Associations between Chlorophyll *a* and various Microcystin-LR Health Advisory Concentrations

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Cyanobacteria harmful algal blooms (cHABs) are associated with a wide arrange of adverse health effects that stem mostly from the presence of cyanotoxins. To help protect agains the impacts, several health advisory levels have been set for some of these toxins, in particular, one of the most common toxins, microcystin, has several advisory levels set for drinking water and recreational use and managing water bodies to meet those levels could have far reaching benefits. However, measuring micorcystin can not currently be done *in situ* and requires samples be processed in a lab. This time consuming and expensive. It is possible to find reliable indicators that may be estimated quickly and *in situ* as a first defense agains high level of microcystin. In particular, chlorophyll *a* has been shown to be postively associated with microcystin. In this paper we use this assocation to provide estimates of chlorophyll *a* that if exceeded would be indiciative of a higher likelihood of exceeding select concentrations of microcystin. Using the 2007 National Lakes Assessment and a conditional probability appoach that has been used in other water quality settings, we idenfify chlorophyll *a* concentrations that are more likely than not to be associated with an exceedance of a microcystin health advisory level. We look at the recent US EPA standards for drinking water as well as the World Health Organization levels for drinking water and recerational use. For microcystin concentrations of 0.3, 1, 1.6, 2. and 4 we find chlorophyll *a* concentrations of 23.68, 65.2, 79.8, 113.14, and 273.6, respectively. When managing for these various microsystin levels exceed these reproted chlorophyll *a* concentratoins should be a trigger for further testing and possibly managment action.

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1 Introduction

EPA just released HA for MC

MC requires lab work

MC associated with Chl a

Use association and cpa to id chl a concentration that indicative of exceeding HA

2 Methods

Source	Type	Concentration
WHO	Drinking	1 ug/l
U.S. EPA	Drinking	0.3 ug/l
U.S. EPA	Drinking	1.6 ug/l
WHO	Recreational	2-4 ug/l
WHO	Recreational	10-20 ug/l
WHO	Recreational	20-2000 ug/l
WHO	Recreational	>2000 ug/l

We evaulated associated chlorohpyll *a* concentrations for an effect for each of the WHO and EPA levels. These were 0.3, 1, 1.6, 2, 4, 10, and 20 ug/l.

2.1 Data and Study Area

3 Results

Source	Microcystin	Chlorophyll
EPA_Child	0.3	23.68
WHO	1	65.2
EPA_Adult	1.6	79.8
WHO	2	113.1
WHO	4	273.6
WHO	10	338.4
WHO	20	338.4

4 Discussion

5 Figures

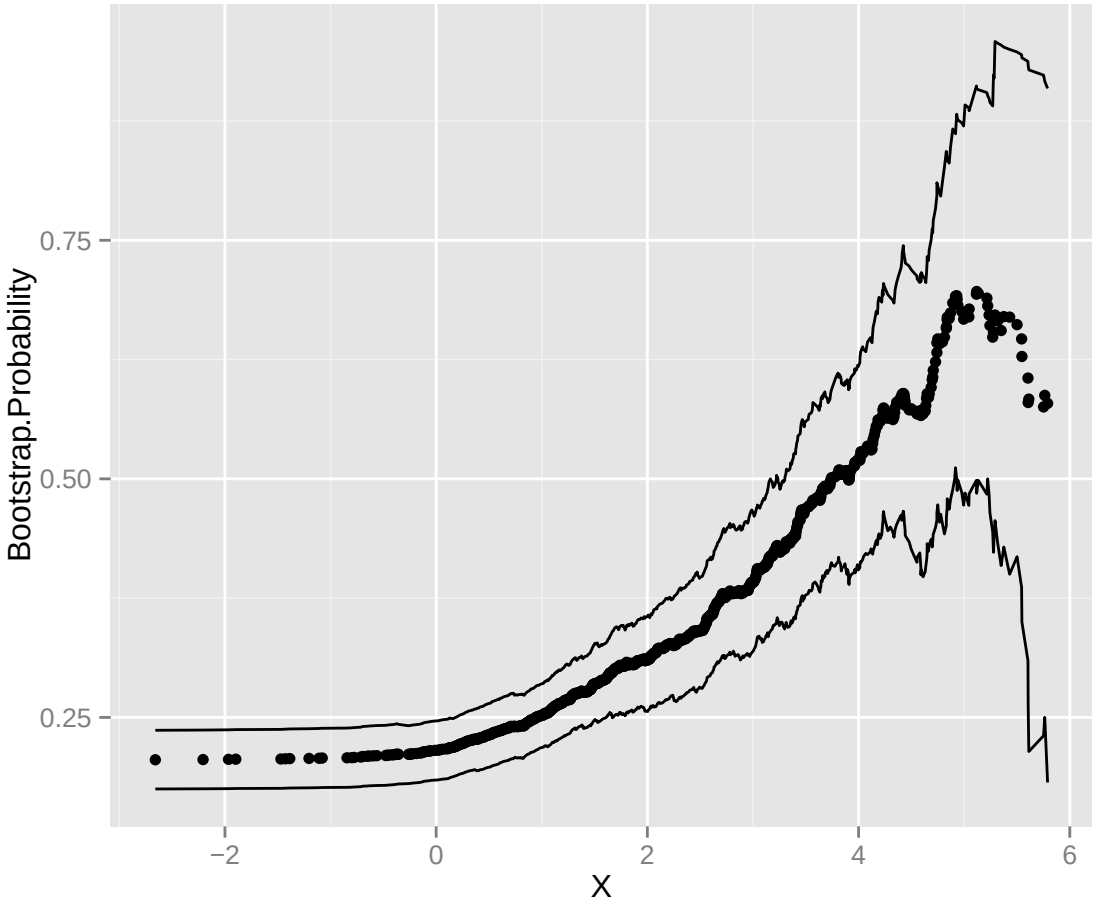


Figure 1

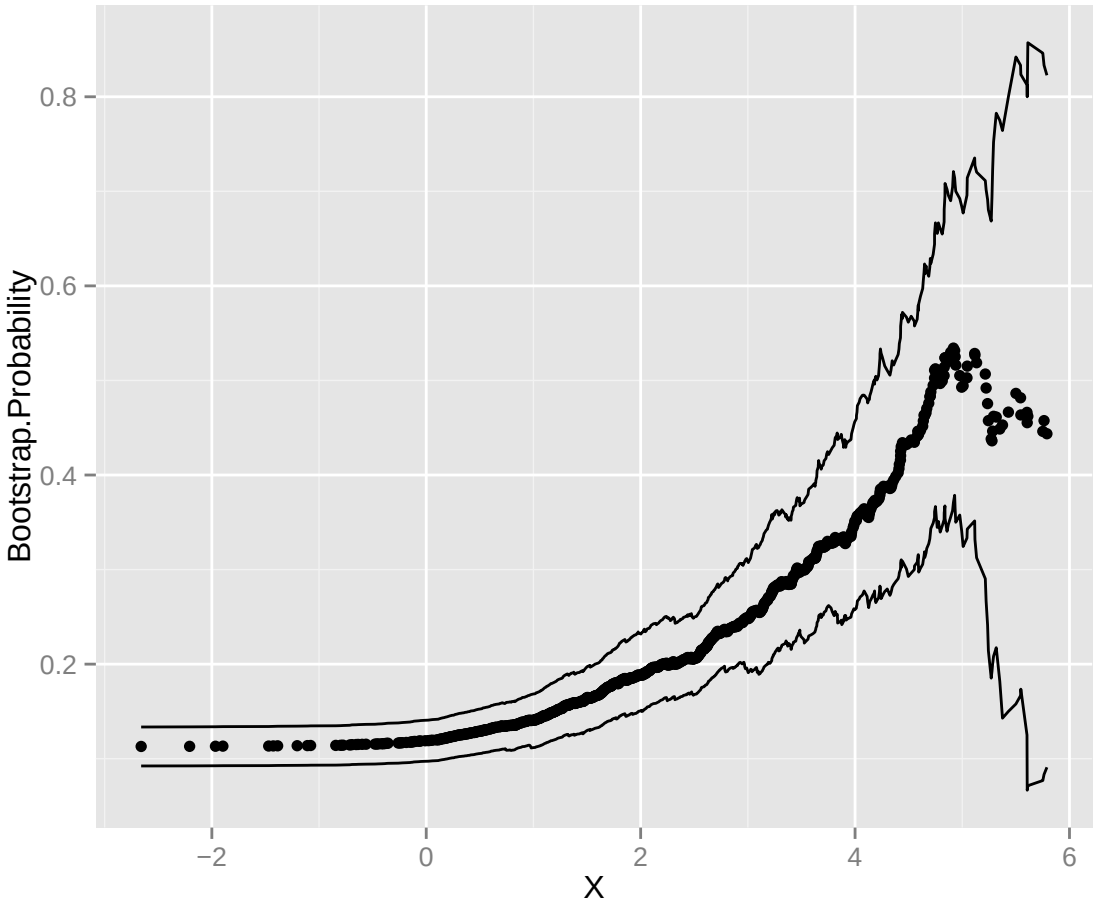


Figure 2

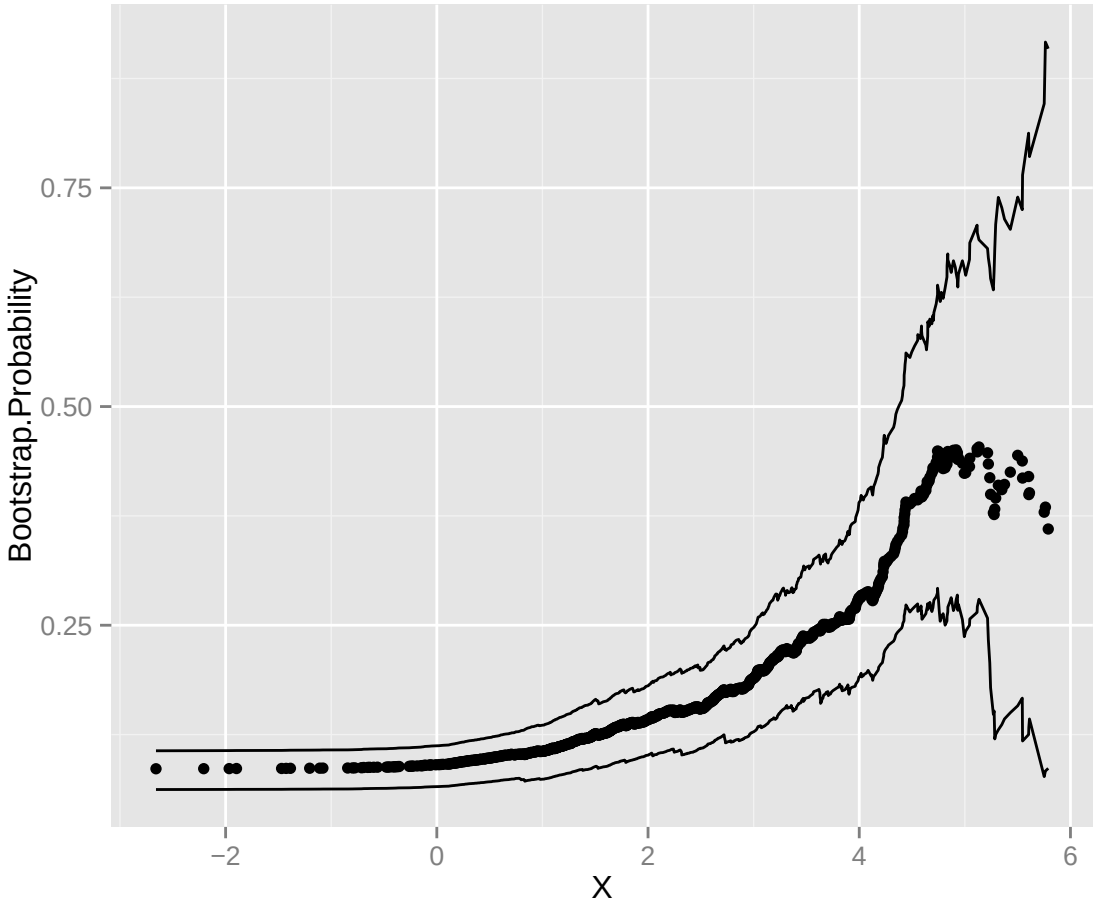
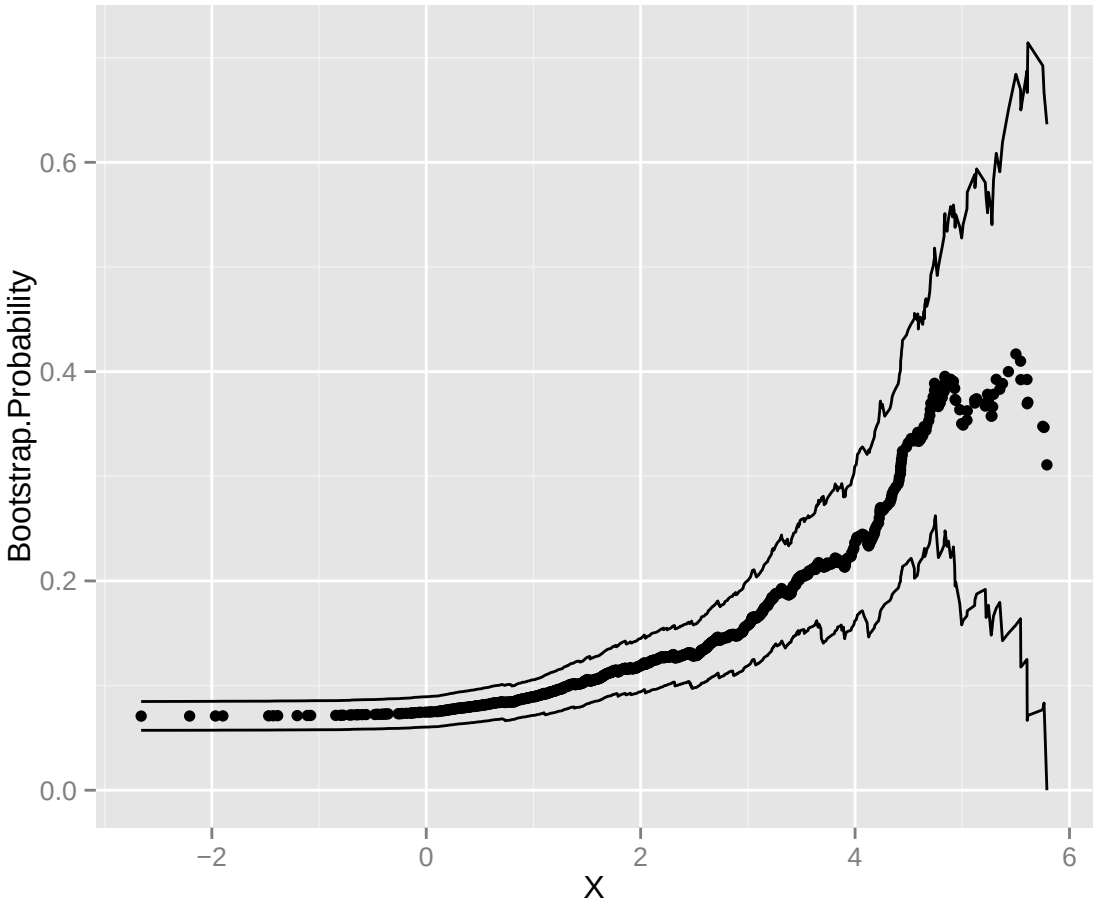


Figure 3



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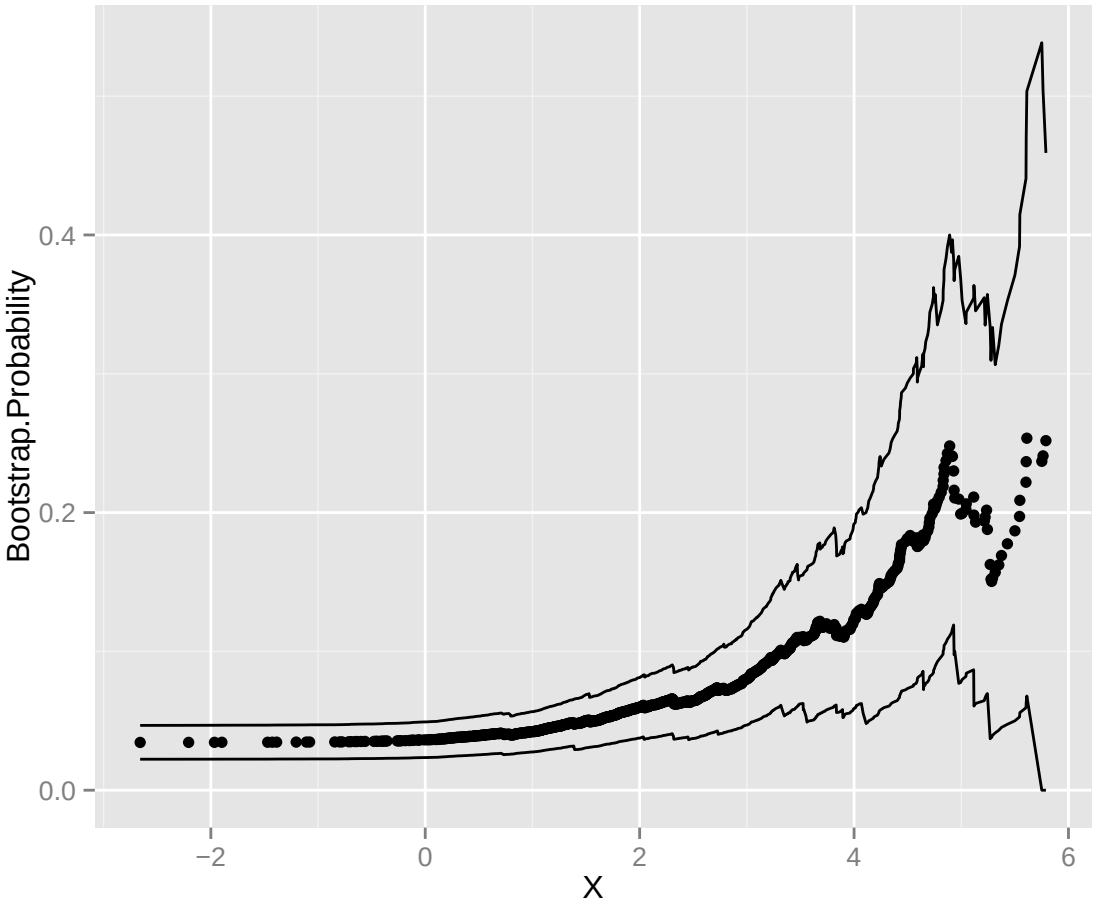
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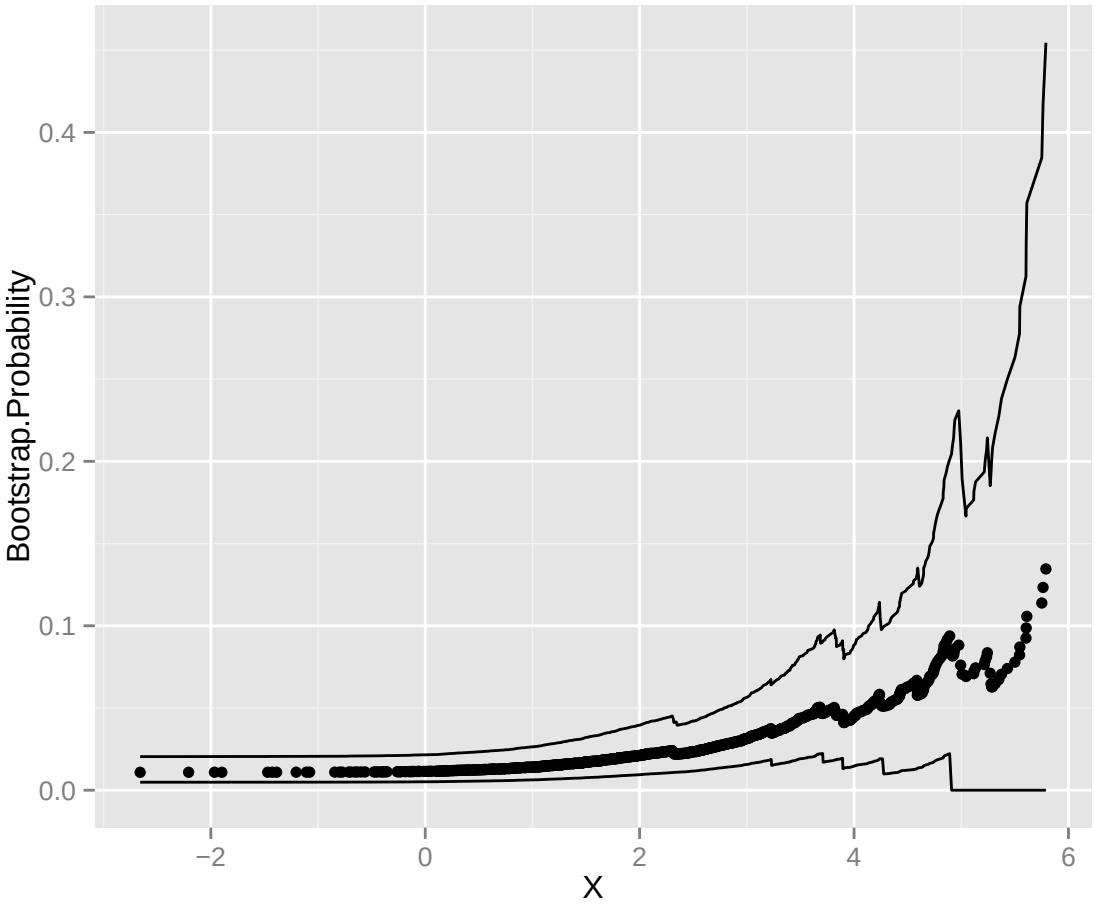
0
2
4
6
X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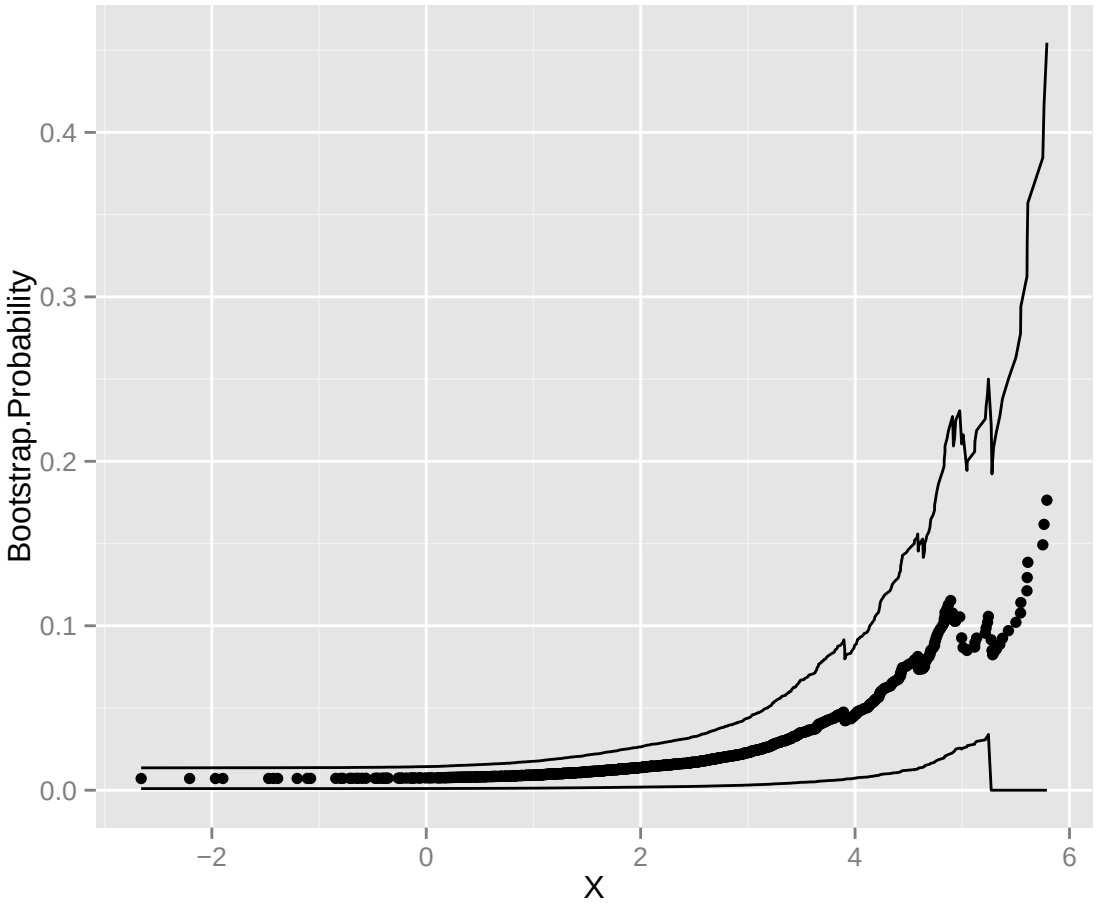
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References