1. The HMRC wants to collect from delinquent taxpayers, and they’ve employed the BIT (behavioral insights team) to assist. We are given some information on a hypothetical taxpayer, John Smith. One approach for changing the letter would be pointing out the compliance rate of citizens from his hometown and neighbors. In the case, 98% of citizens had paid their taxes and 95% of citizens in John’s hometown had paid. Further, his neighbors, and parents both paid on time. The letter would point out these facts and remind John of his delinquent status.   
   This strategy would encourage the taxpayer to join the status quo. If his peers are complying with paying taxes, why isn’t he? It is a form of social pressure to join the crowd and be a normal, compliant citizen.
2. The HMRC should use an A/B test to evaluate the success of the proposed letter. The control group would receive the current letter format and the test group would receive the new letter format. It would be key to assign these letters randomly. With unknown outcomes, it would make sense to keep the treatment group sample size as small as possible in case of a worse outcome.   
   Once the test is performed, they can compare the results of the two groups using a t-test and determine if there are significant changes between the two groups. The important hypothesis is does the new letter significantly increase tax payment collections.
3. TBD
4. TBD
5. For this question, a 3% improvement in the existing conversion rate is 0.2% \* 1.03 = 0.206%  
     
   The number of impressions required per group to detect a 3% improvement in conversation rate at 5% significance and 80% power is 70,546 per group.  
     
   R-code/output:  
      
     
   Text

   Description automatically generated