

# UK Chapter of the System Dynamics Society

## 2023 Annual Conference

### *Presentation Summaries and Abstracts*

---

#### ***System Dynamics in healthcare: a new approach to generic modelling***

Prof. Sally Brailsford and co-authors (University of Southampton)

*Managers and clinicians trust models that they were actively involved in developing, but do not necessarily trust models developed for other settings. This talk presents a new approach to tackling the 'not invented here' problem with healthcare models.*

---

#### ***Understanding Demand and Capacity of Hospital Care Using System Dynamics***

Hugo Herrera and Haeshiya Sivakumara

*The NHS has grouped health care in four broad categories: primary care, secondary care, community care and tertiary care (NHS Digital, 2022). Secondary care includes mental health care and 'hospital care'. Hospital care consists of both planned (elective) care such as a cataract operation, or urgent and emergency care such as treatment for a fracture (NHS Providers, 2019).*

*In recent years the number of patients waiting to receive elective care has increased, lessening patients' experience and quality of life. Between 2019 and 2022, the number of patients waiting for elective care in England increased by 60% and patients are now waiting longer to be treated. For example, the time that patients have to wait to receive elective care in East Suffolk North East Essex NHS Foundation Trust (ESNEFT) has almost doubled between 2019 and 2023 and now many patients are waiting more than 6 months before getting the care they need.*

*This quick increase on the waiting lists combined with recent challenges seen in the emergency departments has prompted the NHS to reassess the way it looks at its demand and to think on different ways to adjust and configure its capacity. This case study conducted in the two ESNEFT hospitals (Colchester Hospital and Ipswich Hospital) is part of this new approach driven by the NHS, the Integrated Care Systems and ESNEFT with the aim to alleviate the capacity challenges seen in hospital care*

---

### ***COVID-19 post-pandemic tourism recovery in small islands***

Yunfei Gu and co-authors (University of Southampton)

*Under the impact of COVID-19, small islands have suffered strongly in terms of tourism. Possible recovery strategies are tested using a behavioural simulation.*

---

### ***Blood collection in England: understanding and optimising donor flow***

Emily Baldwin PhD, Senior Insight Analyst, Planning, Insight & Transformation, NHS Blood and Transplant

*NHSBT aspires to grow and diversify the blood donor base. Increasing the proportion of new donor appointments presents operational challenges. Relative to regular donors, new donors are less likely to successfully donate blood, typically require extra support on session, and their blood type is unknown. Therefore, balancing the flow of regular donors to meet blood demand, with new donors to build the donor base, is an ongoing tension. To support decision makers to optimise the flow of new and regular donors, we sought to model blood collection within England. Cross-organisational interviews have been used to produce qualitative models, bringing insight into how the system functions. These are being used in conjunction with insights from exploratory data analysis and data science investigations to build a quantitative model of the current system. In future, we aim to model policy scenarios that influence donor flow, reviewing their impact on short-term and long-term donor base and blood collection performance, empowering decision makers to optimise the flow of new and regular donors. Ultimately, this will enable growth of our donor base without compromising our ability to meet blood demand.*

---

### *Rethinking the Food Waste Hierarchy: Lessons from Modelling the Food-Energy-Water-Carbon Nexus in Urban Circular Economies (Case of Bristol, UK)*

Ali Parsa, Coventry University

Food waste is a multi-faceted and complex problem for urban circular economies with far-reaching environmental impacts. Effectively addressing this problem requires a comprehensive understanding of the food waste impacts not only on food, but also on its interdependent sectors including energy, water, and climate sectors. Despite the complex dynamics in the food, energy, water, and carbon (FEWC) nexus, food waste hierarchy's reductionist framework (which prioritises reduction, redistribution, animal feed, AD, compost, incineration, and landfill, respectively) is the most popular guidance for food waste management in circular economies.

Aiming to optimise the framework, we developed a comprehensive and replicable system dynamics model to explore the FEWC footprints of food waste management options throughout the supply chain. The model was applied to compare the preferability of each food waste management option, as well as the effectiveness of relevant policies in Bristol, UK.

Unlike the simplistic guidance of the waste hierarchy, our findings show that the preferability of each option can vary for each sector and each FEWC element. In general, the study finds that increasing food surplus redistribution in upstream supply chain and reducing food waste at consumer sectors is the most preferable approach to reduce the environmental impacts of food. Feeding food leftover to pets at household also has a promising impact. The study finds a trade-off between energy and carbon footprint of the remaining options, while having minimal impact on water footprint.

Based on the insights from the model, this paper proposes a new definition for the food waste. It also presents an optimised version of food waste hierarchy that accounts for the scale of preferability of each option for different sectors and different FEWC elements. The simulation model and its reported findings provides a novel and robust understanding of food waste impacts on the FEWC nexus in urban circular economies.

---