Scattering Angle Resolved Optical Coherence Tomography of a Hypoxic Mouse Retina Model: Supplementary Material

Burr Distribution

The Burr Type XII distribution is a generalization of the Pareto and Weibull distributions and was first described by Singh and Maddala[1] who utilized it to investigate income distributions. The Burr distribution has also been utilized in diverse fields such as failure analysis,[2] forestry (tree diameter),[3] and behavioral science (travel time reliability).[4]

The Burr distribution's probability density function is given by Equation 2:

$$PDF_{Burr}(x|\alpha, C, K) = \frac{\frac{KC}{\alpha}\left(\frac{x}{\alpha}\right)^{c-1}}{1+\left(\frac{x}{\alpha}\right)^{c}}, \quad (2)$$

where α is a scale parameter to the sample value, C and K are shape parameters, and x is the sample value. Influence of α, C, and K parameters are illustrated (Figure S1).

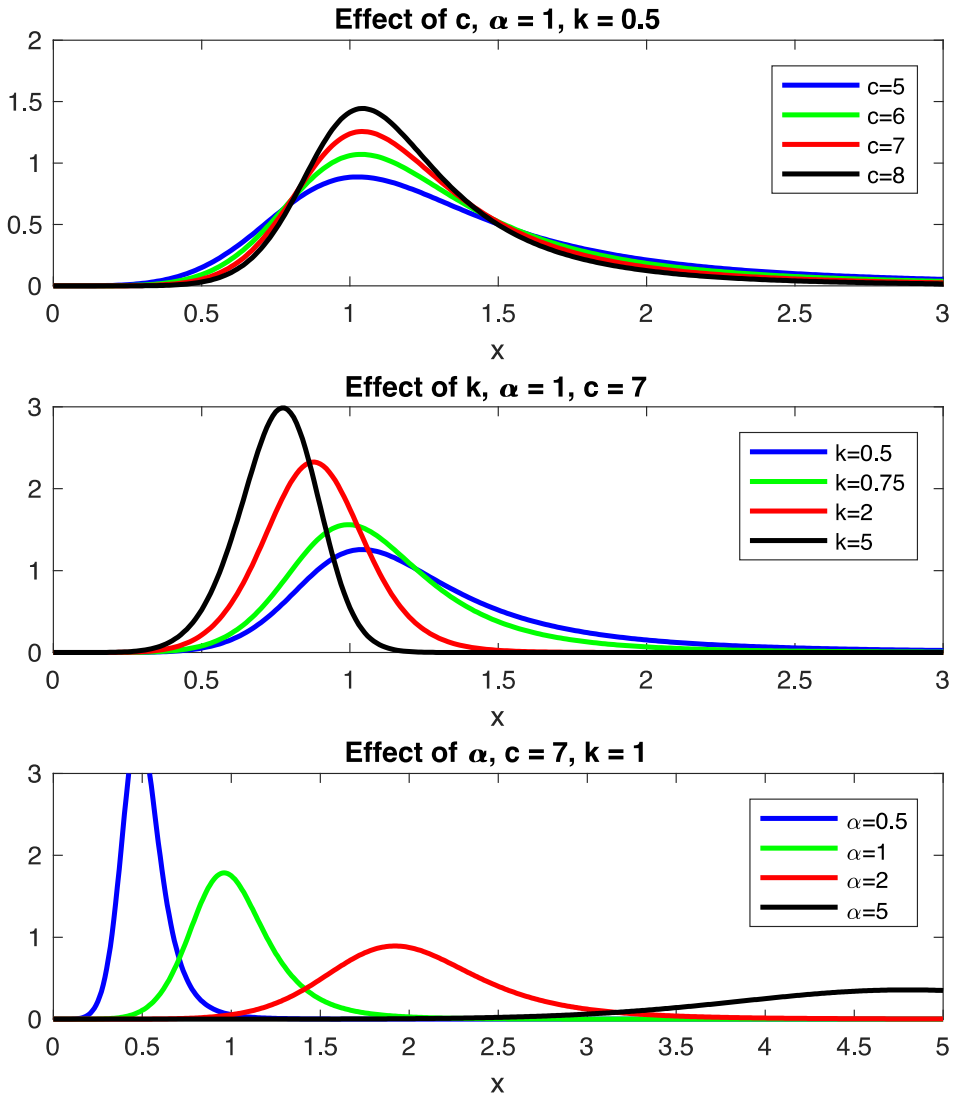

Figure S1. C and K parameters control Burr Type XII distribution shape while α is a scale parameter in the x-dimension.

To demonstrate goodness of fit of L/H_2 values to a Burr distribution, the L/H_2 values were taken from the segmented inner nuclear layer (INL) of a mouse retina was chosen as a representative retinal volume. L/H_2 values in the segmented INL were fit to a Burr distribution. Resulting confidence intervals for the Burr distribution parameters (C, K, and α) were extremely tight. The α parameter was calculated to be 1.069 (confidence interval: [1.068, 1.071]), C parameter as 5.315 (confidence interval: [5.303, 5.327]), and K parameter as 0.972 (confidence interval: [0.967, 0.977]). Thus, a 95% confidence exists that the actual distribution falls with 0.16%

of α, 0.23% of C, and 0.55% of K. Considering a Burr distribution for every retinal layer in a control mouse, on average a 95% confidence exists that the actual distribution falls within 0.43% of α, 0.58% of C, and 1.58% of K (Figure S2).

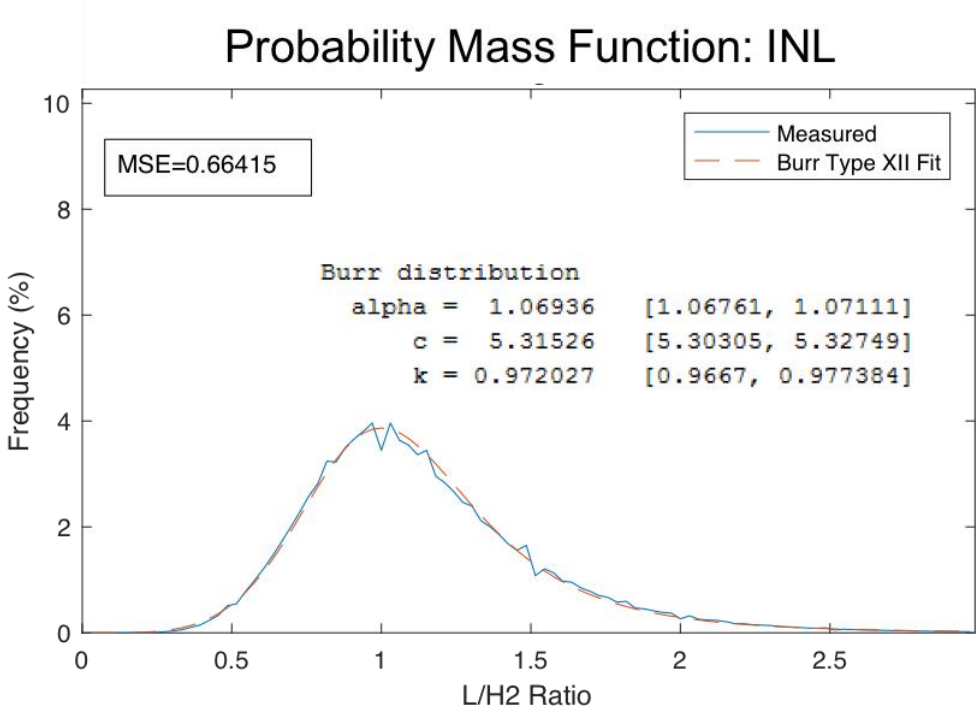

Figure S2. The probability mass function for the INL is displayed with the Burr distribution fit. The burr distribution is an excellent fit for L/H2 values.

References

1. Singh SK, Maddala GS. A function for size distribution of incomes. In: *Modeling Income Distributions and Lorenz Curves*. Springer; 2008:27-35.

2. Zimmer WJ, Keats JB, Wang FK. The Burr XII distribution in reliability analysis. *J Qual Technol*. 1998;30(4):386.

3. Lindsay SR, Wood GR, Woollons RC. Modelling the diameter distribution of forest stands using the Burr distribution. *J Appl Stat*. 1996;23(6):609-620.

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