High-Throughput Non-Linnear Model Comparison of Bacterial Growth Curves: a Bayesian Approach

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January 15, 2021
Word Count: x

1 Here's an abstract - it'll be about 200 words and a summary of all sections of the
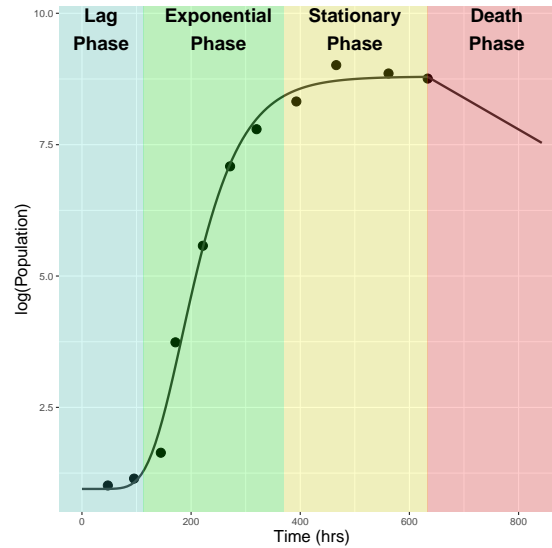2 report s s

Contents

Figure 1: caption explaining the figure, and explaining how the models' parameters relate to the diagram

1 Introduction

Understanding population growth is paramount in fields of study as far-flung as epidemiology, climate science and even geopolitics.(Ozgul et al., 2010; Peleg, 1997) For decades a series of increasibgly complex mathematical models have been used to explain trends in empirical population growth data, and enable prediction.(Grijspeerdt & Vanrolleghem, 1999; Kingsland, 1982; Tjørve & Tjørve, 2017) Those used for modelling bacterial growth largely rely on the same theory of bacterial growth phases, shown in Figure 1.

bacterial growth (Buchanan, 1918)

((also mention the idea of modelling bio stuff as new or whatever (Transtrum & Qiu, 2016)))

(Kingsland, 1982)

This section will include background info on:(Baranyi et al., 1993; Posada & Buckley, 2004)

- population growth in general

- the phases og bacterial population growth, using Figure 1 to help demonstrate

- the models I will be using and differences between them

- BIC for model Comparison, and why I chose it over other methods

- outline the hypothesis and aims

1

2 Methods

2.1 Data

include different measurement techniques, inc spectrometry.(Al-qadiri et al., 2008)

2.2 Computing Tools

contain in the Methods a sub-section called "Computing tools" which states briefly how each of the scripting languages (bash, R, Python) was used and what packages within them were used and a justification of why.

2.3 Model Fitting

2.4 Model Comparison

Here I will

- describe and explain the dataset

- possibly move the model and BIC stuff here from intro

- explain the process I took when fitting the models

- justify important decisions in code which may otherwise seem arbitrary, eg the starting

3 Results

- start off using figure 2 and a table I can't work out how to use in latex to compare the models

- possibly also include a boxplot for BIC values of each model to visualise

- then use figures 3 and 4 to visualise the possibility of one model preforming better depending on temperatiure or medium or pop measurment method
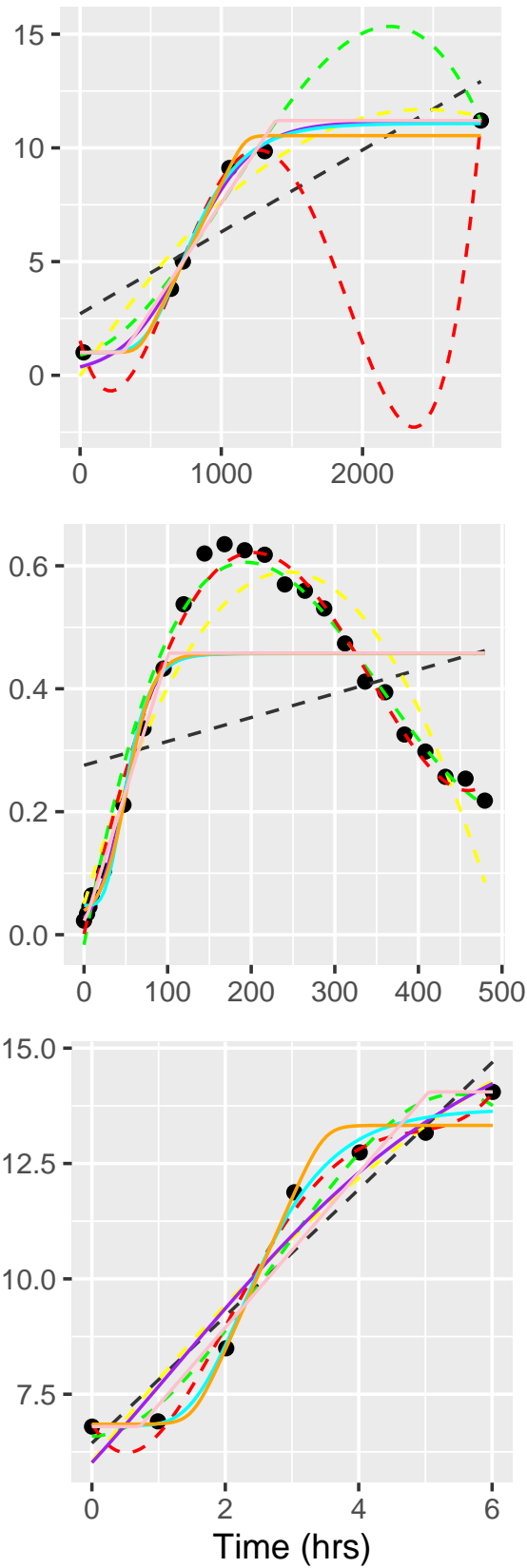
Figure 2: caption explaining the figure, and explaining the y axis (log of different units), which models we're looking at and what it tells us
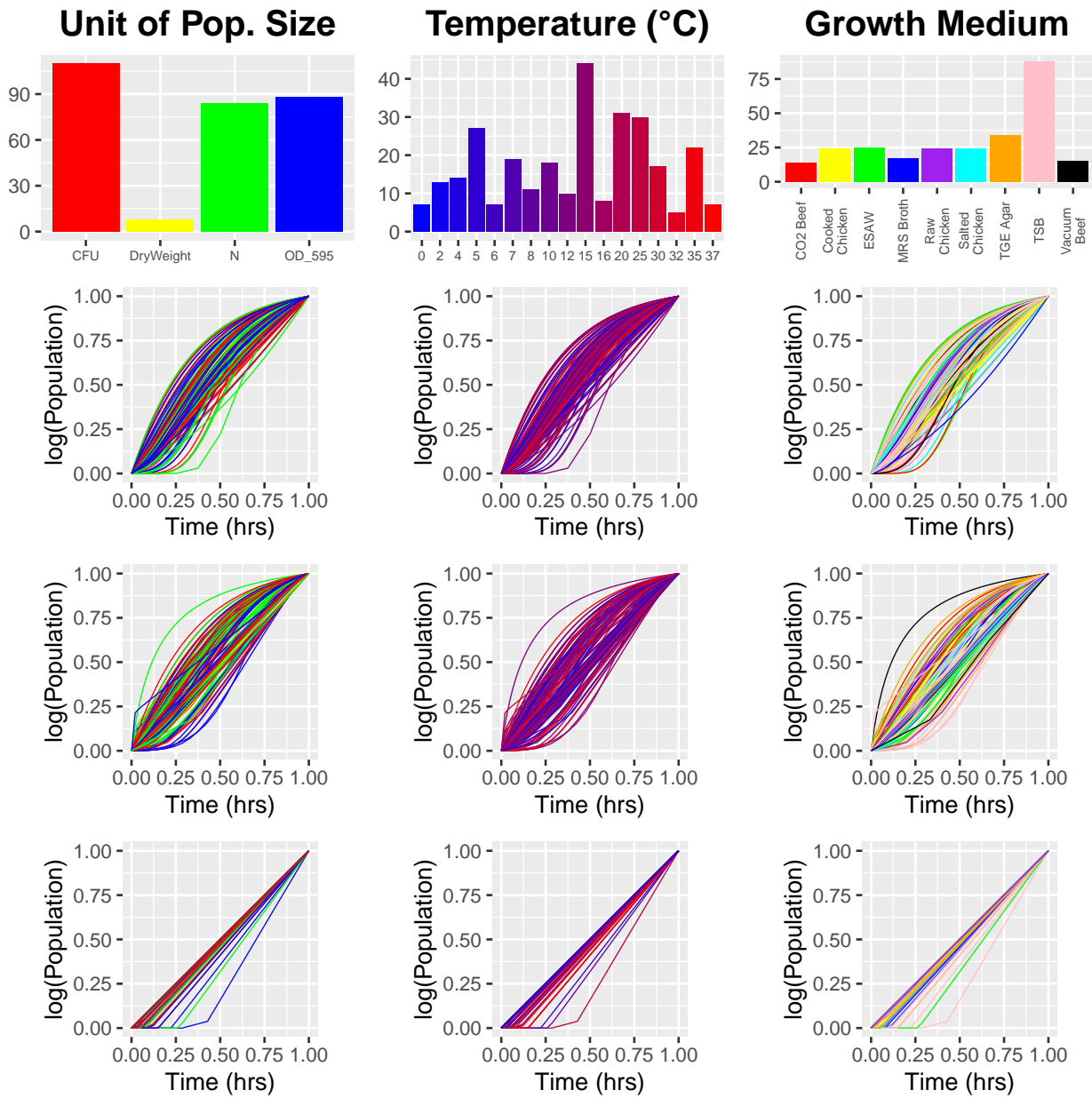
Figure 3: caption explaining the figure, including how it is all the regression lines from fitted models standardised to allow superimposition, and that barplots above act as legend, and which models are which
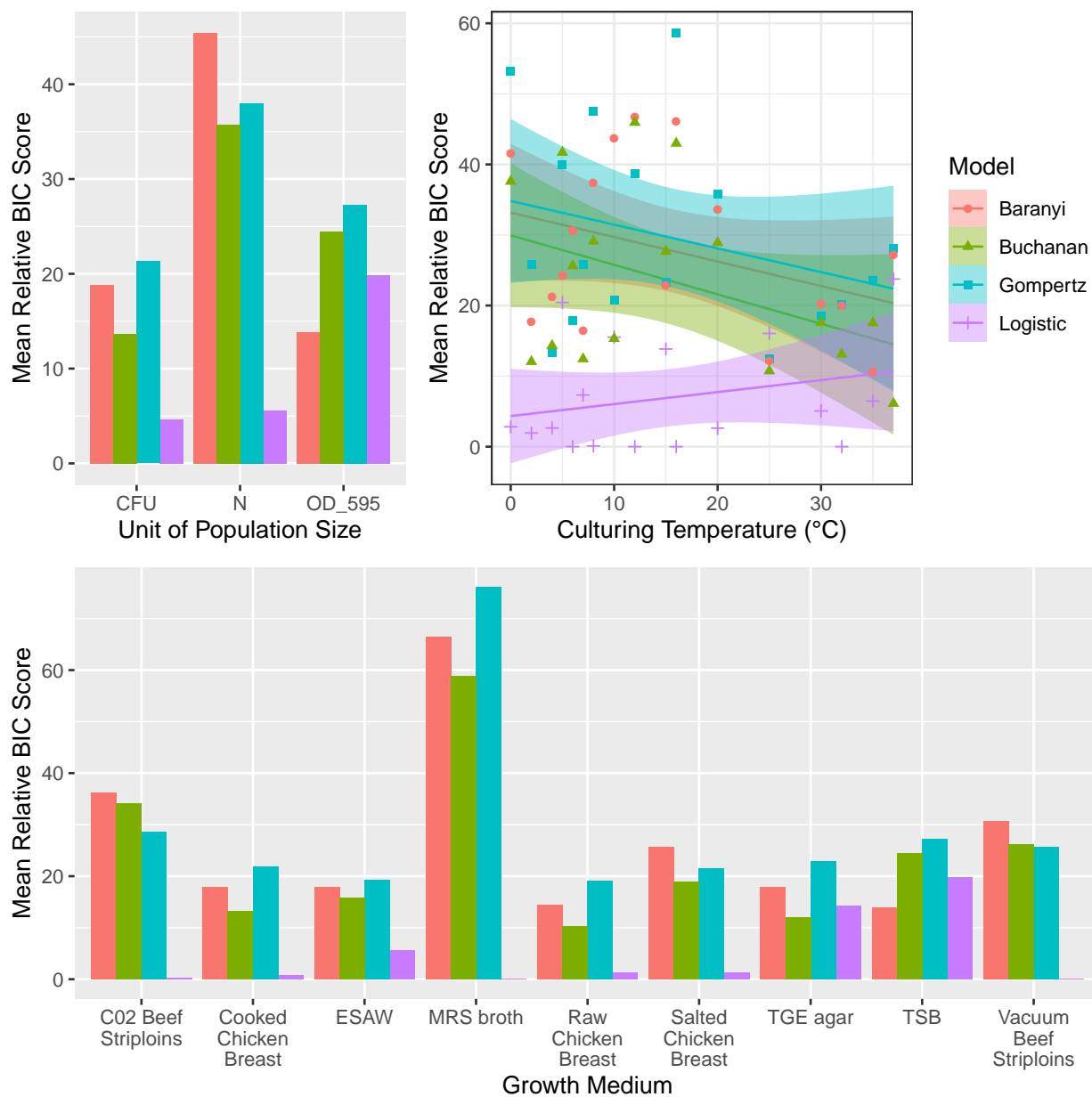
Figure 4: caption explaining the figure, and that colours for each model is concistent throughout.

4   Discussion

- use results to determine best model(s)

- explore whether covariables make a difference

- mention death phase, think about models which account for that, possibly suggest splines

- discuss possibiltiy of accounting for the 3 covariables in the formulae - multivariate regression
  - more on that later!

- discuss how this all fits with my initial aims and hypotheses

References

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