethical integrity of AI algorithms, mitigating the risk of discrimination or bias in forensic investigations. As the FDI emphasizes, the implementation of AI demands strategic initiatives. The implemented CNN model exhibited a relatively higher accuracy in classifying individuals aged 24 years and older, indicating its potential utility for medico-legal age estimation. Further research is warranted to refine model architectures, optimize data augmentation strategies, and expand the dataset to improve the robustness and generalizability of AI-driven forensic age estimation techniques, in addition to implementing robust data governance strategies for reliable forensic clinical identification.

Ethics committee and informed consent: The current research was approved by the Lisbon Academic Center of Medicine (CAML) and the Ethics Committee of Local Health Unit (ULS) Santa Maria, with approval number 271/23. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT – Fundação para a Ciência e a Tecnologia under the project UIDB/00006/2025. This work is support by the Dental Forensic Sciences Research Group (FORENSEMED) integrated part of the Oral and Biomedical Sciences Research Unit (UICOB) at Faculdade de Medicina Dentária da Universidade de Lisboa. This work is partially financed for the project 2024.07444.IACDC, supported by measure 'RE-C05-i08.M04 - "RE-C05-i08.M04 – "Apoiar o lançamento de um programa de projetos de I&D orientado para o desenvolvimento e implementação de sistemas avançados de cibersegurança, inteligência artificial e ciência de dados na administração pública, bem como de um programa de capacitação científica", of the Recovery and Resilience Plan (Plano de Recuperação e Resiliência – PRR), under the funding contract signed between the Recovering Portugal Mission Structure (EMRP)) and the Fundação para a Ciência e a Tecnologia I.P. (FCT), as intermediary beneficiary. **Supplementary material:** List of references. Available online

OC12
Forensic Epidemiology in the Courtroom: Performance of Dental Age Estimation

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Keywords: Dental Age Estimation, Forensic Epidemiology, Moorrees, Fanning and Hunt method.

Introduction/Objective: Age estimation is a critical component of forensic investigations and legal proceedings, particularly in establishing the criminal responsibility of minors and in cases involving undocumented individuals. Thus, forensic epidemiology plays a crucial role in legal contexts by providing evidence-based methodologies to assess and support legal decisions. In this context, this study evaluates the application of dental age estimation through radiographic assessment of dental development, using epidemiological parameters derived from Portuguese populations, while adhering to ethical principles advocating non-intrusive and non-invasive methods, especially when assessing children and undocumented individuals. Hence, this study aims to compare the bias and precision of three age estimation methods in two independent samples of the Portuguese population: an internationally applied method, a method developed from a previous Portuguese sample, and a method based on linear regression.

Methods: The methodology comprises three distinct studies conducted in Portugal, focusing on radiographic analysis of dental development. The first study utilized 626 orthopantomograms (OPGs) from individuals aged 12-25 years to create age estimation tables specific to the Portuguese population, employing multiple methods based on the third molar development. The subsequent two studies, involving samples of 767 OPGs and 184 OPGs (aged 6-21 years), respectively, investigated age estimation using three approaches: the Moorrees, Fanning, and Hunt (MFH) method, the application of Portuguese-specific tables for the lower left third molar (tooth 38), and linear regression analysis. All analyses involved OPGs, non-invasive imaging techniques, ensuring ethical considerations regarding vulnerable populations (children and undocumented individuals) were observed. IBM SPSS® Statistics 29 was used for statistical data analysis.

Results: In the sample of 767 OPGs, linear regression yielded the lowest Mean Estimation Error (MEE) (0.0171) and Mean Absolute Error (MAE) (1.2096), followed by the Portuguese tables for tooth 38 (-0.5094 and 1.8192, respectively). The MFH method showed the highest MEE (1.8393) and MAE (1.9555). The Portuguese tables for tooth 38 slightly overestimated chronological age. In the 184 OPGs sample, the Portuguese tables for tooth 38 presented the lowest MEE (-0.2527) and MAE (1.8123), succeeded by linear regression (0.2701 and 1.4636). The MFH method again displayed the highest errors (MEE: 2.3280; MAE: 2.4783). The Portuguese tables, particularly for males, tended to overestimate age. Furthermore, applying the Mann-Whitney test to the estimation errors indicates no statistically significant differences between the sexes in all applied methods.

Conclusions: The Portuguese-population specific tables and linear regression demonstrated superior accuracy compared to the MFH method, exhibiting lower estimation errors. These findings highlight the importance of utilizing population-specific data and non-invasive radiological techniques in forensic age estimation. Furthermore, epidemiological tools are crucial for mitigating potential biases in legal proceedings, particularly when evaluating the attainment of legal adulthood. This approach ensures results that constitute credible, ethically sound evidence in court, always acting in the best interest of the child and upholding the principles of non-intrusiveness and respect for human rights. Future studies should focus on refining these methods, incorporating AI for enhanced accuracy, and addressing the FDI's concerns regarding AI-driven forensics.

Ethics committee and informed consent: The current research was approved by the Lisbon Academic Center of Medicine (CAML) and the Ethics Committee of Local Health Unit (ULS) Santa Maria, with approval numbers 217/23 and 218/23. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT – Fundação para a Ciência e a Tecnologia under the project UIDB/00006/2025. This work is support by the Dental Forensic Sciences Research Group (FORENSEMED) integrated part of the Oral and Biomedical Sciences Research Unit (UICOB) at Faculdade de Medicina Dentária da Universidade de Lisboa. This work is partially financed for the project 2024.07444.IACDC, supported by measure 'RE-C05-i08.M04 - "RE-C05-i08.M04 – "Apoiar o lançamento de um programa de projetos de I&D orientado para o desenvolvimento e implementação de sistemas avançados de cibersegurança, inteligência artificial e ciência de dados na administração pública, bem como de um programa de capacitação científica", of the Recovery and Resilience Plan (Plano de Recuperação e Resiliência – PRR), under the funding contract signed between the Recovering Portugal Mission Structure (EMRP)) and the Fundação para a Ciência e a Tecnologia I.P. (FCT), as intermediary beneficiary. **Supplementary material:** List of references. Available online

OC13
Preliminary Reliability Assessment of the Exercise and Physical Activity Competence/Attitudes, Beliefs, and Perceptions on Physical Activity Questionnaire

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Keywords: Attitudes, Competence, Physical activity counseling, Questionnaires, Reliability.

Objective: This study aimed to conduct a pre-test with a preliminary evaluation of internal consistency and test-retest reliability of the Exercise and Physical Activity Competence/Attitudes, Beliefs, and Perceptions on Physical Activity Questionnaire (EP-EPACQ/ABPPA).

Methods: The EP-EPACQ/ABPPA was developed by adapting a modified version of the EPACQ and incorporating selected items from related instruments. Translation followed established cross-cultural adaptation guidelines, including independent forward and backward translations and expert panel review. A preliminary version was pilot-tested with 31 participants (15 sixth-year medical students and 16 family physicians / 21 females and 10 males). Internal consistency was assessed using Cronbach's alpha. Test-retest reliability was evaluated over a two-week interval using intraclass correlation coefficients (ICC) based on absolute agreement with average measures (two-way mixed-effects model). Cohen's Kappa was used for categorical items.

Results: The EP-EPACQ/ABPPA showed good overall internal consistency (Cronbach's alpha = 0.887). Domain-specific alphas were: Domain A (Importance) = 0.790, Domain B (Competence) = 0.832, Domain C (Exercise Prescription) = 0.961, and Domain D (Attitudes and Beliefs) = 0.498. ICC values were 0.883 - 95%CI (0.581, 0.963); 0.900 - 95%CI (0.701, 0.967); 0.869 - 95%CI (0.613, 0.956); 0.873 - 95%CI (0.635, 0.957), across Domains A–D, respectively. For Domain E (awareness of WHO recommendations), Cohen's Kappa was 0.857 ($p < 0.001$). Descriptive comparisons between students and physicians were included to explore group differences, though the study was not powered for inferential subgroup analysis.

Conclusions: The European Portuguese version of the EP-EPACQ/ABPPA demonstrated promising preliminary reliability in this pre-test sample. These findings support its potential for assessing physical activity-related competencies and attitudes in the Portuguese context. Further validation with a more representative sample is recommended to confirm its psychometric properties and explore its factorial structure.

Ethics committee and informed consent: The subjects provided their informed consent before being enrolled in the study.
Conflicts of interest: The authors declare no conflict of interest.

OC14
Development and Application of a Harmonization Method for IgG Antibody Levels Against SARS-CoV-2 Spike Protein: A Cohort Study in Healthcare Professionals

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Keywords: Harmonization, Healthcare workers, IgG antibody, SARS-CoV-2

Introduction: The emergence of COVID-19 led to the rapid development of vaccines and diagnostic tests. To assess antibody responses in healthcare workers (HCWs), a 2021–2022 cohort study was conducted in three Portuguese hospitals. Antibody levels were measured at six time points: pre-vaccination, post-first dose, at 3, 6, 12 months after the second dose, and post-booster. Each hospital utilized a different assay: Abbott's CMIA, Roche's Elecsys® ECLIA, and Siemens' ADVIA Centaur®, leading to challenges in data comparability. The study aimed to harmonize serological data across these hospitals to enable joint analysis and better understand the dynamics of humoral immunity among HCWs in Portugal.

Methods: To ensure adequate conversion of antibody titers obtained from different laboratory methods, several harmonization strategies were applied and compared. These included the World Health Organization (WHO) international conversion and a main strategy based on quantile interpolation, with linear and spline methods tested, followed by Deming regression. Before interpolation, models were required to estimate the antibody titers due to the limitations of each method, such as linear regressions with polynomials and splines, followed by data linearization and normalization. The final choice between methods was based on a graphical assessment of which approach best preserved the original data patterns prior to harmonization.

Results: The application of quantile interpolation followed by regression proved more effective than the WHO recommended approach for harmonizing data across hospitals. This method preserved the individual distribution patterns of each hospital, even after transformation. Importantly, it allowed the harmonized values to reflect the scale and magnitude observed in the reference method (Abbott's CMIA). After harmonization, a marked increase was observed between the pre-vaccination time point and the post-vaccination time point, followed by a gradual decrease over the next three time points. Finally, a second, even more pronounced increase was observed after the booster dose.

Conclusions: Quantile interpolation followed by regression enabled effective harmonization of serological data across the hospital centers, allowing for the comparison and joint analysis of anti-SARS-CoV-2 IgG antibody titers from different laboratory methods. This approach also preserved the expected temporal antibody response pattern. Although laboratory validation, by quantifying the same samples across different laboratories, was not performed, which would be necessary to fully confirm the adequacy of the method, the presented methodology shows strong applicability to other contexts, particularly in European studies that conduct pooled analyses of data from multiple countries and laboratories.

Ethics committee and informed consent: The current research was approved by an independent ethics committee and subjects gave their informed consent before they were enrolled in the study. **Conflicts of interest:** The authors declare no conflict of interests
Acknowledgements: The data of the study were originally collected as part of the project 'Developing an infrastructure and performing vaccine effectiveness studies for COVID-19 vaccine in the EU/EEA' (Contract ECD.11486 Lot3 (HCW) and amendment Nº ECD.11486), and the Enhanced laboratory support to perform assessment of vaccine effectiveness against SARS-CoV-2 infection (ECD.12175) and the 'Vaccine Effectiveness, Burden and Impact Studies (VEBIS) of COVID-19 and Influenza', funded by the European Centre for Disease Prevention and Control through a service contract with Epiconcept (ECD.12609).

OC15
Determinants of health care delivery in OECD countries: a robust panel data analysis.

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Keywords: Health care, Outliers, Panel data, Robust methods.

Introduction: The World Health Report of 2000 (World Health Organization - WHO) contained important information about the health systems of various countries around the world. The health care attainment was measured by disability adjusted life expectancy (DALE) and its modelling dependence was related to education and health care expenditure. The WHO data have been studied by many researchers. Trying to ensure that the countries considered have similar characteristics, Greene used a subset of WHO data which corresponds to a panel data with the 30 OECD countries, from 1993 to 1996. In this study we use the same panel data set and fit a model referred to in a WHO report. Real data often contains outliers and violates the assumptions usually assumed in the model. Robust methods are recommended for this type of data analysis, as they are less affected by the presence of outliers. This work aims to improve the process of estimation for such of data. We propose a robust estimator for panel data model which results from the robustification of the Feasible Generalized Least Squares (FGLS) estimator, which is named by RFGLS.

Methods: We used robust methods to check for outliers in panel data set and to estimate the model parameters. We estimated the parameters using both FGLS and RFGLS methodologies. To evaluate the performance of the two estimators, we used the root mean squared error of prediction (RMSEP) calculated over the set of the cleaned data. RMSEP indicates the mean prediction error, so the best performance approach is the one with the lowest RMSEP value, since on average it presents closest predictions to the observed values. We also calculate the residuals obtained for cleaned data and we carried out a descriptive analysis of them. The lower the residuals, the better performance of the method.

Results: The analysis shows many outliers. Robust estimation should be more appropriate in this case. The RMSEP value obtained with RFGLS is smaller, showing that the robust method performs better. The residual analysis shows that the robust method leads to more precise results than the classical method, as it leads to smaller values.

Conclusions: This analysis of the WHO data, which contains outliers, show that the robust proposed method, RFGLS, performs better than its classical version, FGLS. This conclusion is supported by the fact that the robust method presents a lower error value and is associated with smaller residuals. This indicates that the robust method allows us to obtain more accurate predictions, considering these performance evaluation criteria. RFGLS estimator improves compared to FGLS, as expected in the presence of outliers.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** This work is supported by CIDMA (Center for Research and Development in Mathematics and Applications) under the FCT (Portuguese Foundation for Science and Technology). Multi-Annual Financing Program for R\&D Units.

OC16
Psychometric Validation of the Portuguese Short Form of the Paternal Breastfeeding Self-Efficacy Scale (BSES-SF): An Exploratory Factor Analysis

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Keywords: Breastfeeding, Self-Efficacy, Paternal behaviors.

Introduction: Confident, informed, and supportive fathers contribute to better health outcomes for both infants and mothers and help build a strong foundation for shared parenting and emotional well-being in the family. This study evaluates the psychometric properties of the short form of the Paternal Breastfeeding Self-Efficacy Scale (BSES-SF) among Portuguese fathers.

Methods: This methodological study involved translating and validating the BSES-SF for the Portuguese population. Published guidelines by Sousa et al. (2011) were followed for translation and validation. For the field study, researchers invited participants through online programs that support motherhood and fatherhood preparation. Inclusion criteria required participants to: be the father of a child aged three months or younger; have a child who is currently breastfeeding, live with the mother and the child, and identify Portuguese as their first language. A minimum of 5 participants per item and a sample n>100 was considered as the target for performing Exploratory Factor Analysis (Gorsuch, 1983). The data was analysed using JASP 0.18.3.0. The reliability of the scale was assessed through Cronbach's Alpha coefficient. After checking for Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity indicators,EFA options for exploring construct validity included principal axis factoring with varimax orthogonal rotation and eigenvalues higher than one for factor extraction.

Results: From the 156 questionnaires answered, 120 (76.9%) were eligible for analysis, with a mean age of 36.9y±5.2y (range: 23y-55y), with most fathers having a high degree diploma (n=70, 58.3%). The value of 0.907 was obtained for the KMO test, and Bartlett's test of sphericity (Chi-square=1005.5, df=91. P<0.001) indicates adequacy for EFA. EFA returned a three-factor solution explaining 59.2% of the variance. Factor 1 reveals the dimension 'practical assistance', had an eigenvalue of 7.24, which explained 49.0% of the variance, and comprised eight items with loadings ranging from 0.48 to 0.80. Factor 2, concerning the 'emotional bonding', had an eigenvalue of 1.16, which explained 5.2% of the variance, and comprised four items with loadings ranging from 0.57 to 0.81. Factor 3 had an eigenvalue of 1.06, which explained 5.0% of the variance, and comprised four items with loadings ranging from 0.50 to 0.73. 'Perceptions and beliefs to breastfeeding support' represent this third factor. The BSES–SF scale mean was 53.2±11.5, and items varied between 3.4±1.3 and 4.3±0.9. Cronbach alpha was estimated as α=0.926 (CI 95% 0.905-0.944), and any improvement in this result would occur if any of the items were dropped. Item-rest correlation ranged between 0.513 and 0.777, meeting the criterion of being above 0.30. Cronbach's alpha for each of the factors were: Factor 1, α=0.868; Factor 2, α=0.872; Factor 3, α=0.806.

Conclusions: The Portuguese version of the short form of the Paternal BSES-SF showed acceptable psychometric properties, suggesting it may be a reliable and valid tool for use among Portuguese fathers. Confirmatory Factor Analysis is a necessary future step to consolidate the instrument's validity.

Ethics committee and informed consent: An independent ethics committee, 25-CED/2023, approved the current research and subjects gave their informed consent before they were enrolled in the study. **Conflicts of interest:** No conflicts of interest to declare.

OC17
Manipulating OMOP CDM Databases: the versatility of R

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Keywords: Biostatistics, Decision Making, Evidence-Based Practice, Public Health.

Background: The digitisation of health records, together with technological advances, has enabled the use of patient-level data, collected during routine clinical care, to generate real-world evidence that can subsequently inform and improve clinical decision-making. Despite its benefits, real-world evidence faces several challenges, as observational data are often unstructured, inconsistent and incomplete, limiting the reproducibility of research findings [1]. To overcome this limitation, the Observational Medical Outcomes Partnership (OMOP) developed the OMOP Common Data Model (CDM) to standardise the structure, content, and semantics of relational databases, where observational data are typically stored, allowing statistical analysis code to be written once and reused across all data sites [2]. OHDSI software tools offers several tools to facilitate OMOP CDM data analysis, such as ATLAS platform or R packages in the HADES repository. However, these solutions often favour automated pipelines over direct manipulation of the data. The official OMOP CDM book also introduces a package that allows users to write SQL queries in R, although this approach assumes prior knowledge of SQL. This study aims to explore an alternative approach for accessing, manipulating, and analysing OMOP CDM data directly in R, without requiring prior knowledge of additional programming languages.

Methods: We used a synthetic dataset organised in the OMOP CDM format and manipulated it using the functions of the dbplyr package in R, which allows R code to be translated into SQL - the language typically recognised by relational databases.

Results: R software allows the visualisation and manipulation of databases stored in the complex OMOP CDM format, by creating a traditional dataframe and enabling subsequent analysis in the usual way. Additionally, it allows the whole process to be performed locally on a personal computer or on external servers. Although there is an initial steep learning curve, the package is easy and intuitive to use in the OMOP CDM framework.

Conclusion: In an era of exponential growth in health data and scientific publications, ensuring the reproducibility of findings is more important than ever to confirm their reliability and clinical relevance. Although R is not the primary language traditionally used for interacting with OMOP CDM-formatted databases, this study demonstrates its feasibility. The findings highlight R as a dynamic, flexible, and up-to-date software that is capable of manipulating and analysing complex healthcare datasets.

Conflicts of interest: The authors declare no conflict of interests. **Supplementary material:** List of references. Available online

OC18
Parkinson's Disease in the Netherlands: incidence and spatial variation in 2017-2022

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Keywords: Electronic Medical Records, Incidence, Mortality Records, Parkinson Disease, Spatial Distribution.

Background: Parkinson's disease (PD) is the second most common neurodegenerative disorder and associated important economic and public health burdens. While its prevalence is rising globally, inconsistent incidence trends have been reported across countries. We aimed to comprehensively assess PD incidence and its spatial distribution in the Netherlands in 2017-2022, exploring demographic and socioeconomic disparities in PD risk.

Methods: We developed a new algorithm that integrates four independent, high-quality health-related administrative data sets to identify incident PD cases: mortality records, hospital data, health insurance claims and medication prescriptions. Linking these to other demographic and socioeconomic data, we estimated overall and stratified age- and sex-standardized PD incidence rates (IR). We further investigated PD spatial distribution using Bayesian hierarchical models to estimate smoothed relative risks at neighbourhood level.

Results: There were 22,343 new PD cases in a population of 19,995,771 individuals (105,027,472 person-years at risk) in 2017-2022. Overall sex- and age-standardized IR was 21.8 per 100,000 person-years-at-risk. Stratified IRs showed higher incidence in men than women, older individuals (peaking at 75–85 years) and individuals with higher socioeconomic position. We observed higher incidence in northern provinces, supported by the geographical clustering of PD risk in spatial analyses.

Conclusion: Our algorithm robustly identified incident PD cases, enabling the first comprehensive nationwide PD incidence assessment in the Netherlands. Its application revealed regional disparities in PD risk that are not align ecologically with known environmental risk factors for PD such as air pollution, agricultural activity, or urbanization. Considering the face validity of this method for identifying incident PD cases, our approach provides a solid basis for future analyses at the individual level on the environmental, genetic, and socioeconomic determinants of PD. Such analyses can yield important insights that help shape targeted public health strategies addressing modifiable risk factors.

Conflicts of interest: Prof. Bas Bloem serves as the co-Editor in Chief for the Journal of Parkinson's disease, serves on the editorial board of Practical Neurology and Digital Biomarkers, has received fees from serving on the scientific advisory board for the Critical Path Institute, Gyenno Science, MedRhythms, UCB, Kyowa Kirin and Zambon (paid to the Institute), has received fees for speaking at conferences from AbbVie, Bial, Biogen, GE Healthcare, Oruen, Roche, UCB and Zambon (paid to the Institute), and has received research support from Biogen, Cure Parkinson's, Davis Phinney Foundation, Edmond J. Safra Foundation, Fred Foundation, Gatsby Foundation, Hersenstichting Nederland, Horizon 2020, IRLAB Therapeutics, Maag Lever Darm Stichting, Michael J Fox Foundation, Ministry of Agriculture, Ministry of Economic Affairs & Climate Policy, Ministry of Health, Welfare and Sport, Netherlands Organization for Scientific Research (ZonMw), Not Impossible, Parkinson Vereniging, Parkinson's Foundation, Parkinson's UK, Stichting Alkemade-Keuls, Stichting Parkinson NL, Stichting Woelse Waard, Health Holland / Topsector Life Sciences and Health, UCB, Verily Life 8 Sciences, Roche and Zambon. Prof. Bloem does not hold any stocks or stock options with any companies that are connected to Parkinson's disease or to any of his clinical or research activities. Dr. Sirwan Darweesh serves on the editorial board of Neurology, as co-chair of the Movement Disorders Society Epidemiology Study Group, has received fees for speaking at conferences and podcasts from AbbVie (paid to the institute), and has received research support from the Parkinson's Foundation (PF-FBS-2026), ZonMW (09150162010183), ParkinsonNL (P2022-07 and P2021-14), Michael J Fox Foundation (MJFF-022767), Davis Phinney Foundation and Edmond J Safra Foundation. The other authors declare no conflict of interests.

OC19
Analyzing the Efficacy and Safety of Endovascular Therapy for Posterior Cerebral Artery Occlusion Stroke: A Comparative Interpretation of Outcomes

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Keywords: Morbidity, Mortality, Posterior Cerebral Artery, Stroke, Thrombectomy.

Objective: The objective of this study was to compare the efficacy and safety of endovascular therapy in patients with posterior cerebral artery occlusion versus those with middle cerebral artery occlusion. By evaluating clinical outcomes such as recanalization success, early neurological improvement, functional independence, and adverse events, the study aimed to clarify the relative benefits and risks of endovascular treatment in these distinct vascular territories.

Methods: This is a secondary analysis of patients treated with endovascular therapy for acute ischemic stroke at two centers in Portugal between 2015 and 2022. Adults with posterior or middle cerebral artery occlusions were included. Clinical, imaging, and procedural variables were collected. Comparative analyses between groups were performed using univariate and multivariate logistic regression models adjusted for potential confounders. Model performance was evaluated using Akaike Information Criterion, likelihood ratio tests, and the area under the ROC curve. To assess clinical similarity between groups, equivalence testing for proportions was conducted using the two one-sided tests (TOST) approach.

Results: The study included 1,837 patients (81 in PCA cohort, 1,756 in MCA cohort). Recanalization rates were significantly lower in the PCA cohort (73% vs. 90%, $p<0.001$), and early neurological improvement was less frequent (47% vs. 61%, $p=0.013$), but experienced significantly fewer intracranial hemorrhage (3.7% vs. 13%, $p=0.013$) and lower 90-day mortality (9.9% vs. 19%, $p=0.042$). Multiple analysis confirmed that PCA occlusion remained associated with lower chances of recanalization (OR=0.30, $p<0.001$) and worse functional outcomes (good: OR=0.58, $p=0.014$; excellent: OR=0.57, $p=0.033$). However, PCA patients had significantly lower rates of intracranial hemorrhage (adjusted OR=0.28, $p=0.037$) although the mortality difference became non-significant after adjustment (OR=0.71, $p=0.374$). Equivalence testing demonstrated statistical equivalence between groups for functional outcomes and safety endpoints, but not for recanalization or early improvement.

Conclusions: Endovascular therapy for PCA occlusion appears to be a safer but less effective treatment option compared to MCA occlusion. While PCA patients benefit from lower rates of intracranial hemorrhage and 90-day mortality, they exhibit poorer recanalization and early neurological improvement, potentially leading to suboptimal functional recovery. These findings suggest that EVT remains viable for PCA occlusions but highlight the need for further investigation into tailored approaches that enhance efficacy while maintaining the observed safety advantages.

Conflicts of interest: The authors declare no conflict of interests.

OC20
Psychometric Evaluation of a Questionnaire about health professionals' perception of Clinician and Patient-Reported Outcome and Experience Measures utility in Rehabilitation

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Keywords: Rehabilitation, Outcome Measures, PROMs, PREMs, Psychometrics, Factor Analysis.

Introduction: In the context of modern healthcare, the integration of Clinician-Reported Outcome Measures (CROMs), Patient-Reported Outcome Measures (PROMs), and Patient-Reported Experience Measures (PREMs) is gaining widespread recognition for its potential to improve care quality. This study aimed to explore the psychometric properties of a subset of questions contained in a questionnaire regarding the usefulness of CROMs/PROMs/PREMs in an outpatient rehabilitation context.

Methods: Methodological study that consisted of the translation and adaptation to European Portuguese of a questionnaire developed by Jette et al. (2009) concerning the use of standard outcome measures in the rehabilitation field. Data collection was carried out using the adapted questionnaire made available online and disseminated through digital tools. For this work, eight questions, comprising a three-level response option, were considered for assessing the professionals' perception regarding the usefulness of using CROMs, PROMs, PREMs in the context of rehabilitation. Inclusion criteria required participants to be a rehabilitation health professional with more than two years of professional practice. The data was analysed using JASP 0.19.3.0. Exploratory Factor Analysis (EFA) options for exploring construct validity included principal components analysis with oblimin oblique rotation and eigenvalues higher than one for factor extraction, after checking for Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity indicators. After confirming the unidimensionality of the scale, fit measures of the single-factor model were analysed from Confirmatory Factor Analysis (CFA).

Results: Of the 83 data entries, 47 participants were considered eligible for analysis, mainly male (60.5%) with 21.7 years of experience in the profession. Participants spent approximately 24±24 minutes with each client, mainly people with musculoskeletal conditions (86.7%) over 50 years of age (83%). The KMO test, and Bartlett's test of sphericity (Chi-square=137.65, df=28, P<0.001) indicate adequacy for EFA. EFA returned a one-factor solution explaining 47,3% of the variance (eigenvalue of 3.78) - Table 1. Cronbach's alpha was estimated as α=0.832 (CI 95% 0.753-0.910), and any improvement in this result would occur if any of the items were dropped. Model fit indicators from CFA were: Chi-square/df=2.09; RMSEA=0.152; SRMR=0.081. For the total scale value, no statistically significant differences were found for sex, length of experience in the profession, type of pathology, or average duration of client treatment.

Conclusions: The adapted questionnaire demonstrated acceptable internal consistency and a unidimensional factor structure for assessing healthcare professionals' perceptions of the utility of CROMs, PROMs, and PREMs. Despite limitations in sample size and in model fit, the tool shows promise for further use and refinement in clinical settings. No significant differences in perceptions were observed across demographic or professional experience variables, suggesting broad applicability across different practitioner profiles. Future work includes revisiting all validation and reliability indicators with a larger sample.

Ethics committee and informed consent: The survey did not require an approved ethics proposal as no vulnerable group was targeted, and all data was always collected and analysed anonymously. **Conflicts of interest:** Authors declare no conflict of interest to report. **Acknowledgements:** The authors would like to thank Mrs. Diane U Jette for kindly authorizing the use of the original questionnaire as part of this work. **Supplementary material:** Table 1. Available online

OC21
Reanalysis of Existing Data on the Impact of Food on Flucloxacillin Pharmacokinetics

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Keywords: Bioavailability, Confidence Interval, Crossover Study, Food Effect, Geometric Mean Ratio.

Introduction: Bioavailability refers to the rate and extent to which a drug reaches systemic circulation. Since absorption determines bioavailability and is influenced by food in multiple ways, it is important to conduct studies evaluating the food effect on this pharmacokinetic phase. Assessing the bioavailability of flucloxacillin in the fed and fasted states is particularly relevant, given that the limitations of older studies raise doubts about the necessity of administering it on an empty stomach. In contrast to the original study, this work evaluates the comparative bioavailability of flucloxacillin in the presence and absence of food using statistical methods recommended in current regulatory guidelines.

Methods: The original study [1] analysed here was an open-label, two-way crossover trial in 12 healthy adults who received 1,000 mg of flucloxacillin under fed and fasting conditions, separated by a 7-day washout. Blood samples were collected over 12 hours for pharmacokinetic evaluation of flucloxacillin. A 90% confidence interval (CI) for the geometric mean ratio (GMR) of the pharmacokinetic parameters of the unbound fraction of the drug was calculated to assess bioavailability equivalence, requiring that the entire interval fall within the 80–125% acceptance range. The analysis of variance (ANOVA) with log-transformed data quantifies variability from period, sequence, and subject within sequence, ensuring differences are attributed to treatment. The Mean Squared Error obtained from the ANOVA residuals is used to construct the CI for the GMR of the drug under the two physiological conditions. To confirm the results obtained from the ANOVA, the CI was also extracted from a Linear Mixed Effects Model (LME), with the subject as a random effect.

Results: All participants completed the study. The statistical analysis showed that geometric means of C_{max} (maximum plasma concentration) and $AUC_{0\text{-}inf}$ (area under the curve from time zero to infinity), were lower in the fed state (C_{max}: 0.55 mg·L^{-1}; $AUC_{0\text{-}inf}$: 2.18 mg·L^{-1}.h) compared to fasting (C_{max}: 1.08 mg·L^{-1}; $AUC_{0\text{-}inf}$: 2.73 mg L^{-1}.h). Considering the fasting state as the reference, the GMR of C_{max} was 51.39% (90% CI: 41.85–63.10), indicating a lack of equivalence. For $AUC_{0\text{-}inf}$, the GMR was 79.72% (90% CI: 68.62–92.62), with the CI partially falling outside the accepted 80–125% range, leading to an inconclusive result. The same results as in the original study were obtained, and both the ANOVA and the LME model produced identical estimates.

Conclusions: Although a food effect was observed, its clinical relevance remains uncertain. Establishing therapeutic equivalence requires both pharmacokinetic and pharmacodynamic evaluation.

Ethics committee and informed consent: Ethical approval was provided by the Northern B Health and Disability Ethics Committee; Written informed consent was obtained from all volunteers. **Clinical study registration number:** The research was registered as a clinical trial with the Australian New Zealand Clinical Trials Registry (ACTRN12617001046392). **Conflicts of interest:** The authors declare no conflict of interest. **Supplementary material:** List of references. Available online

OC22
Reassessment of Pharmacokinetic Parameters Using a Non-Compartmental Analysis

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Keywords: Censored Data, Flucloxacillin, Food Effect, Non-Compartmental Analysis, Pharmacokinetic Parameters.

Introduction: Pharmacokinetic (PK) studies evaluate the effects of the human body on a drug by analysing plasma concentration over time. These data are typically interpreted using Non-Compartmental Analysis (NCA), a model-independent approach that relies on algebraic equations. Due to its simplicity, robustness, and consistency, NCA is widely used to estimate key PK parameters, which support bioavailability and bioequivalence assessments.

Methods: This analysis, derived from a previously published study [1], examines only unbound (active) flucloxacillin concentrations under fasting and fed conditions. Since this fraction exhibited low drug levels, some measurements fell below the lower limit of quantification (LLOQ), requiring the use of censored data methods, such as imputing half of the LLOQ value (0.005mg/L:2). The main NCA parameters are $AUC_{0\text{-}inf}$ (area under the curve from time zero to infinity) and the K_{el} (elimination rate constant), from which the remaining parameters are derived. The $AUC_{0\text{-}tlast}$ (area under the curve from time zero to the last measurable concentration) was estimated using the trapezoidal method, specifically the linear-up/log-down approach. The $AUC_{tlast\text{-}inf}$ (residual area) was calculated using linear regression on at least three terminal data points plotted on a semi-logarithmic scale. The absolute value of the slope of the best-fit line (assessed by adjusted R^2) represents the K_{el}, from which the residual area and other PK metrics are estimated.

Results: NCA was conducted using two software platforms: R (v4.4.1) and PKanalix (Monolix2024R1) to assess reliability. Geometric means of PK parameters were computed for comparison to the original study, revealing discrepancies in some parameters. In the fasting state, the obtained values were as follows: a C_{max} (maximum plasma concentration) of 1.08 $mg \cdot L^{-1}$ (vs. 1.08), a T_{max} (time to maximum concentration) of 1.08 hours (vs. 1.08), an $AUC_{0\text{-}inf}$ of 2.73 $mg \cdot L^{-1}.h$ (vs. 2.79), a $T_{1/2}$ (half-life) of 1.43 hours (vs. 1.50), a CL/F (apparent clearance) of 366.35 $L \cdot h^{-1}$ (vs. 359). In the fed state, the C_{max} was 0.55 $mg \cdot L^{-1}$ (vs. 0.55), the T_{max} was 2.25 hours (vs. 2.33), the $AUC_{0\text{-}inf}$ was 2.18 $mg \cdot L^{-1}.h$ (vs. 2.23), the $T_{1/2}$ was 1.49 hours (vs. 1.57), and the CL/F was 459.53 $L \cdot h^{-1}$ (vs. 448).

Conclusions: Both R and PKanalix presented the same results. However, the differences between the obtained and published results may be attributed to the software used and the method applied for handling LLOQ values. Nevertheless, our values fall within the confidence intervals reported in the original publication. The main effects of food intake are delayed T_{max} and reduced C_{max}, which may impact the drug's efficacy.

Ethics committee and informed consent: Ethical approval was provided by the Northern B Health and Disability Ethics Committee; Written informed consent was obtained from all volunteers. **Clinical study registration number:** The research was registered as a clinical trial with the Australian New Zealand Clinical Trials Registry (ACTRN12617001046392). **Conflicts of interest:** The authors declare no conflict of interest. **Supplementary material:** List of references. Available online

OC23
Mobility across testing services of the Portuguese Community-based Screening Network participants from 2017 to 2022.

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Keywords: Community services, HIV, Mobility, Record linkage, Sreening network.

Introduction: The Portuguese Community-Based Screening Network provides testing for HIV, viral hepatitis B and C, and syphilis and linkage to care across mainland Portugal. Understanding participant mobility within this network is essential, as it may influence testing access, care engagement, and transmission dynamics. This study investigates participants' mobility patterns across services from 2017 to 2022. To support this study, Social Network Analysis (SNA) was applied. SNA is a methodological approach used to explore and visualise the relationship and interaction patterns between entities (testing services) helping to identify how participants move within and across services in the network.

Methods: We analysed 113 087 testing sessions from 31 community-based services within Portugal's Community-Based Screening Network. Data were collected via structured interviews; participants were pseudonymized using a code based on birthdate, sex assigned at birth, and name initials. Probabilistic record linkage was performed to connect visits across services using the code and educational level. Social network analysis mapped mobility patterns between services, with connections defined by five or more shared individuals per year. Networks metrics (degree, betweenness, density) were calculated for global and stratified by year analysis, and optimal community structure (clusters) were identified and compared for HIV-reactivity.

Results: A social network analysis identified three communities, along with a fourth comprising testing services that did not register any connections: Community 1 (mobile services in the Península de Setúbal), Community 2 (mixed mobile and fixed services in the Centro region), and Community 3 (fixed services in the Grande Lisboa). The overall network density was 0.296. The testing services with the highest degree and betweenness values are all located in the Grande Lisboa. The highest proportion of HIV-reactive cases was observed in Community 3 (3.29 CI: 2.00-5.91) compared to Community 1. Additionally, testing services with fixed or mixed modalities presented a higher risk of HIV infection compared to mobile services (2.26 CI: 1.55-3.32 and 3.41 CI: 2.80-4.14, respectively). Higher degree values were also associated with an increased risk of HIV infection (1.06 CI: 1.00-1.12). Social network analysis stratified by year revealed an increase in network density from 0.008 (2017) to 0.02 (2019), followed by a decline during the pandemic period (0.008 in 2020). In 2022, network density increased again to 0.03.

Conclusions: This study revealed that Grande Lisboa's services exhibited the highest centrality, acting as key hubs within the network. Participants accessing services in Grande Lisboa and fixed services (Community 3) demonstrated a higher risk of HIV infection. Given that mobility patterns shifted during the COVID-19 pandemic, these findings highlight the importance of a coordinated, network-based response to the epidemic. This can be achieved by integrating real-time mobility data, strengthening interregional communication, and developing adaptive public health strategies that respond to changing movement trends.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements**: This study was supported by national funds Fundação para a Ciência e Tecnologia (FCT) under the scope of the projects UIDB/04750/2020—Research Unit of Epidemiology–Institute of Public Health of the University of Porto (EPIUnit) and LA/P/0064/2020–Laboratory for Integrative and Translational Research in Population Health (ITR). Inês Viseu was the recipient of PhD grant (UI/BD/15474/2022) funded by funds of FCT. PM: CEECINSTL/00007/2022/CP2914/CT0001, DOI https://doi.org/10.54499/CEECINSTLA/00007/2022/CP2914/CT0001. The funding sources had no role in this study.

OC24
Ten Years of Integrated Continued Care at Naturidade Penela: Adapting to Changing Health Demands

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Keywords: Geriatric rehabilitation, Institutionalized elderly, National Network of Continued Integrated Care, Treatment outcome, General health levels

Introduction: With increasing life expectancy and associated comorbidities in the Portuguese population, there is a growing demand for integration of elders in geriatric healthcare services, including the response provided by the National Network for Integrated Continuous Care (RNCCI). Characterizing the RNCCI is essential to improving the quality of care provided to this population. This study aimed to characterize the population admitted to the Medium-Term and Rehabilitation Unit (UMDR) – Naturidade Penela, over a ten-year period.

Methods: This longitudinal descriptive study was conducted at the Integrated Continuous Care Unit (UCCI) – Naturidade Penela. Data were collected over a decade, including 1,130 patients admitted between 2013 and 2023.Collected variables included age, gender, length of stay, discharge destination, referral source, intervention area, and reason for admission.

Results: The sample consisted of 56.1% female and 43.9% male participants, with a mean age of 77.93 ± 11.15 years. 68% were aged between 66.78 and 89.08 years, with over 90% aged ≥65 in 2018, 2019, and 2020. The mean length of stay was 98.82 ± 69.80 days, with a maximum of 791 days. Men had shorter stays (91 ± 66.9 days) compared to women (105 ± 71.44 days). Between 2013 and 2018, most users stayed ≤90 days (2013 (61,8%), 2014 (67,2%), 2015 (72,9%), 2016 (67,3%) 2017 (62,9%) a 2018 (62,8%)), a trend that re-emerged in 2022–2023 (2022 (52.5%), 2023 (59.2%)). In 2020–2021, most stays lasted ≥90 days (2020 (62.6%), 2021 (56.2%)). Patients aged <65 had shorter stays (94 ± 49.12 days) than those aged ≥65 (≈100 ± 72,01 days). Referral sources included hospitals (51.24%), home (38%), other UCCI (8.67%), and residential aged care facilities (ERPI) (2.2%). Since 2020, there has been increased demand for UCCI among people aged 80 and above. Musculoskeletal area interventions accounted for 43.27% of cases and neurological for 40.62%, cardiorespiratory area count with 11.95% and oncology with 4.16%. Comparing the genders, the most women, (≥50%) were categorised by musculoskeletal area; while men, the most frequent diagnostic area was neurological (45.4%) followed by musculoskeletal (35.1%). The main reason for admission was rehabilitation (73.45%), followed by wound care (14.96%). Regarding discharge, 49% returned home, 17.1% transferred to another UCCI, and 15% to an ERPI. Between 2016 and 2020, over half were discharged home, with a progressive rise in discharges to ERPI since 2021.

Conclusions: Over the last decade, the UMDR population was predominantly older adults (mean age >75), with a female majority. Rehabilitation was the main reason for admission, with sex-related differences in intervention areas. Between 2013 and 2023, most users were hospitalized for up to 90 days, with the exception of 2020 and 2021. These findings underscore the need to adapt RNCCI services to an aging population and growing clinical complexity.

Ethics committee and informed consent: Access to the database was previously authorized (institutional authorization), respecting international ethical principles regarding the presentation of information. **Conflicts of interest:** The authors declare no conflict of interests.

OC25
Evolution of the health status of patients admitted in Naturidade Penela S.A., National Network of Continued Integrated Care in terms of their level of functionality (Barthel Index): Prospective study

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Keywords: Delivery of Health Care, Disability and Health, Functional Status, Patient Acceptance of Health Care, Barthel Index.

Objective: Evaluation of Functional Status (FS) and its evolution associated with innate and non-innate factors of users in an Integrated Continued Care Unit (UCCI).

Methods: Observational, analytical study. The primary data came from the UCCI in the center region (Naturidade Penela S.A). The assessment of FS using the *Barthel Index* was administered to patients from the date of admission to the date of discharge. The total number of patients included in the study was 1130. Statistical inference was carried out using the ANOVA I factor, Kruskal-Wallis H, ANOVA II fixed factors; ANOVA Repeated Measurements II factors; MANOVA. Tukey HSD, LSD and Bonferroni multiple comparison tests.

Results: It was found that the FS of users of the UCCI at the time of admission showed significantly different levels in terms of their origin ($H(3)=98.240$; $p<0.001$; $n=1,130$). Users who came from the 'hospital' showed lower levels of functionality compared to users who came from their 'home', another 'UCCI' and 'Residential Structures for the Elderly' (ERPI). With regard to the different types of 'reason for hospitalisation' in the UCCI, ($H(4)=82.934$; $p<0.001$; $n=1,129$) it was found that users whose reason for hospitalisation was 'treatment of wounds' showed less independence, compared to users whose reason was 'management of the therapeutic regime' and users in a 'rehabilitation' condition. It was found that the evolution of users' FS during the intervention period in the UCCI did not differ between men and women ($F_{H\text{-}F(FI*Sex)}=0.538$;$p=0.572$) or between age ($U=0.010$; $F_{(FI*Sex)}=1.406$;$p=0.208$). As for the 'reason for hospitalisation', this had a significant effect on the positive evolution of users' FI ($U=0.033$; $F_{(FI*Reason)}=2.979$; $p=0.002$; $\eta^2_p=0.011$; $\pi=0.973$), users in the "rehabilitation" and "management of the therapeutic regime" areas were the ones who over the 3 months showed the best results in terms of independence compared to users in the "treatment and wounds" and "maintenance of devices" areas. The 'intervention area' to which the users were submitted for treatment also showed a combined effect on the gains in FI ($U=0.034$; $F(FI*\text{intervention area})=3.106$;$p=0.001$;$\eta^2_p=0.011$; $\pi=0.979$). The 'Musculoskeletal' and 'Cardiorespiratory' areas showed the greatest gains in FS compared to users in the 'Neurology' and 'Oncology' areas at the end of the intervention.

Conclusions: The success of the therapeutic teams' intervention with users cannot be dissociated from the former's exogenous and endogenous factors if there is to be an effective gain in health.

Ethics committee and informed consent: Access to the database was previously authorized (institutional authorization), respecting international ethical principles regarding the presentation of information. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** The authors would like to thank the physiotherapists of the unit who contributed to data collection, namely Carina Freitas, Carla Ramos, Elisabete Almeida, Joana Vieira, Maria João Simões, Sara Luís, Sofia Rodrigues, for their support and collaboration.

OC26
Applicability of Left Atrial Strain Parameters for Assessing Diastolic Function and their Predictive Value in Chronic Kidney Disease – Literature Review and Meta-analysis

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Keywords: Disease Progression, Left Atrial Strain, Meta-Analysis, Chronic Renal Insufficiency, Left Ventricular Dysfunction

Background: Despite the promising clinical applications of left atrial strain (LAS) parameters, few studies have validated their role in chronic kidney disease (CKD). This meta-analysis evaluates the relationship between LAS and CKD stage, aiming to determine its diagnostic and predictive relevance.

Methods: We analyzed studies involving adults (>18 years) with CKD who underwent two-dimensional transthoracic echocardiography with LAS assessment via speckle tracking. Literature was retrieved from PubMed, Web of Science, and Google Scholar, up to August 15, 2024. Study quality was assessed using the Newcastle-Ottawa Scale and National Institute of Health tools. CKD was stratified into three groups: stages 1–2, 3a–3b, and 4–5. Statistical analysis, including subgroup meta-analysis and meta-regression, was performed using IBM SPSS Statistics 30. Effect sizes (ES) were reported with 95% confidence intervals (CI).

Results: Fourteen studies were included, comprising 4,341 renal patients. LAS reservoir (LASr) and conduit (LAScd) values were significantly lower in CKD patients compared to controls, regardless of CKD stage, however, no such difference was observed for contractile strain. Specifically, LASr (ES: -12.139, CI: -14.494 to -9.785, $p < 0.001$) and LAScd (ES: -10.682, CI: -15.503 to -5.861, $p < 0.001$). In early-stage CKD (stages 1–2), LASr and the peak velocity of the mitral A wave, were the only significantly altered parameters (ES_{LASr}: -7.972, 95% CI: -13.412 to -2.533, $p = 0.004$; and ES_{Awave}: 61.1 95% CI: 50.554 to 71.785, $p < 0.001$). In stages 3a–3b, all variables, except left ventricular ejection fraction (LVEF), differed significantly from controls. For stages 4–5, all variables, except the E wave velocity, showed significant changes. Meta-regression highlighted factors contributing to LASr variability across studies. Moderator variables explained 77.4% of between-study heterogeneity.

Conclusion: LASr was the only echocardiographic variable altered from the early stage of the disease, regardless of heart rhythm, emerging as a potential predictor of diastolic dysfunction, major adverse cardiovascular events, mortality, and glomerular filtration rate decline. Its integration into stratification algorithms may be crucial for the prognosis of renal patients. CKD patients exhibit lower LASr and LAScd values compared to controls. Despite applying analytical strategies to reduce study heterogeneity, complete elimination was not achieved.

Conflicts of interest: The authors declare no conflict of interests.

OC27
Musculoskeletal and Connective Tissue Disorders Triggered by Drug Use: Insights from Literature and Pharmacovigilance Data

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Keywords: Adverse Drug Reactions, Drug-Induced, Musculoskeletal Disorders, Pharmacovigilance

Introduction: Rheumatic diseases (RDs) are commonly manifested as painful conditions characterized by inflammation, swelling, and discomfort in the joints or soft tissues, resulting in a decline in functional ability and varying degrees of temporary or permanent disability. The primary goal of treatment is to reduce pain and prevent or slow the progression of further damage, typically through the use of non-steroidal anti-inflammatory drugs, antimalarial medications, corticosteroids, immunomodulators, and immunosuppressants. While RDs are most frequently caused by autoimmune dysfunctions - the immune system mistakenly attacks the body's own tissues - they can also arise as adverse reactions to certain medications. Since the 2000s, drug-induced RDs have been increasingly studied, with numerous publications addressing this issue. Adverse reactions leading to these conditions are classified under the "Musculoskeletal and Connective Tissue Disorders" system organ class (10028395) in the MedDRA terminology, which includes events affecting bones, connective tissues, and musculature. This study aims to identify the drugs most frequently linked to musculoskeletal adverse drug reactions (ADRs) and to analyze the most commonly reported reactions.

Methods: A descriptive comparative study was conducted, combining a narrative literature review with the analysis of real-world pharmacovigilance data. The literature review was performed to gather information regarding the drugs or pharmacological groups that are more often associated with each ADR. The dataset used covers data from 1986 to 2023, containing 59,803 records (submitted to The Netherlands Pharmacovigilance Centre Lareb and Marketing Authorization Holders). Selected reports had Musculoskeletal and Connective Tissue Disorders (MCTD) as the primary system organ classes. A descriptive analysis of the dataset provided insights into the demographic characteristics, serious adverse events (SAE), and the prevalence of specific ADRs related to drugs, allowing the identification of trends and patterns. Fourteen tables were created to summarize and analyze the data. The two sources were used complementarily: the literature review identified commonly implicated drug classes to frame the research context, while the pharmacovigilance dataset provided empirical evidence to quantify and compare these associations

Results: Among the most frequently reported ADRs were myalgia (n=12,086), arthralgia (n=7,731), and muscle spasms (n=5,872). The drugs most often associated with musculoskeletal disorder reports were *levodopa* and *decarboxylase inhibitors* (n=6,630), *denosumab* (n=2,661), and *evolocumab* (n=2,642). The pharmacological groups with the highest number of associated ADRs included dopa and dopa derivatives, HMG CoA reductase inhibitors, lipid-lowering agents, and drugs that affect bone structure and mineralization.

Conclusions: These findings highlight the significant role drug-induced MCTDs play within the broader context of adverse drug reactions and underscore the importance of continued pharmacovigilance and research to reduce risk and ensure patient safety.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** We would like to express our sincere gratitude to The Netherlands Pharmacovigilance Centre Lareb for providing access to their database, which was instrumental in supporting the data analysis for this study. Their commitment to enhancing patient safety through comprehensive pharmacovigilance has significantly contributed to the outcomes of this research.

OC28
Oral Cancer Survival in Portugal: A Population-Based Overview (2015-2020)

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Keywords: Lip Cancer, Net Survival, Oral Cancer, Oropharyngeal Cancer, Portugal

Background: Oral cancer represents a significant global public health burden. Despite its anatomical accessibility for clinical inspection, many cases are diagnosed at advanced stages, which compromises treatment outcomes and reduces survival rates. This study aims to evaluate survival probabilities among individuals diagnosed with cancers of the lip, oral cavity, and oropharynx in Portugal between 2015 and 2020, with a focus on identifying disparities by tumour site and stage.

Methods: We conducted a retrospective population-based cohort study using data from the Portuguese Oncological Registry. The cancer registry has national coverage, and data completeness is regularly audited, ensuring high case ascertainment. Tumours are staged according to the TNM Classification of Malignant Tumours. All new cases of lip, oral cavity, and oropharyngeal cancers diagnosed from 2015 to 2020 were analyzed. Net survival was estimated using the Kaplan Meier estimator. Additionally, Cox proportional hazards models were used to estimate hazard ratios (HRs) for mortality, adjusting for age, sex, tumour site, stage, and region of residence. Stratified analyses were performed by sex, tumour location and clinical stage. Five-year net survival (5yr-NS) and 95% confidence intervals (CI) were calculated for the total sample and subgroups.

Results: The study included 6,122 cases, 77.1% of whom were male. Primary tumour location was in the lip (14.4%), oral cavity (58.2%), and oropharynx (27.4%). A substantial proportion of patients were diagnosed at advanced stages: 12.2% at stage III and 52.3% at stage IV. The overall 5yr-NS for all three cancer sites was 56% (95% CI: 55–58). By tumour site, 5yr-NS was 60% (95% CI: 59–61) for lip cancer and 46% (95% CI: 44–48) for oral cavity and oropharyngeal cancers combined. Stratification by tumour stage revealed significant differences: 77% (95% CI: 76–79) for stage I/II and 44% (95% CI: 43–46) for stage III/IV. Survival was also lower in older age groups and in patients residing in certain regions of the country.

Conclusions: More than half of oral cavity and oropharyngeal cancer cases are diagnosed at advanced stages, associated with markedly lower survival probabilities. These findings emphasize the urgent need for enhanced early detection strategies including systematic risk-based screening integrated, clinical training to improve symptom recognition, and public awareness campaigns on modifiable risk factors/early warning signs. Delays in diagnosis are often influenced by regional disparities in healthcare access. Addressing these inequalities may contribute to improved survival and equity in cancer care.

Ethics committee and informed consent: The current research was approved by an independent ethics committee and subjects gave their informed consent before they were enrolled in the study. **Conflicts of interest:** The authors declare no conflict of interests.

OC29
From Free Text to ICD-10 Codes in the Emergency Department: Protocol for Evaluation of an AI-based Tool

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Keywords: Emergency Department, Free Text, ICD-10 Coding, International Statistical Classification of Diseases, Natural Language Processing

Introduction: The coding of free clinical text into standardized clinical codes, such as International Statistical Classification of Diseases and Related Health Problems (ICD), is essential for hospital management, epidemiological surveillance, and research. Artificial intelligence (AI)-based tools, such as machine learning and natural language processing (NLP) models, have been developed to automate this process. However, their effectiveness in high-pressure environments, such as the emergency department, remains poorly investigated.

This study aims to evaluate the performance and usage patterns of an existing tool used in the emergency department of the Unidade Local de Saúde São João (ULS São João) – CliKode – which performs automatic suggestion of ICD-10-PCS (International Statistical Classification of Diseases, 10th Revision, Procedure Coding System) and ICD-10-CM (International Statistical Classification of Diseases, 10th Revision, Clinical Modification) codes for procedures and diagnosis, respectively, based on NLP of free text in the clinical notes.

Methods: This is a prospective observational study that will be conducted in the emergency department of ULS São João. Firstly, a technical and preliminary evaluation will be made to fine tune the variables that will be collected using an internal developed system. Variables related to the type of emergency (e.g., adults, pediatrics), health specialty, clinician role, text (e.g., length) and generated codes (e.g., number of suggested codes, final codes used, explainability of each suggestion), user interaction with the tool and data on usage patterns (e.g., time spent to select codes) will be proposed and its collection feasibility will be assessed in the preliminary study. After the pilot study, the final list of variables will be collected and data analysis will be conducted: descriptive statistics will summarize tool performance and user interaction patterns and accuracy metrics (precision, recall, F1 score) will also be calculated.

Results: As this is a study protocol, no results are available at this stage. Data collection and analysis will be conducted following completion of the observation period.

Conclusions: This study will provide an evaluation of CliKode, an AI-based ICD-10-PCS and ICD-10-CM coding tool currently used in the emergency department of ULS São João. By identifying performance gaps (e.g. in a specific health area), usage patterns issues, or contextual challenges, the study may guide iterative improvements and support more effective integration of AI into high-pressure clinical workflows. Ultimately, the results may guide future development and implementation of AI-assisted clinical coding tools.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** This work was financed by the project Health from Portugal ("Aviso 2022-C05i0101-02 Agendas/Alianças mobilizadoras para a reindustrialização, Projeto nº C630926586-00465198") and "Clikode - Automatic Processing of Clinical Coding, (3I) Innovation, Research of AI models for hospital coding of Procedures and Diagnoses", POCI-05-5762-FSE-000230, is financed by Portugal 2020, through the European Social Fund, within the scope of COMPETE 2020 (Operational Programme Competitiveness and Internationalization of Portugal 2020).

OC30
Parish-level socioeconomic deprivation and breast cancer screening outcomes in a Portuguese Local Health Unit

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Keywords: Breast Neoplasms, Health inequities, Mass Screening, Socioeconomic Factors

Introduction: In Portugal, breast cancer is the most commonly diagnosed cancer and the leading cause of death by cancer among women [1]. Breast cancer incidence tends to be lower among women residing in socioeconomically deprived areas in Europe, with cancer screening adherence being lower, but lethality rates are higher [2,3]. Portugal has a population-based breast cancer screening program, targeting women aged 45 to 74 [4]. This study aims to evaluate the association between breast cancer screening outcomes and residence in socioeconomically deprived parishes.

Methods: Breast cancer screening results (2024) from a Local Health Unit in Northern Region of Portugal were provided by National Coordination Center for Population-Based Screening Programs. Mammography results are classified as negative (BI-RADS 1 or 2), positive (4 or 5), or inconclusive (0 or 3). Individuals with missing addresses or parishes were excluded. European Deprivation Index (EDI) is publicly available and was used to assess socioeconomic deprivation [5]. The first EDI quintile was treated as an ordinal variable ranging from 1 (lowest deprivation) to 5 (highest deprivation), in a multinomial logistic regression. The analysis was conducted in R.

Results: In 2024, 14868 women underwent mammography. Of the 14,617 included, 90.0% (13164) had a negative result, 9.5% (1,388) an inconclusive result and 0.4% (65) a positive result. The mean age of women was 59.8 years (±5.7) and they lived in 176 different parishes. Overall, 45% lived in the most socioeconomically deprived parishes (fourth and fifth quintile). Among women with a negative result, 4.9% (639) lived in the least deprived quintile (first quintile) and 19.3% (2,540) in the most deprived quintile (fifth quintile). Among women with a positive result, 6.2% (4) lived in the first quintile, while 27.7% (18) lived in the fifth quintile. For each increase in the EDI quintile, the odds of a positive mammography result (versus negative) increased by 10.9% (CI 0.882–1.396).

Conclusions: While not statistically significant, the results show a trend suggesting increased odds of a positive mammography result, with higher socioeconomic deprivation. However, no association can be confirmed based on this analysis. These findings should be interpreted with caution due to the small number of positive mammography results and the inclusion of mammography results solely from the population-based screening program. Further investigation is needed to determine whether women in deprived areas are at greater risk of a positive mammography result or if results are influenced by differential screening adherence.

Conflicts of interest: The authors declare no conflict of interests. **Supplementary material:** List of references. Available online

OC31
Estimating Thyroid Nodule Size Using incRidGME: A Comparative Analysis

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Keywords: GME, incRidGME, Indeterminate nodules, Linear regression, Thyroid nodules

Introduction: Detection rates of thyroid nodules (TNs) is diagnostic dependent. Fine-needle aspiration has limitations in assessing indeterminate TNs (ITNs). Linear regression models can be used to differentiate benign TNs (BTNs) from ITNs in the attempt to prevent unnecessary surgery. In ill-conditioned problems, ordinary least squares (OLS) may be excluded and replaced by ridge or generalized maximum entropy (GME) estimators. The RidGME estimator uses the ridge trace to deal with the arbitrariness in the GME's choice of supports. Different supports, either in number of points or in range, provide different estimates, and ridge's constraint may lead to the exclusion of the parameters' true value. This study aims to describe the size of TNs using incRidGME, an adaptation of RidGME in which the range of the parameters' support is increased by a factor chosen by k-fold cross-validation (CV).

Methods: Two data sets are used: i) randomly generated data with high condition number; ii) data from an observational prospective study conducted at CHBV Aveiro (size and category of TNs, free thyroxine (FT4) and thyroid stimulating hormone (TSH) levels). Estimates are obtained for OLS, RidGME and incRidGME with $\epsilon = 0,01$ the three-sigma rule for noise supports ($J=3$) and symmetric parameters' supports ($M=5$) with ranges multiplied by $\alpha \in \{1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.75, 2, 3, 5, 10, 17.5, 25, 50, 100\}$. Combinations of $M, J \in \{3,5, \dots, 25\}$ are tested using the that previously best performed (lowest CV root mean squared error) and bootstrap confidence intervals (BCI) are computed.

Results: In the simulated scenario, three supports do not include the true parameter using RidGME and a prediction error of 2.857 is returned. Lower values are obtained from OLS and incRidGME with $\alpha = 10$ (2.657 and 2.611, respectively). incRidGME returns a precision error of 3.034 against 9.945 and 5.021 from OLS and RidGME. Computation time and precision error increase with J, and the latter decreases with M. Data from 240 adults is analyzed, 173 with BTNs and median values of FT4, TSH and size of 1.110 ng/dL, 1.275 mlU/L and 21.15 mm, respectively. OLS finds that an increase of FT4 levels is associated with larger TNs (β=3.407, BCI95%=[1.388, 4.624]). On the contrary, incRidGME with $\alpha = 1.3$, $M = J = 7$, indicates that an increase of FT4 levels results in smaller TNs (β=−4.496, BCI95%=[−13.295, −4.424]). Moreover, ITNs are 1.412 mm smaller than BTNs (BCI95%=[−4.354, −1.303]).

Conclusions: incRidGME seems to be an improvement of RidGME yet other simulation scenarios should be considered. Higher levels of FT4 and ITNs seem to be associated with smaller TNs, with the latter being consistent with its suppressive effect on TSH, and potentially pointing to therapeutical approaches.

Ethics committee and informed consent: Ethical approval was granted by the CHBV Ethics Committee for Health in December 2019 (Ref: 39-01-2019). Informed consent was obtained from all participants and data privacy was ensured in accordance with the European Union General Data Protection Regulation 2016/679 (GDPR). **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This research is supported by the CIDMA (Center for Research and Development in Mathematics and Applications) under the FCT (Portuguese Foundation for Science and Technology) Multi-Annual Financing Program for R&D Units. Additional support was provided by FCT through project reference UIDB/04501/2020 (DOI: https://doi.org/10.54499/UIDB/04501/2020) and project reference UIDP/04501/2020 (DOI: https://doi.org/10.54499/UIDP/04501/2020). This work was also funded by individual doctoral grants from FCT (grants number UI/BD/152575/2022 and 2023.02418.BD).

OC32
Burn Injuries in Older Adults (65-74, 75-84 and >85 years old) Compared to Young Adults (18-64 years old): Age-Stratified Analysis of Risk Factors and Clinical Outcomes

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Keywords: Burn Injuries, Burn Severity Index, Geriatric Burn, Mortality, Total Body Surface Area

Objective: This study examines clinical profiles, burn characteristics, and in-hospital mortality in burn patients aged 65 and older, comparing age subgroups to younger adults, and identifies key mortality risk factors over a five-year period.

Methods: This cross-sectional study included an initial sample of 772 individuals, with data collected from the Burn Unit of ULS de Coimbra. Descriptive analysis across age groups was performed using Kruskal-Wallis and Chi-square tests. Logistic and log-linear regressions (univariate, multivariate, and outlier-adjusted) were used to identify predictors of in-hospital mortality and hospitalization days, respectively. The quality and accuracy of the models were assessed using standard evaluation measures. Variable selection was performed using the StepAIC method, and results were expressed as Odds Ratios (OR) with 95% confidence intervals. Analyses were performed in RStudio (v4.4.2), with statistical significance set at $p < 0.05$.

Results: The statistical analysis revealed significant differences between age groups for variables like Total Body Surface Area (TBSA), A Body Shape Index (ABSI), Revised Baux %, and hospitalization days ($p < 0.05$). The Wilcoxon test showed significant differences in TBSA ($p = 0.035$) and hospitalization days ($p = 0.037$) between the 18-64 and 75-84 age groups. Logistic regression indicated that ABSI (OR = 2.160, $p = 0.023$), mechanical ventilation (OR = 4.402, $p < 0.001$), and hospitalization days (OR = 0.963, $p = 0.004$) are significant predictors of mortality. The model's performance was evaluated using the area under the curve (AUC = 0.8953) and Akaike Information Criterion (AIC = 260.148), both indicating strong predictive quality. The log-linear regression analysis showed that TBSA (%) (Coef: -0.0043, $p = 0.0083$), mechanical ventilation (Coef: -0.2640, $p = 0.00018$), CVC (Central Venous Catheter - Coef: 0.3380, $p < 2e\text{-}16$), survival (Coef: 0.3900, $p = 1.23e\text{-}05$), vasopressor use (Coef: 0.2945, $p = 0.00012$), and number of surgeries (Coef: 0.2295, $p < 2e\text{-}16$) are significantly associated with hospitalization days.

Conclusions: Elderly burn patients, particularly those aged 85 and older, face significantly higher mortality risks compared to younger adults. Factors such as third-degree burns, higher TBSA, sepsis, and need for vasoactive support were also associated with worse outcomes. These findings highlight the need for age-specific prevention strategies and early, proactive management in geriatric burn care.

Conflicts of interest: The authors declare no conflict of interests. **Acknowledgements:** We are grateful for the support and guidance of Professor Vera Afreixo, who guided us throughout the project.

OC33
Emergency Contraception and Contraceptive Practices Among Portuguese Youth: A Cross-Sectional Descriptive Study

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Keywords: Adolescent, Postcoital Contraception, Contraceptive Agents, Health Knowledge Attitudes, Health Knowledge Practice, Young Adult

Introduction: Emergency contraception (EC) plays a critical role in preventing unintended pregnancies, particulary when regular contraceptive methods fail or are not employed. Although EC is readily accessible in Portugal, studies indicate that knowledge gaps and inconsistent contraceptive behaviours persist among youth. The aim of this study was to characterize EC use and regular contraceptive practices among Portuguese adolescents and young adults aged 15 to 24 years, assess their understanding of EC, including prevalent misconceptions, and examine sociodemographic and behavioral factors associated with its use.

Methods: A cross-sectional, descriptive, quantitative study was conducted using an online questionnaire disseminated via social media between December 2022 and April 2023. Eligible participants were Portuguese residents aged 15 to 24. The questionnaire covered sociodemographic characteristics, sexual activity, EC use and knowledge, and regular contraceptive methods. Descriptive and inferential statistical analyses were performed using R software. Mann-Whitney and Chi-squared tests were used with a significance level of $p < 0.05$.

Results: Of 262 participants (mean age: 20.66 ± 2.12 years), 20.61% had used EC at least once. Among these, the most common reasons were condom rupture or slippage, failure to use any contraceptive method, and incorrect or inconsistent use of hormonal contraceptives (e.g., forgetting the pill or early removal of the vaginal ring). While 84.35% knew where to obtain EC, knowledge gaps were substantial: 67.18% mistakenly believed EC prevents implantation, and 61.07% did not know when to initiate regular contraception after EC use. Only 19.78% correctly identified EC's primary mechanism as delaying ovulation. Although 73.7% were satisfied with their regular contraceptive method, dual protection was reported by only 19.1%, and long-acting reversible contraception (LARC) usage was very low (1.1%). Statistically significant associations were found between EC use and age ($p = 0.001$), frequency of family planning consultations ($p = 0.001$), and the use of withdrawal or no contraception ($p < 0.05$). EC use was more frequent among older participants, those with more frequent gynaecological consultations, and those who reported using less effective or no contraceptive methods.

Conclusions: Portuguese adolescents and young adults demonstrate moderate awareness but considerable misconceptions regarding EC. As for regular contraception, short-acting methods were the most frequently reported, and the uptake of LARC was very low. Misunderstandings about EC's timing and mechanism may reduce its effectiveness. Targeted reproductive health education and enhanced counselling by healthcare professionals are essential to support young adults in making contraceptive choices that are informed, safe, and aligned with their life goals.

Ethics committee and informed consent: The study was approved by the Ethics Committee of the Northern Red Cross Health School (Ref. 026/2022), and informed consent was obtained from all participants or their legal guardians. **Conflicts of interest:** The authors declare no conflict of interest related to this study.

OC34
SIADAP as a Management Tool: Impact on the Efficiency in the Operating Room

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Keywords: Hospital Efficiency, Health Management, Operation Room, SIADAP

Introduction: This study evaluates the impact of defining objectives withing SIADAP, in 2022, for anesthesiologists at ULSEDV during the perioperative period, with a particular focus on ensuring that the pre-anesthetic evaluations, on the same day, were completed by 8:30 AM,to reduce surgical cancelations cause by delays in the first scheduled surgery. The analysis compares data from the second half of 2022 (with SIADAP focus on 8:30 pre-anesthetic evaluation) vs. the second half of 2023 and 2024 (without SIADAP focus on 8:30 pre-anesthetic evaluation), specifically related to the first scheduled surgery in the operation rooms of the central operating room at ULSEDV.

Methods: A retrospective study was conducted involving 2,128 patients who underwent scheduled surgeries, focusing on temporal variables such as the time of entry into the operating room, the start of anesthesia, the beginning and end of surgery, recovery durations, the number of cancelations, and also patients characteristics. To identify significant differences across the three years, Pearson's Chi-square tests and Kruskal-Wallis rank sum tests were used. Additionally, logistic regression was employed to evaluate the time taken for the patient retrieval from clinical discharge.

Results: The time of entry into the operating room remained consistent across the years, but anesthesia and surgery start times were delayed in 2023 and 2024. In the recovery room, approximately 76% of patients were discharged within 30 minutes after clinical clearance. Although, 2023 and 2024 were associated with a higher likelihood of delays in recovery room discharge (OR=8.5; $p<0.001$ and OR=7.3; $p<0.001$, respectively), the overall average recovery time was longer in 2022. Additionally, there was a significant reduction in cancellations on the same day, in 2023 and 2024 compared to 2022, particularly in Orthopedics (from 45 to 15 and 12) and Urology (from 13 to 2 and 0).

Conclusions: The introduction of performance objectives focused on anticipating pre-anesthetic evaluations had a positive impact on intraoperative timings in 2022, as the entry time in the room and the start of the anesthetic process began sooner comparing with the other years, coinciding with the changes of SIADAP. However, no differences were observed across the three years regarding surgery start and end times. Postponements on the same day were also higher in 2022, suggesting that surgical delays are not exclusively caused by the initiation of the anesthetic process timing but are instead a multifactorial issue requiring the development of new measures to improve hospital efficiency. The results highlight the importance of strategically setting objectives within SIADAP and standardizing processes to enhance operating room efficiency, particularly focusing on recovery times.

Conflicts of interest: The authors declare no conflict of interests.

OC35
IL-6 as a Differentiating Marker in the Detection of Neonatal Sepsis in Combination with CRP and PCT

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Keywords: Diagnostic Performance, Interleukin-6, Logistic Regression, Neonatal Sepsis

Introduction: Neonatal sepsis is a serious infection in newborns, with a challenging diagnosis and non-specific symptoms. Early detection is crucial to prevent the deterioration of the newborn's health, especially in premature births. This study investigated the markers IL-6, C-reactive protein (CRP), and procalcitonin (PCT) to assess their effectiveness in detecting neonatal sepsis.

Methods: Two datasets were used, with groups divided into asymptomatic and symptomatic. marker levels were compared using boxplots and non-parametric tests. The Shapiro-Wilk test assessed normality, and the Wilcoxon-Mann-Whitney test was used due to the non-normal distribution of variables. Logistic regression models were applied to evaluate the relationship between clinical data and the response variable (occurrence of sepsis). Model performance was assessed using ROC curves, AUC, and sensitivity. Two models were built: one for the response variable identifying asymptomatic vs. symptomatic individuals, and another registering the presence of negative vs. positive blood cultures. Diagnostic Odds Ratios (DOR) were calculated through a complementary meta-analysis using both fixed-effect and random-effects models.

Results: The research showed that CRP and PCT had significant differences in central tendency ($p < 0.05$), since both the mean and median values were notably higher in the symptomatic group compared to the asymptomatic group. However, IL-6 did not show significant differences. Model 2 (AUC = 0.9483; sensitivity = 95%) outperformed Model 1 (AUC = 0.8506; sensitivity = 68%), indicating better performance in distinguishing the groups. The meta-analysis revealed strong diagnostic power, with a Diagnostic Odds Ratio (DOR) of 22.16 using the fixed-effect model and 34.37 using the random-effects model.

Conclusions: The data shows that CRP and PCT are reliable markers in the detection of neonatal sepsis, showing statistically significant differences between symptomatic and asymptomatic groups. IL-6 had less clear results but showed potential to be a good marker.

Conflicts of interest: The authors declare no conflict of interests.

OC36
Statistical Approach to the Efficacy of Individual Cognitive Stimulation in Alzheimer's Disease: The Added Value of Meta-Regression and Subgroup Analysis

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Keywords: Alzheimer's Disease, Cognitive Stimulation Therapy, Dementia, Non-pharmacological Interventions, Randomized Controlled Trial

Introduction: Alzheimer's disease (AD) is the most common form of dementia, accounting for approximately 60–70% of all cases. Its prevalence is expected to double by 2050, potentially affecting over half a million people in Portugal. Cognitive stimulation is a recommended psychosocial intervention for individuals with AD. To assess the effectiveness of such interventions, repeated-measures ANOVA or mixed linear models (MLMs) are commonly used.

Methods: Data were drawn from a multicenter randomized controlled trial with a repeated-measures experimental design (pre-intervention, post-intervention, and follow-up). Assessments were conducted at three time points: before the intervention (baseline, T0), immediately after its completion (T1), and 12 weeks later (follow-up, T2). Global cognitive functioning, memory, and executive function were assessed using standardized instruments. The 'moderate' and 'moderately severe' of the Alzheimer's Disease Severity classification were considered. The standardized mean difference (SMD), adjusted using Hedges' g method, was calculated to estimate the direction and magnitude of the effect between the experimental and control groups. Effects were presented using forest plots, and heterogeneity across outcomes was assessed using the I^2, τ^2, and Q-test statistics. In cases of low heterogeneity, the analysis was complemented with meta-regression models and subgroup analyses.

Results: Low heterogeneity was observed across group assessments ($I^2 = 23.1\%$; $\tau^2 = 0.035$; Q-test p-value = 0.22), leading to subgroup analysis and meta-regression to compare effects across severity levels. Subgroup analysis revealed a significant positive effect in the experimental group (0.4848, 95% CI [0.2222; 0.7474], $p < 0.001$). The meta-regression model, using severity level as an explanatory variable and SMD as the response variable, showed an intercept of 0.48 and a coefficient of -0.6891 (95% CI [-1.0911; -0.2872], $p<0.001$).

Conclusions: This study demonstrated a significant difference between the two severity levels, suggesting that disease severity may moderate the intervention's effectiveness. The proposed statistical approach offers a viable alternative to standard models (ANOVA and MLM) in studies involving two or more experimental groups. These findings may potential clinical relevance for evaluating the effectiveness of non-pharmacological interventions and strategies designed to promote cognitive health in older adults with dementia.

Ethics committee and informed consent: The current research was approved by an independent ethics committee, and participants or their legal representatives provided informed consent before enrollment in the study. **Clinical study registration number:** ClinicalTrials.gov Identifier: NCT05433493. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT under the projects UID/00006/2025 and UIDB/00006/2020. DOI: 10.54499/UIDB/00006/2020 (https://doi.org/10.54499/UIDB/00006/2020).

OC37
Psychosocial Risk and Engagement in Early Childhood Professionals: Insights from a Regional Portuguese Study

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Keywords: Psychosocial Factors, Job Satisfaction, Occupational Health, Early Childhood Personnel, Early Intervention

Introduction: The European Agency for Safety and Health at Work recognizes psychosocial risks in the workplace as a major threat to workers' health and safety. Work engagement has emerged as a strong predictor of performance and productivity. Therefore, it is crucial to investigate these concepts among professionals from the Local Early Intervention Teams (LEI) of the National Early Childhood Intervention System (SNIPI) within the Lisbon and Tagus Valley Regional Subcommittee (SCRLVT), who are often exposed to high work demands. This study aimed to identify psychosocial risks and engagement levels, analyze variations according to sociodemographic and professional characteristics, examine differences across engagement dimensions, and explore the relationship between psychosocial risks and engagement.

Methods: A cross-sectional study was conducted with 468 professionals from the ELIs of SCRLVT during November and December 2024, using an online questionnaire comprising three instruments: a sociodemographic questionnaire, the Copenhagen Psychosocial Questionnaire III (COPSOQ III), and the Utrecht Work Engagement Scale (UWES-9), both validated for the Portuguese population. Psychosocial risk and work engagement levels were assessed, as well as their correlation. Additionally, associations between sociodemographic and professional variables and these constructs were analysed. Finally, post hoc analysis was performed to compare the domains of UWES-9.

Results: The response rate was 22.20% (n=103), with a predominantly female sample. High psychosocial risk levels were found in cognitive (90.29%) and emotional demands (81.55%). Health and well-being domains showed moderate risk, while others exhibited low risk. Overall work engagement was moderate, with Absorption standing out at a high level (M = 4.46). Post hoc tests revealed significant differences between Dedication and Vigor ($p = 0.005$). A significant negative correlation was found between global psychosocial risk and engagement ($p < 0.001$; $\rho = -0.536$), with relevant associations with sociodemographic and professional variables.

Conclusions: This study identified a significant relationship between psychosocial risks and work engagement among ELI professionals at SCRLVT, with higher risks associated with lower engagement. Positive aspects, such as the perceived meaning of work and high Absorption levels, were also highlighted. Macro, organizational, and individual-level measures are suggested to promote well-being and engagement. This research is pioneering within this professional group and contributes to the validation of COPSOQ III in Portugal, despite limitations such as a low response rate and the scarcity of comparable studies.

Ethics committee and informed consent: Approved by an independent ethics committee. All participants provided written informed consent. **Conflicts of interest:** The authors declare no conflict of interests. **Acknowledgements:** This work is partially financed by national funds through FCT under the projects UID/00006/2025 and UIDB/00006/2020. DOI: 10.54499/UIDB/00006/2020 (https://doi.org/10.54499/UIDB/00006/2020).

OC38
Quality Indicators in an Intensive Care Unit: Application of Statistical Analysis for Decision Making

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Keywords: APACHE Score, Intensive Care Units, Quality Indicators, Quality Management, SAPS Score

Introduction: The Intensive Care Unit (ICU) plays a key role in early detection, prevention, and treatment of critical conditions, aiming to stabilize and recover patients' health. This study aims to analyse and characterize ICU patients from the Local Health Unit of the Aveiro Region in 2024, exploring associations between demographic and clinical variables, and between quality indicators and clinical outcomes (improvement vs. death).

Methods: A retrospective observational study was conducted using data from 301 ICU admissions. To compare clinical and patients' characteristics between clinical outcome groups (improvement vs. death), Pearson's Chi-square and Fisher's Exact tests were applied. To identify predictors among quality indicators (SAPS II, APACHE II, infection on ICU admission, ICU and hospital admission) were associated with clinical outcomes, both simple and multiple logistic regression models were used. Due to high number of missing values in some indicators, analyses were performed using both listwise deletion and multiple imputation. Linear regression models were also employed to evaluate the impact of these indicators on ICU and hospitalization duration. Models' performances were assessed using AUC and McFadden's R^2.

Results: Most ICU patients were male (60.5%) with an average age of 64, and the majority were admitted via emergency services. Of the 301 patients, 263 were included in the logistic regression. SAPS II, APACHE II, and hospital admission were significantly associated with clinical outcome ($p < 0.05$) in the univariate model. Otherwise, in the multivariate model, APACHE II lost significance, while infection at admission became significant. Longer hospital duration increased the chance of improvement (OR=1.12), while higher SAPS scores reduced it (OR<1). The results were consistent using multiple imputation. Infection at ICU admission was significantly associated with longer ICU and hospital duration, as shown by log-transformed linear regression models.

Conclusions: The analysis of ICU admissions in 2024 demonstrated that quality indicators such as SAPS II, infection at admission and hospital duration are significant predictors of clinical outcomes. The findings also revealed that infection at ICU admission it was also linked to longer ICU and hospital duration, reinforcing the need for targeted clinical strategies. This study provides a foundation for improving care processes, optimizing ICU efficiency, and informing future performance objectives within the institution.

Ethics committee and informed consent: The current research was approved by an independent ethics committee and subjects gave their informed consent before they were enrolled in the study. **Conflicts of interest:** The authors declare no conflict of interests.

OC39
Psychometric Validation of the Portuguese Version of the Food and Nutrition Literacy Scale (E-LAN) for youth

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Keywords: E-LAN scale, Food and nutritional literacy, Psychometric validation

Introduction: Food and nutritional literacy are key components of health literacy that impact health outcomes, with childhood and adolescence being pivotal stages for fostering healthy habits. The Food and Nutrition Literacy scale, originally developed for Iranian adolescents, was later translated and culturally adapted into Portuguese (E-LAN); however, its psychometric validation has not yet been conducted. Therefore, this study aims to analyze the psychometric properties of the E-LAN.

Methods: Data were collected from 165 participants (ages 10-12) in Alcobaça. The E-LAN consists of 49 items (42 likert scale and 7 multiple-choice), across seven subscales, assessing cognitive and skills domains. The multiple-choice subscale was excluded from analysis due to differences in question format. The psychometric validation included: reliability analysis that was assessed using Cronbach's α, inter-item correlations, and corrected item-total correlations. Confirmatory factor analysis (CFA) was conducted to validate the internal structure of the scale, employing model fit indices such as X^2/df, AGFI, and RMSEA.

Results: The E-LAN demonstrated good internal consistency (Cronbach's $\alpha = 0.875$), with an average inter-item correlation of 0.16. Several items (9, 14, 20, 22, 28, 30, 31, 37, and 42) exhibited low item-total correlations (<0.30). Items 9, 30, and 37 also had low factor loadings (<0.30) in the CFA, and their removal would lead to an increase in the α value. Based on these findings, items 9, 30, and 37 were excluded, and item 22 was removed due to its lack of theoretical relevance. Cronbach's α for the remaining 38 items increased to 0.889. Despite some remaining low item-total correlations, the revised E-LAN maintained an acceptable average inter-item correlation (0.18) and exhibited good model fit ($X^2/df = 1.45$, AGFI = 0.91, RMSEA = 0.06), with all factor loadings exceeding 0.30, confirming the adequacy of the revised model.

Conclusions: The study confirmed the validity of the revised E-LAN scale, which consists of 45 items, across seven subscales, that assess cognitive and skills domains.

Ethics committee and informed consent: This study received ethical approval from the Ethics Committee of the Polytechnic Institute of Leiria (PLeiria). This work was funded by Portuguese national funds provided by Fundação para a Ciência e a Tecnologia (FCT) (UI/05704/2025) and by project 2023.04951.BDANA with https://doi.org/10.54499/2023.04951.BDANA identifier.
Conflicts of interest: All authors declared no conflict of interest.

OC40
Mapping Tools for Healthcare Standards - a Scoping Review

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Keywords: Interoperability, Mapping tool, health standardsAbstract:Background

Background: Semantic interoperability in healthcare relies on standardized terminologies/ ontologies, but their complexity and varied use pose challenges, especially when handling unstructured data, electronic health records (EHRs), or cross-system data exchange. Mapping tools are key to ensuring consistency and interoperability. This scoping review focuses on tools published between 2022 and 2024, a post-pandemic period marked by significant advances in health informatics.

Methods: The review followed the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines. Searches were conducted in PubMed, Scopus, and Web of Science for articles published from 2022 to 2024. The search strategy included terms related to terminologies, ontologies, mapping tools, and interoperability. Studies were included if they described a tool, model, or process for mapping to or between health-related terminologies or ontologies. Two reviewers independently performed study selection and data extraction, resolving any disagreements by consensus. Data were collected using a standardized charting form, capturing descriptive information and tool-specific features, such as input/output data formats, type of tool, open-source status, and maturity level. A descriptive analysis was carried out to identify the most frequently mentioned terminologies and ontologies. A matrix was also developed to analyse the distribution of mapping tools described in the literature, focusing on the pairs of standards, terminologies, or ontologies for which mappings are available.

Results: Out of 723 articles identified through the database search, after the screening 76 articles were included in the final review. The three main types of health data mapping were identified from unstructured text, structured data and between clinical terminologies. Unstructured text mapping commonly used ontology-based natural language processing tools and, more recently, large language models to improve accuracy when converting clinical notes into standardized formats like Fast Healthcare Interoperability Resources. Structured data mapping relied on Extract, Transform, Load (ETL) pipelines and transformer models such as Bidirectional Encoder Representations from Transformers (BERT), often targeting SNOMED CT, LOINC, and ICD-10. For terminology-to-terminology mapping, infrastructures like UMLS and the OMOP vocabulary were commonly used. These systems provide predefined relationships between various coding schemes and are often integrated into ETL pipelines and BERT models with the support of semi-automated tools.

Conclusion: As healthcare becomes increasingly digitally supported, interoperability is essential. Healthcare standards adoption paves the way this quest, enabling data coherence across systems. However, integration is challenging, mapping tools are the key to aligning data across systems and enhancing healthcare efficiency.

Conflicts of interest: No conflict of interest. **Acknowledgements**: This work was financed by the project Health from Portugal ("Aviso 2022-C05i0101-02 Agendas/Alianças mobilizadoras para a reindustrialização, Projeto nº C630926586-00465198").