Academic Language and Literacy for Mathematics Dissertations

# Session 2: SwDS Structure and Line of Argument: Answer Sheet

*This session will help you to*

* Understand the report structure
* Develop and communicate a central argument
* Use appropriate language to clearly state your objective

## Defining a research territory

* 1. Analyse the research project introduction below. Identify the different stages of a typical introduction
* Defining the research territory
* Establishing a niche
* Occupying the niche
1. Introduction

Liver cancer is one of the most frequently diagnosed cancers worldwide and also one of the most common causes of cancer-related death (Ahmedin et al., 2011). Hepatocellular carcinoma (HCC), on which this report focuses, is the most common type of primary liver cancer and is associated with poor prognosis, even among patients with early and small manifestations (Fong and Tanabe, 2014). Because of its burden to global health, HCC is the object of numerous surveillance programmes, and there is much debate on the best methodology for this surveillance (Bird et al., 2016). This report aims to contribute to this discussion by examining the risk factors behind HCC diagnosis. We hope that a better understanding of the causes of HCC development can help inform the design of surveillance programmes in the future. We analyse a sample of1 555individuals undergoing HCC surveillance in2009 in Scotland, some of whom were diagnosed with cancer within the study period. Our goal is to find, among the following factors, the most relevant for explaining HCC diagnosis: aetiology of pre-existent liver disease; sex; age; and alpha-fetoprotein (AFP) levels, of which we have multiple measurements per subject over time. AFP measurement is a commonly used screening test in HCC surveillance programmes, with higher levels being associated with greater long-term risk of cancer development (Bird et al., 2016).

## Elements of a conclusion

Look at the research project extract. Can you identify typical elements of a conclusion?

* Restated objective
* Overview of main findings
* Limitations
* Direction of future research

7 Conclusion

The objective of this paper was to establish if there exists an association between drug use (measured in DDD/1000 OBD) and AMR (measured by proportion of clinical isolates exhibiting resistance) at the hospital level, using a Bayesian orderd logit model. We find a 95% probability of a positive association between DDD and AMR for invasively administered drugs, with a 97% probability that non-invasive administration leads to a smaller association between DDD and AMR. This latter association may even be negative, however the probability of this is only 80% which is too small to draw conclusions from. The relative importance of invasively administered DDD in determining the proportion group is small, with a minimum transition ratio of 23.65 for a bottom to bottom transition. These ratios were smallest at more extreme proportions, perhaps implying a tipping-point phenomenon. In general, resistance mostly arises from a few drugs - namely amoxicillin, doxycycline, and trimethoprim. The drugs with the most negative association were linzolid, meropenem, and metronidazole.

We have also suggested an alternative model (ZOIB), and how it might be improved by accounting for the natural ordering in the data, which is currently ignored. Marginalisation is also an attractive proposition.

Concerns involve the generalisability of the model due to the subpopulation of a single hospital which could mean ignored hospital-specific or location-specific effects. The average age of patients is also very high, with the minimum average age on a ward-week being 45.Additionally, there may be selection bias due to the study being in a hospital setting where people are already ill. There is also the concern of the model’s poor predictive performance, even when considering the purposefully overfit model.

## Executive summary

Look at the research project extract. Can you identify typical elements of an executive summary?

* Description of the problem
* Summary of findings
* Proposed solution

**Executive Summary**

At the moment, the Great Britain (GB) and Ireland (IR) electricity systems are two stand-alone system. When one system has surplus while the other has shortage, the shortfall in one system cannot be fulfilled by excess in other system. If the two systems are connected, then deficit in one system can be met by surplus in the other system.

The cost of connecting these two systems is significant, therefore we need to understand the benefit from linking the two systems. For this reason, a realistic assessment of the joint capacity from these two systems is essential. **What the LOLE will be for GB and IR if the two systems are connected with 1 GW interconnector?** Intuitively, we know that joint system will have a lower LOLE1but we still do not know by how much. **How do we estimate the LOLE for joint system?**

So far, we have well established approach to estimate the LOLE for one isolated model—i.e. Time Collapse Model –*Hindcastand Independence approach*—but until now we still do not have a model to estimate the LOLE for joint system.

This project offers a model to estimate the LOLE for joint system. It describes new statistical approaches to extend the existing *Hindcast* approach2of estimating the LOLE and assessing the uncertainty for two joined systems, both for the first rule (each system to meet its own demand first) and the second rule (both systems to share deficit proportionally). By using these new approaches, the expected LOLE for GB and IR can be estimated.

According to our analysis, linking the Systems significantly reduces the shortage problem for both GB and IR. In one isolated system, each system has LOLE at ~3 hours/year. In two joined systems, the LOLE is 1.73 hours/year and 0.47 hours/year for GB and IR.

In addition, the Joint System also narrow the LOLE confidence interval (i.e. reduce the uncertainties). The LOLE 95% confidence interval for GB and IR is 1.31-2.23 hours/year and 0.26-0.72 hours/year—well below 3.00 hours/year, indicating clearly the benefit of joint systems.

Furthermore, the Joint System considerably increase the stability of the system (i.e. becoming less sensitive to changes in wind capacity and demand).

While having the interconnector is beneficial, increasing the interconnector capacity to maximum is not optimal. Simulation suggests that increasing the interconnection capacity up to 1.5 GW will give us a significant benefit in term of LOLE reduction. However, no significant benefit beyond building more than 2.0 GW capacity.

To conclude, we strongly recommend that GB and IR should build the interconnector and the optimal capacity is between 1-2 GW.