# Appendix 12: Additional results for dietary prevalence of ARGs and ARG families

## Introduction

The following results were generated in the same way as described in the main report (Section 3.6: Estimation of UK population burden) but relate to alternative groups of ARGs or ARG families.

### Incidence of ARG families in UK diet – by food type

The process for calculating the UK dietary incidence of individual ARGs found **per food type** (see Section 3.6.2) was repeated to summarise the number of ARG families (rather than ARGs) per food type. A total of 111 unique ARG families were recorded. An alphabetically sorted list is provided below

* 16S rRNA methyltransferase (G1405)
* AAC(2')
* AAC(3)
* AAC(6')
* AAC(6');APH(2'')
* ABC-F ATP-binding cassette ribosomal protection protein
* ACT beta-lactamase
* ADC beta-lactamase without carbapenemase activity
* AER beta-lactamase
* AIM beta-lactamase
* ampC-type beta-lactamase
* ANT(3'')
* ANT(6)
* ANT(9)
* APH(3'')
* APH(3')
* APH(4)
* APH(6)
* AQU beta-lactamase
* ATP-binding cassette (ABC) antibiotic efflux pump
* ATP-binding cassette (ABC) antibiotic efflux pump;major facilitator superfamily (MFS) antibiotic efflux pump
* ATP-binding cassette (ABC) antibiotic efflux pump;major facilitator superfamily (MFS) antibiotic efflux pump;resistance-nodulation-cell division (RND) antibiotic efflux pump
* Bc beta-lactamase
* BJP beta-lactamase
* BKC Beta-lactamase
* blaZ beta-lactamase
* Bleomycin resistant protein
* BPU Beta-lactamase
* CAU beta-lactamase
* Cfr 23S ribosomal RNA methyltransferase
* chloramphenicol acetyltransferase (CAT)
* chloramphenicol phosphotransferase
* CIA beta-lactamase
* class A LRA beta-lactamase
* class C LRA beta-lactamase
* class C LRA beta-lactamase;class D LRA beta-lactamase
* CMY beta-lactamase
* CphA beta-lactamase
* CPS beta-lactamase
* CTX-M beta-lactamase
* defensin resistant mprF
* Erm 23S ribosomal RNA methyltransferase
* ESP beta-lactamase
* EXO beta-lactamase
* FAR beta-lactamase
* fosfomycin thiol transferase
* FOX beta-lactamase
* fusidic acid inactivation enzyme
* General Bacterial Porin with reduced permeability to beta-lactams
* General Bacterial Porin with reduced permeability to beta-lactams;resistance-nodulation-cell division (RND) antibiotic efflux pump
* gimA family macrolide glycosyltransferase
* glycopeptide resistance gene cluster;van ligase
* glycopeptide resistance gene cluster;vanH
* glycopeptide resistance gene cluster;vanR
* glycopeptide resistance gene cluster;vanS
* glycopeptide resistance gene cluster;vanT
* glycopeptide resistance gene cluster;vanX
* glycopeptide resistance gene cluster;vanXY
* glycopeptide resistance gene cluster;vanY
* glycopeptide resistance gene cluster;vanZ
* intrinsic colistin resistant phosphoethanolamine transferase
* JOHN beta-lactamase
* kdpDE
* KHM beta-lactamase
* KPC beta-lactamase
* L1 family beta-lactamase
* lincosamide nucleotidyltransferase (LNU)
* macrolide esterase
* macrolide phosphotransferase (MPH)
* major facilitator superfamily (MFS) antibiotic efflux pump
* major facilitator superfamily (MFS) antibiotic efflux pump;resistance-nodulation-cell division (RND) antibiotic efflux pump
* MCR phosphoethanolamine transferase
* methicillin resistant PBP2
* mgt macrolide glycotransferase
* MIR beta-lactamase
* MOX beta-lactamase
* MSI-OXA family beta-lactamase
* MSI beta-lactamase
* multidrug and toxic compound extrusion (MATE) transporter
* non-erm 23S ribosomal RNA methyltransferase (A1067)
* non-erm 23S ribosomal RNA methyltransferase (G748)
* Not in aro\_index
* OCH beta-lactamase
* OKP beta-lactamase
* OXA beta-lactamase
* OXY beta-lactamase
* PER beta-lactamase
* pmr phosphoethanolamine transferase
* quinolone resistance protein (qnr)
* RbpA bacterial RNA polymerase-binding protein
* RCP beta-lactamase
* resistance-nodulation-cell division (RND) antibiotic efflux pump
* rifampin ADP-ribosyltransferase (Arr)
* rifampin monooxygenase
* rifampin phosphotransferase
* rifamycin-resistant beta-subunit of RNA polymerase (rpoB)
* Rm3 family beta-lactamase
* Sed beta-lactamase
* SHV beta-lactamase
* small multidrug resistance (SMR) antibiotic efflux pump
* SPG beta-lactamase
* SRT beta-lactamase
* streptothricin acetyltransferase (SAT)
* sulfonamide resistant sul
* Target protecting FusB-type protein conferring resistance to Fusidic acid
* TEM beta-lactamase
* tetracycline-resistant ribosomal protection protein
* THIN-B beta-lactamase
* trimethoprim resistant dihydrofolate reductase dfr
* undecaprenyl pyrophosphate related proteins
* vanJ membrane protein

Summaries of the number of distinct ARG families detected within individual food types are displayed in figures 1-3.

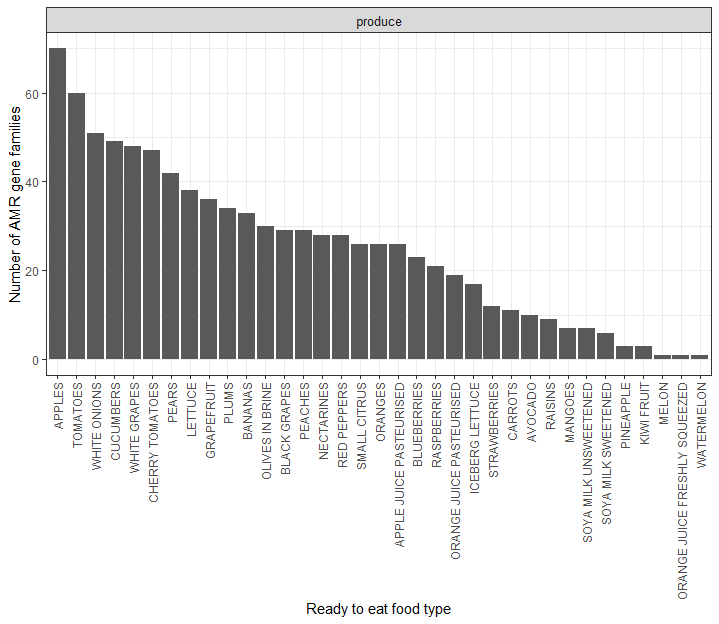
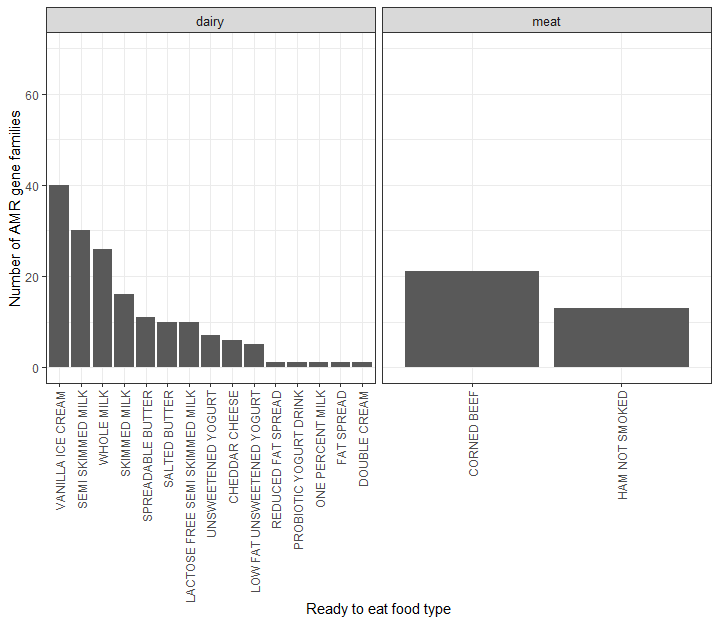


Figure 1. Number of ARG gene families found per food type. These are displayed by food type (dairy, meat, produce) without accounting for sample size or population consumption

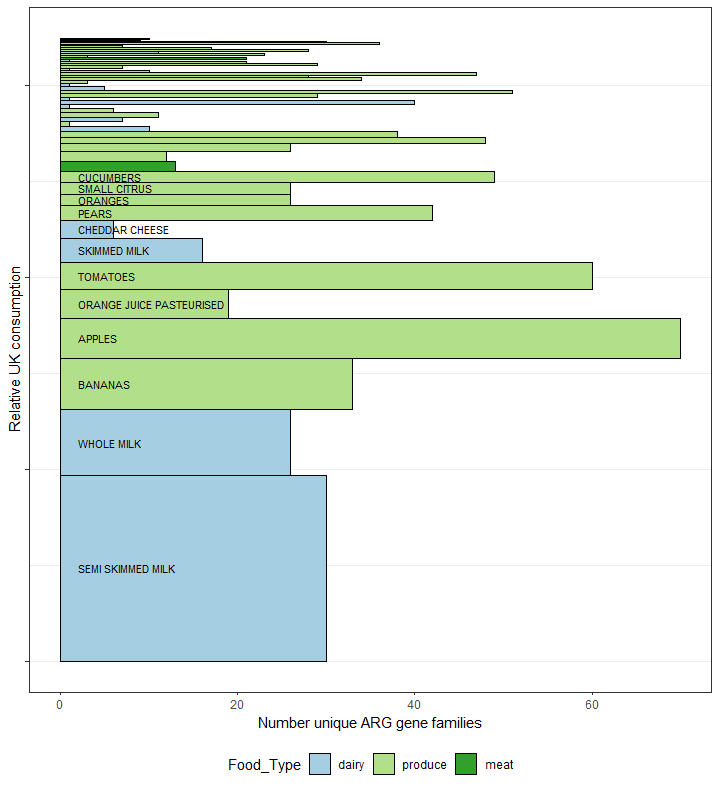
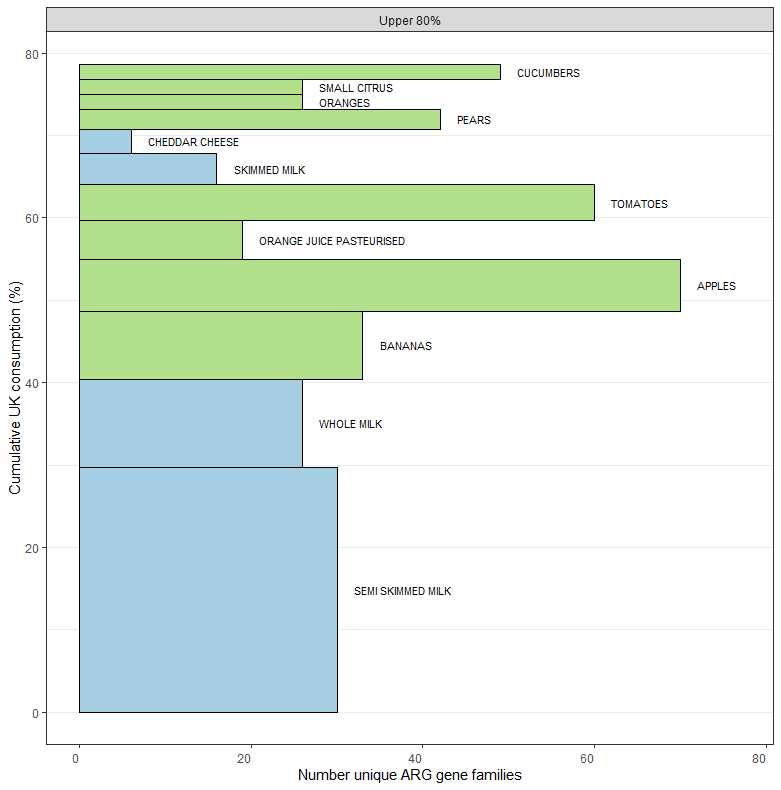


Figure 2. Number of ARG families found per food type. These are ordered by overall consumption amounts, with only foods representing the top 80% of consumption labelled.



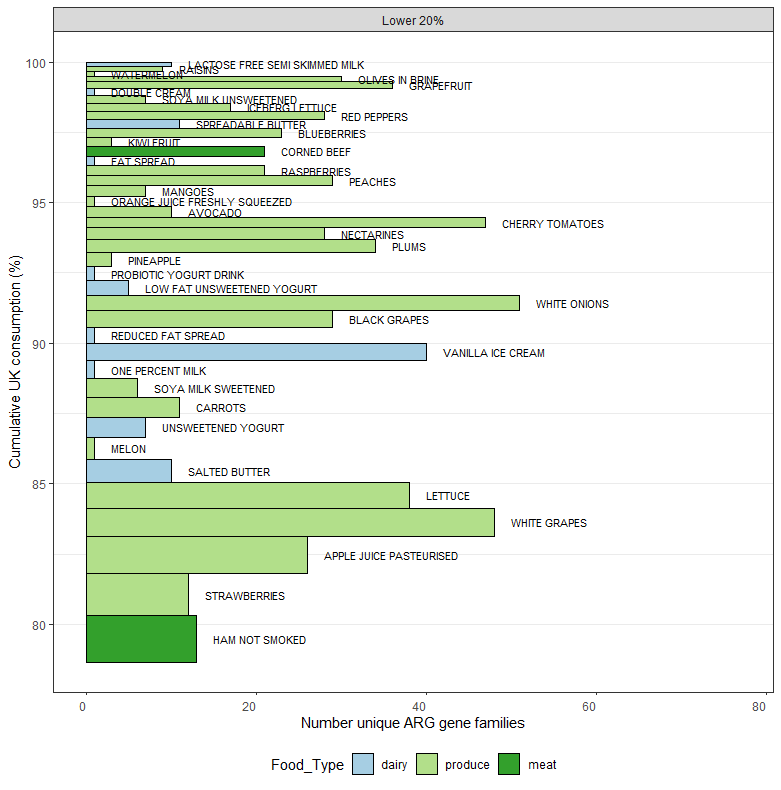


Figure 3. Number of ARG gene families found per food type. These are ordered by overall consumption amounts. Top 80% consumption (top) and bottom 20% consumption (bottom) relative to total consumption for the selected items.

### Incidence of ARG families – Total UK diet

The following results extend those presented in Section 3.6.3: “Incidence: Total UK Diet”. Here we present results with respect to unique ARG families instead of single ARGs

Examples of the frequency (relative number of samples) of a given ARG in a food specific dataset are shown for semi-skimmed milk (Figure 4), whole milk (Figure 5) and bananas (Figure 6). These food types were selected as the 3 most highly consumed ready to eat products included in the analysis.

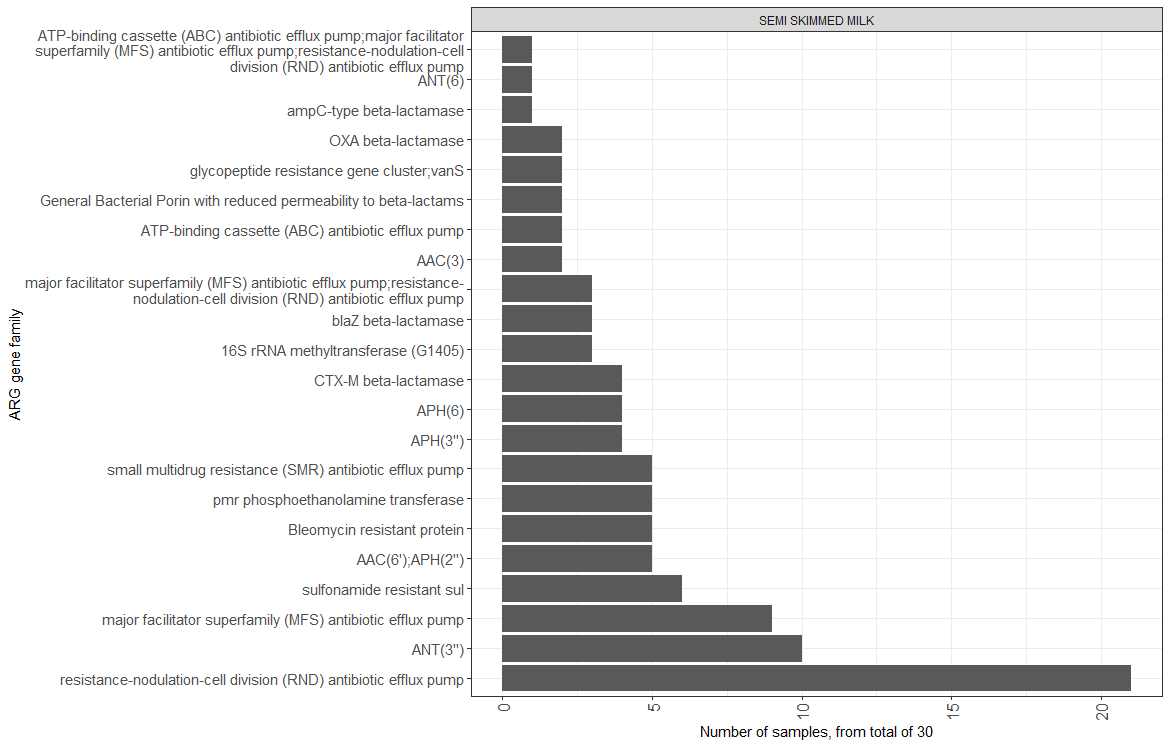
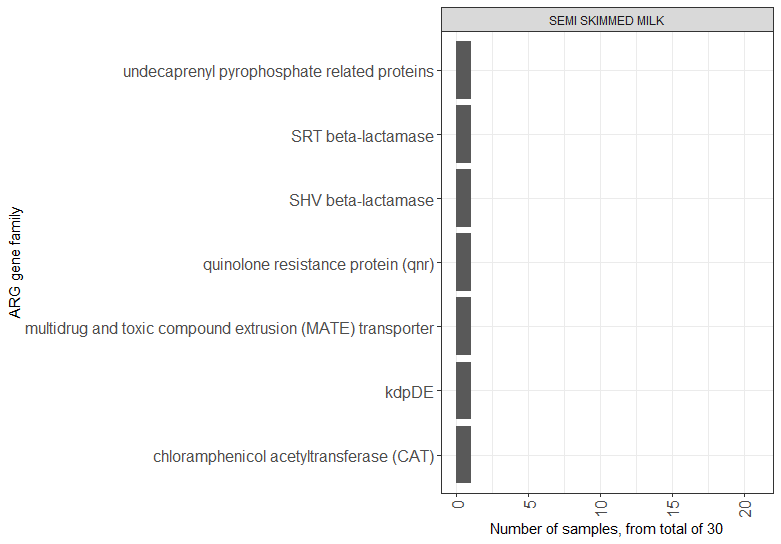


Figure 4. Number of semi-skimmed milk samples containing an ARG from individual gene families. (30 samples were found to contain one or more ARGs from a total of 69 measured original samples)

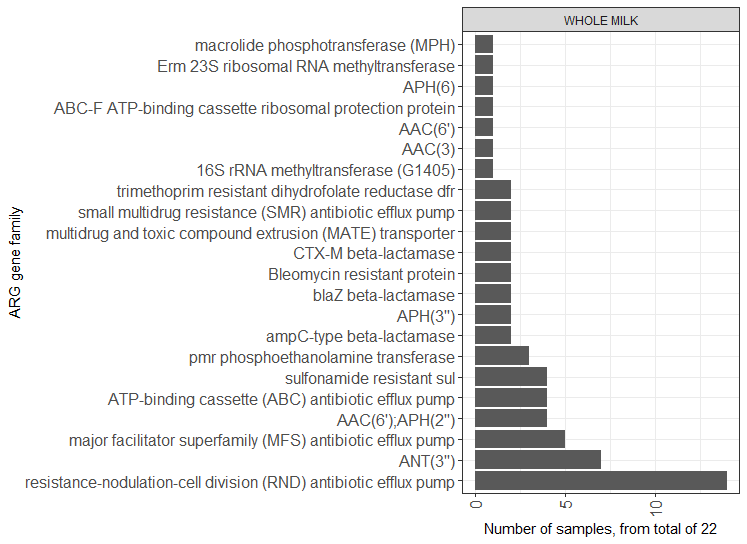
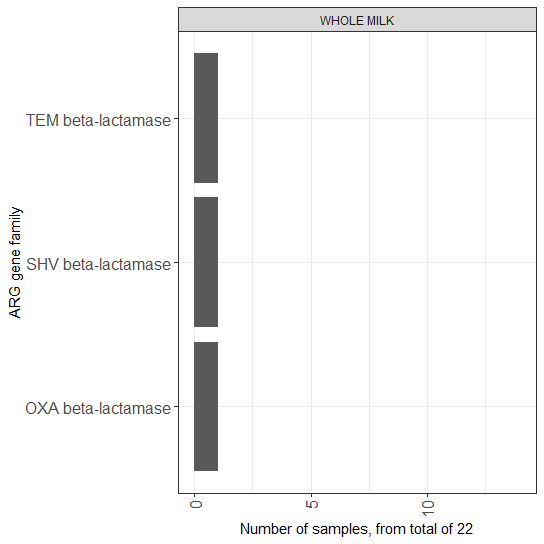


Figure 5. Number of whole milk samples containing an ARG from individual gene families (22 samples were found to contain one or more ARGs from a total of 42 measured original whole milk samples)

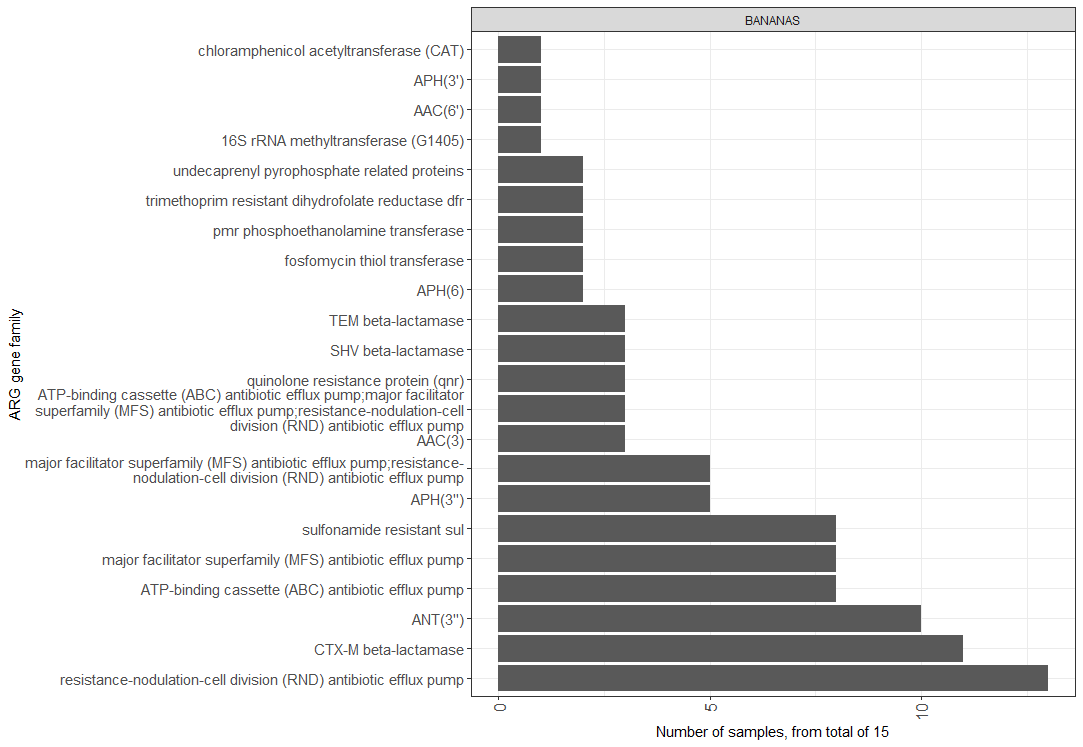
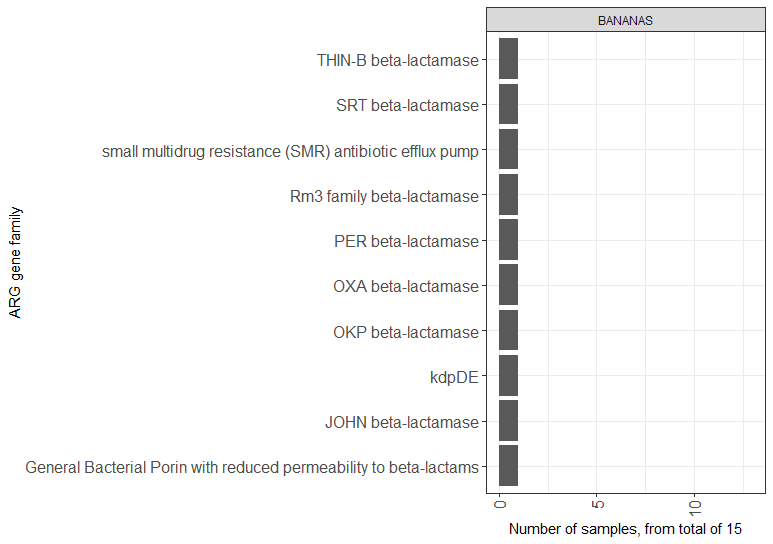
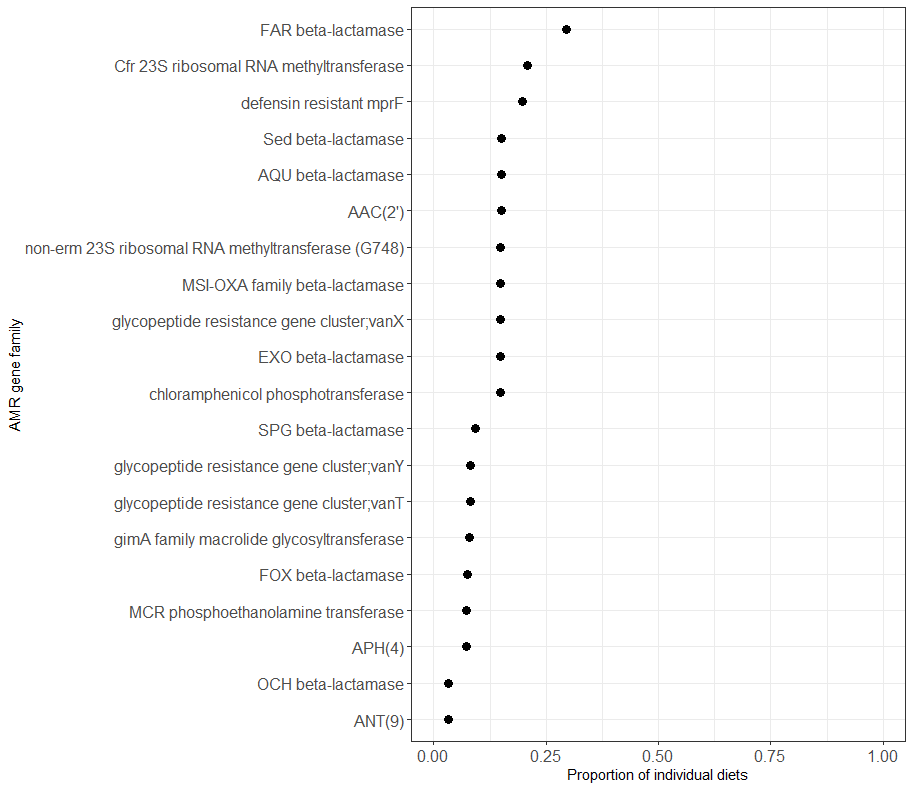
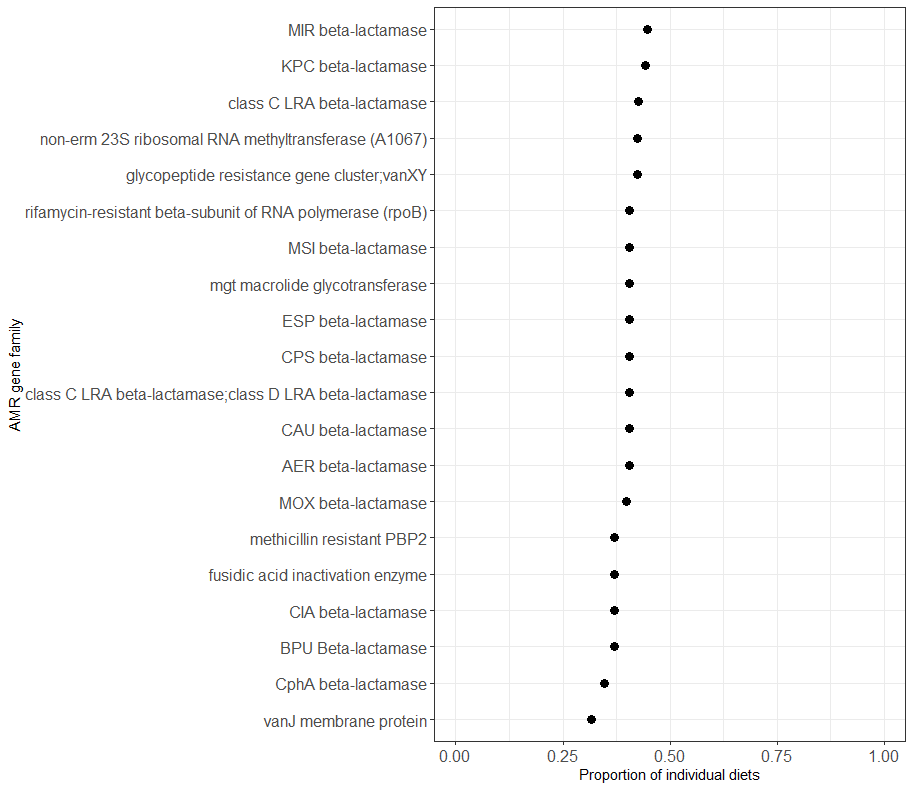
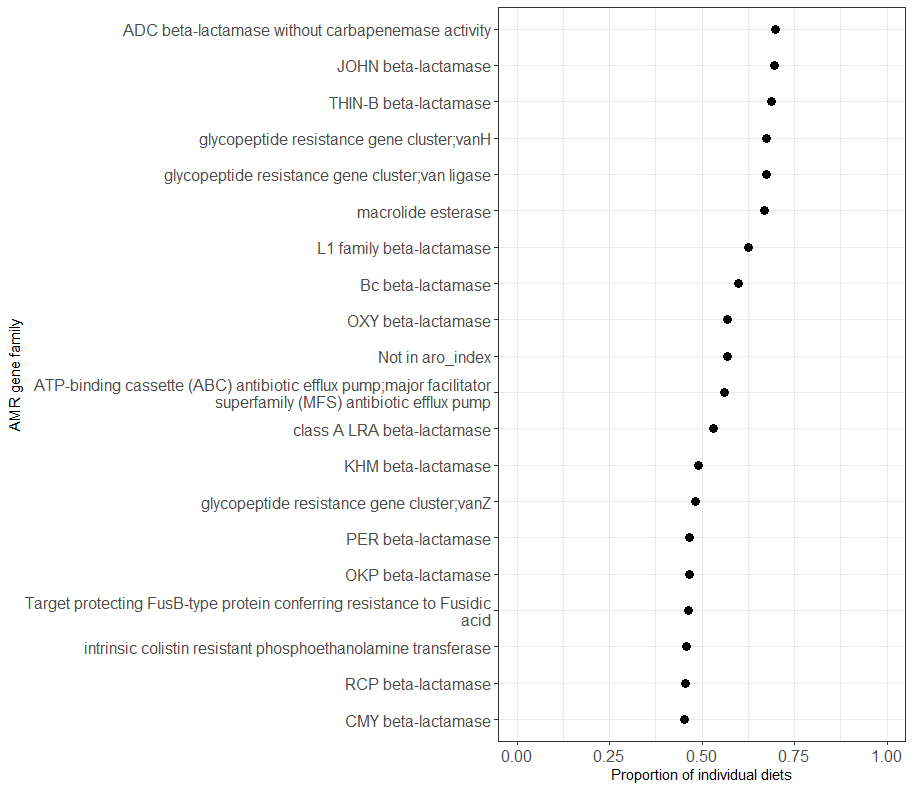
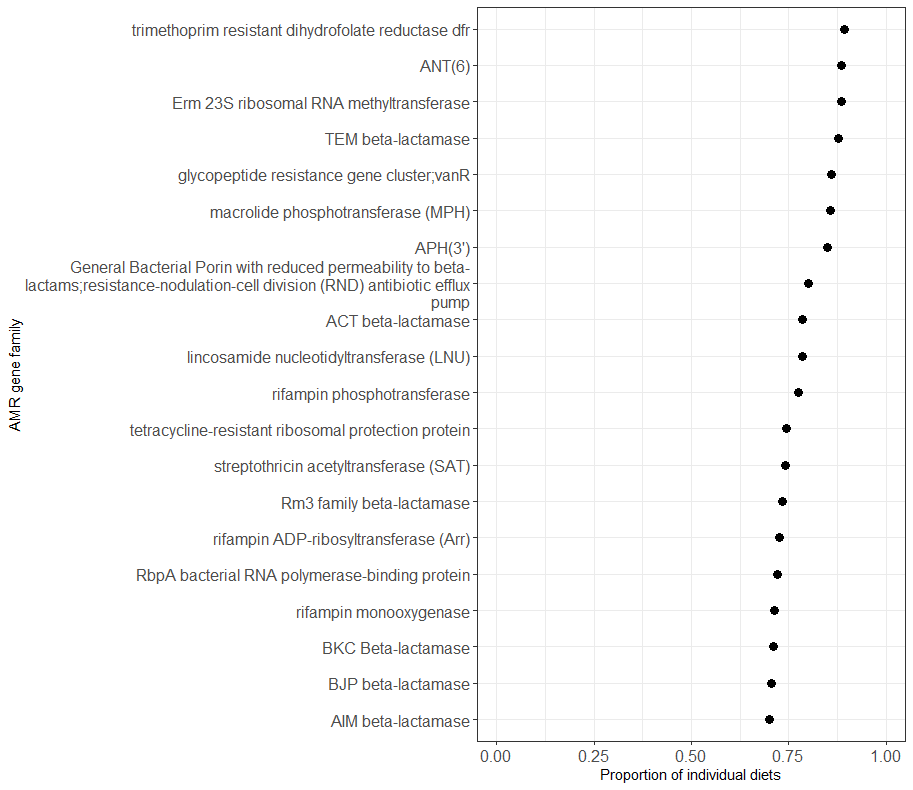
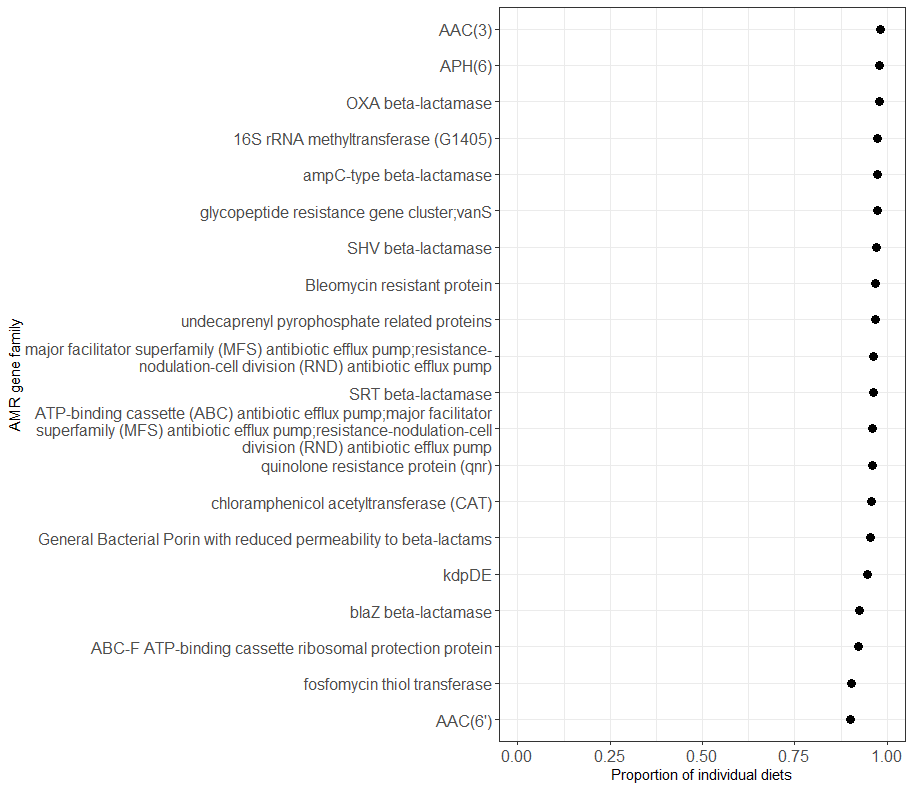
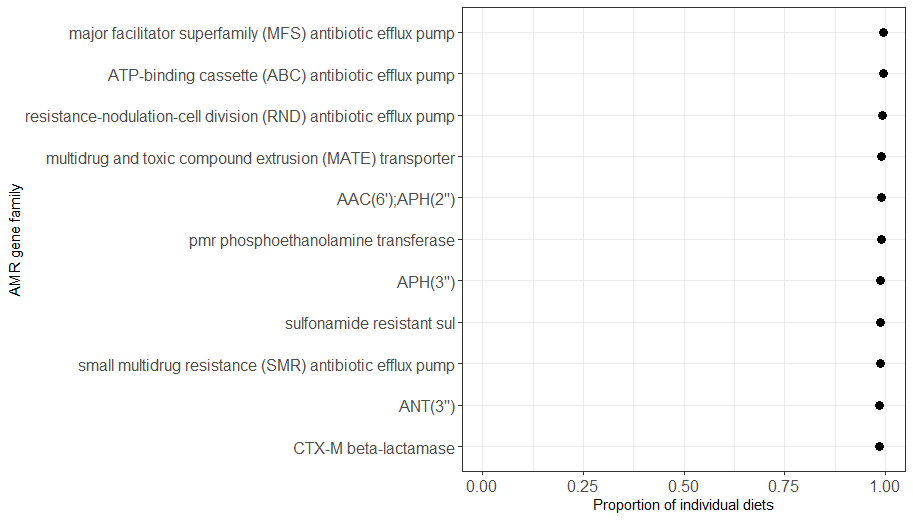


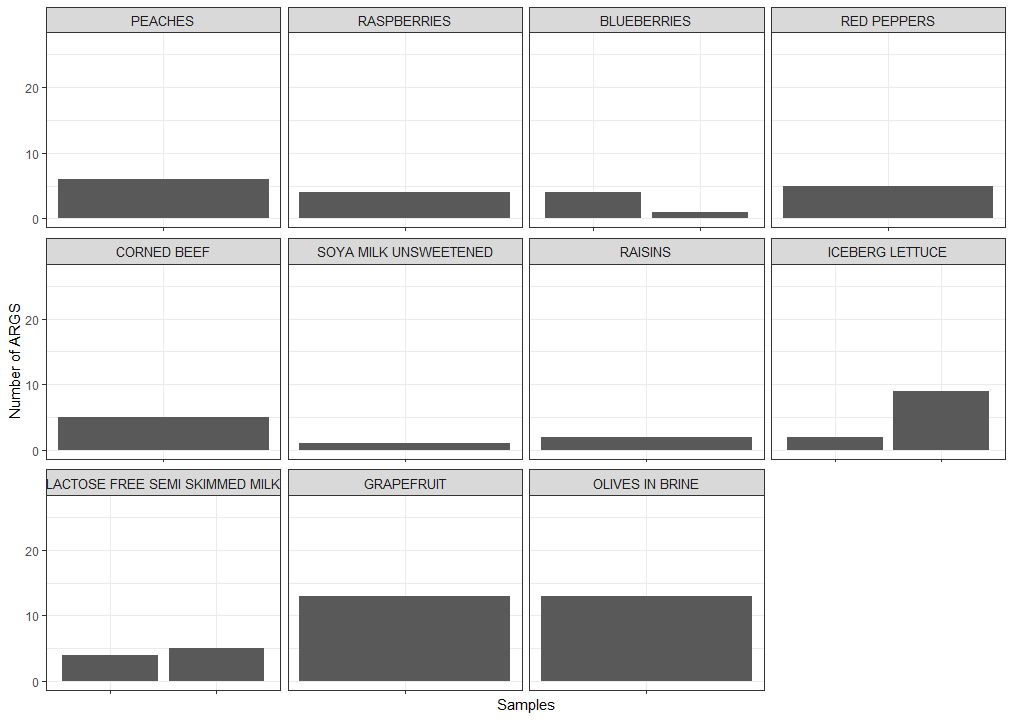
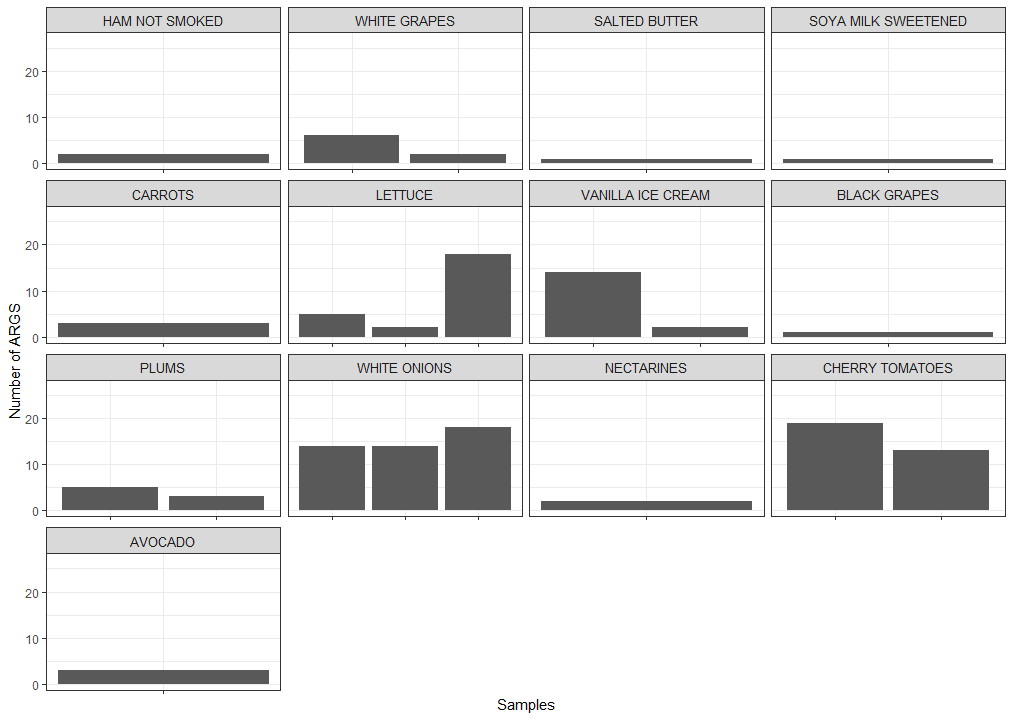
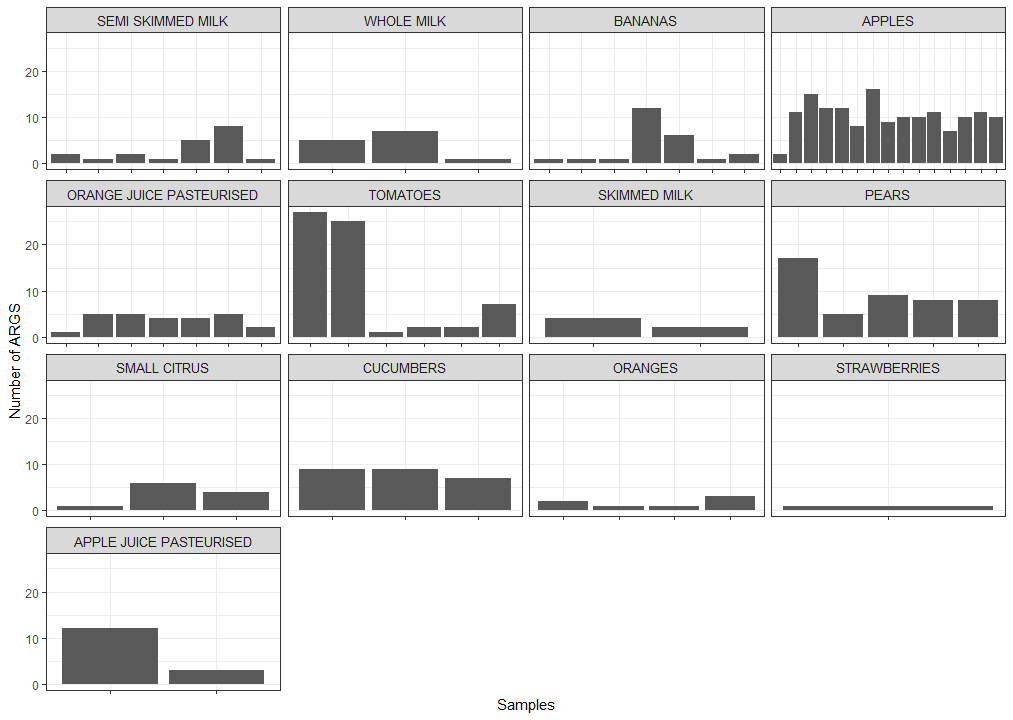
Figure 6. Number of banana samples containing an ARG from individual gene families. (15 samples were found to contain one or more ARGs from a total of 16 measured original banana samples).

### Prevalence Calculations, Population Level, for ARG families

Figure 7. Prevalence (proportion of UK individual diets) for each ARG gene family, for all classes found in 10% or more diets. For better readability, particularly given the length of the names on the y-axis, the plots have been divided into roughly equally numbers of points, with panels ordered from highest prevalence at the top to lowest prevalence at the bottom.

### Carbapenem Resistance ARGs

The following results relate to Section 3.6.8 “Carbapenem Resistance ARGs” of the main report.

Figure 8. Numbers of carbapenem resistant ARGs found in individual samples.

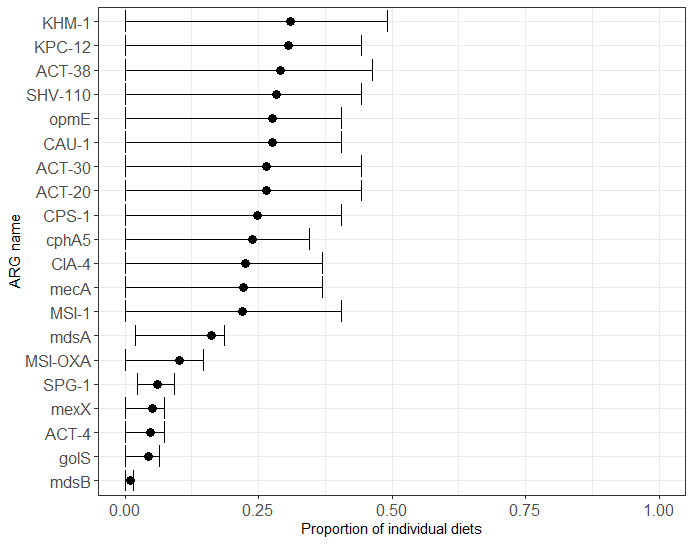
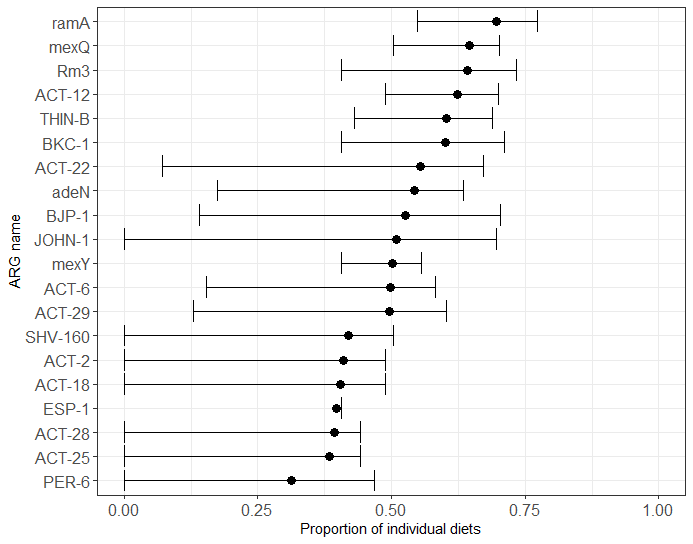
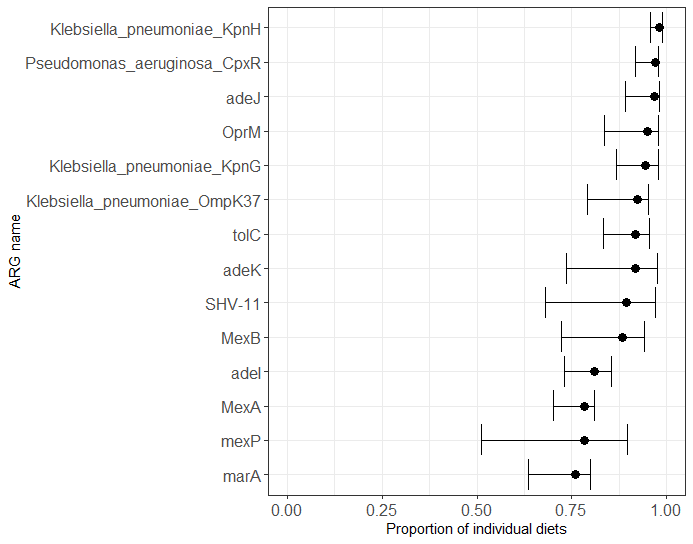


Figure 9. Estimated proportion of individual UK diets containing particular ARGs classed as carbapenem resistant. Mean and 95% confidence intervals shown, estimated from 100 bootstrap samples. For better readability, the plots have been divided into roughly equally numbers of points, with panels ordered from highest prevalence ARGs at the top to lowest prevalence ARGs at the bottom.

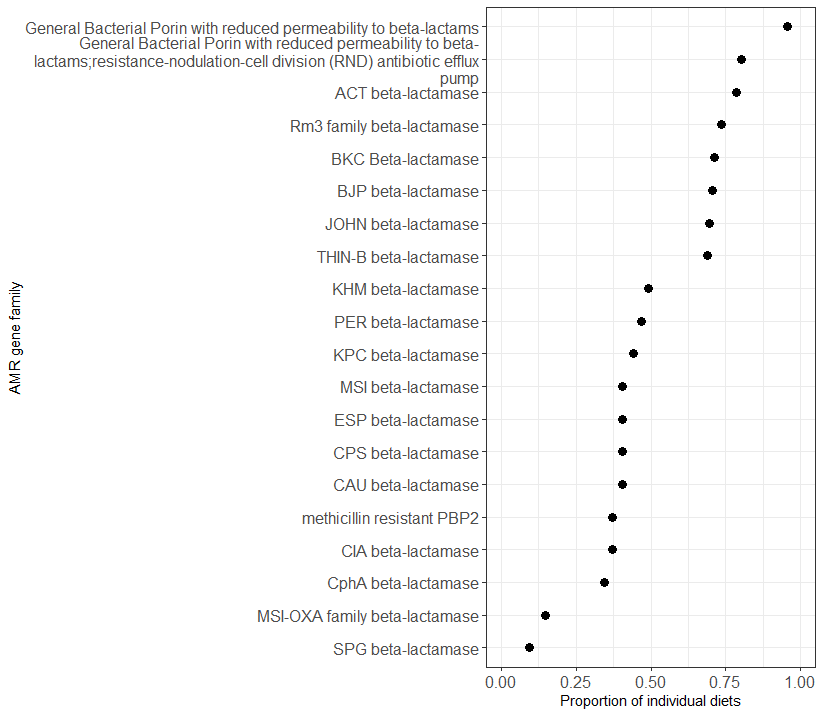
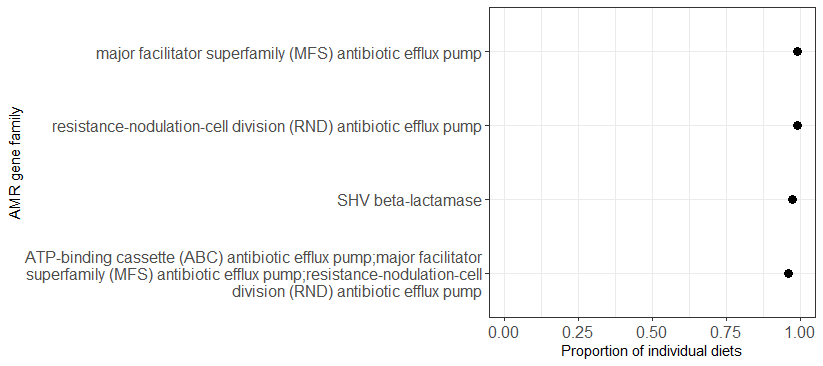
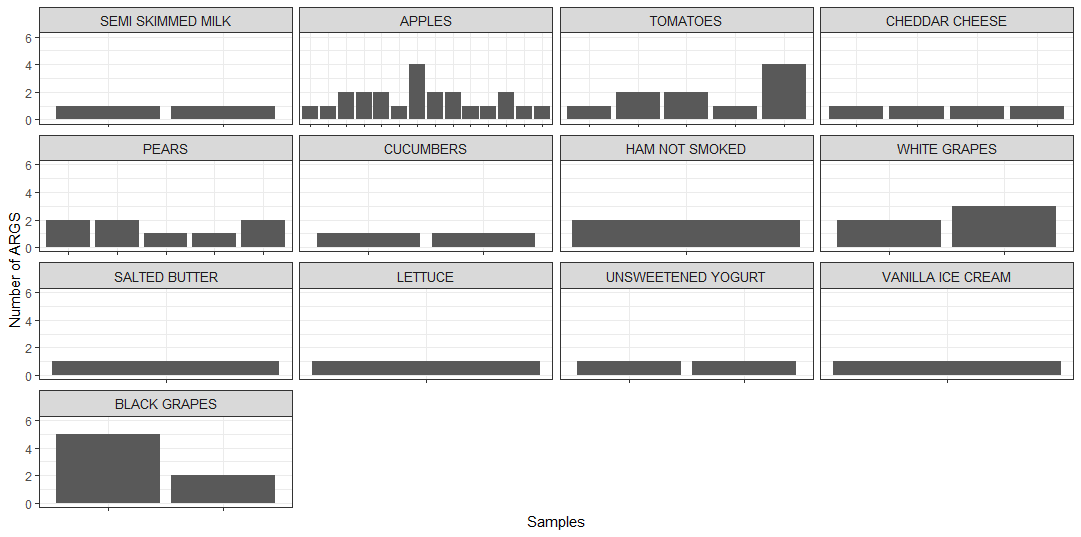
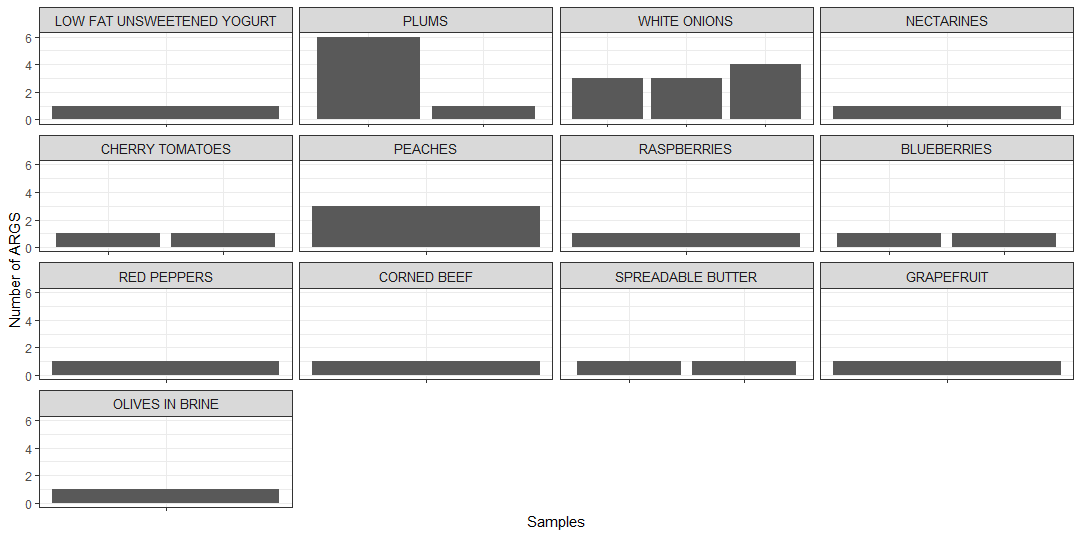
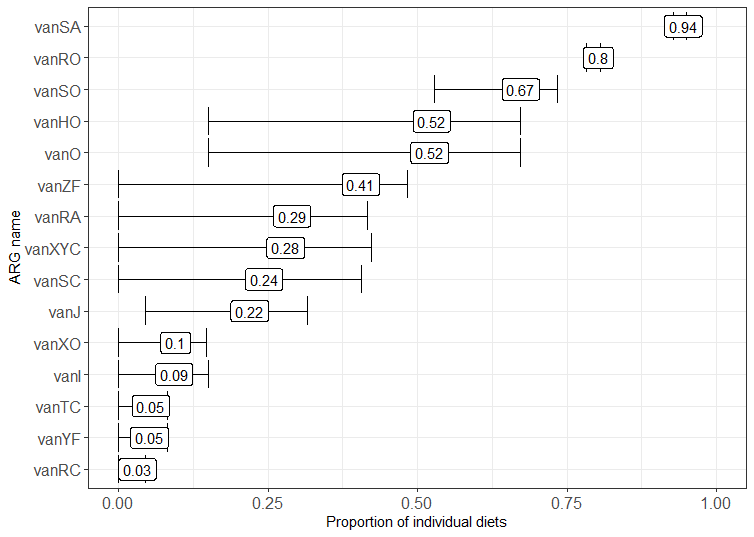


Figure 10. Estimated proportion of individual UK diets containing particular ARG gene families linked to carbapenem resistance. For better readability, particularly given the length of the names on the y-axis, the plots have been divided into roughly equally numbers of points, with panels ordered from highest prevalence families at the top to lowest prevalence families at the bottom.

### Vancomycin resistant ARGs

The following results relate to Section 3.6.9 “Vancomycin resistance ARGs” of the main report.

  Figure 11. Numbers of vancomycin resistant ARGs found in individual samples

 Figure 12. Estimated proportion of individual UK diets containing particular ARGs classed as vancomycin resistant. Mean and 95% confidence intervals shown, estimated from 100 bootstrap samples.

### Potential ESBL Activity

The following results relate to Section 3.6.10 “Potential ESBL Activity” of the main report.

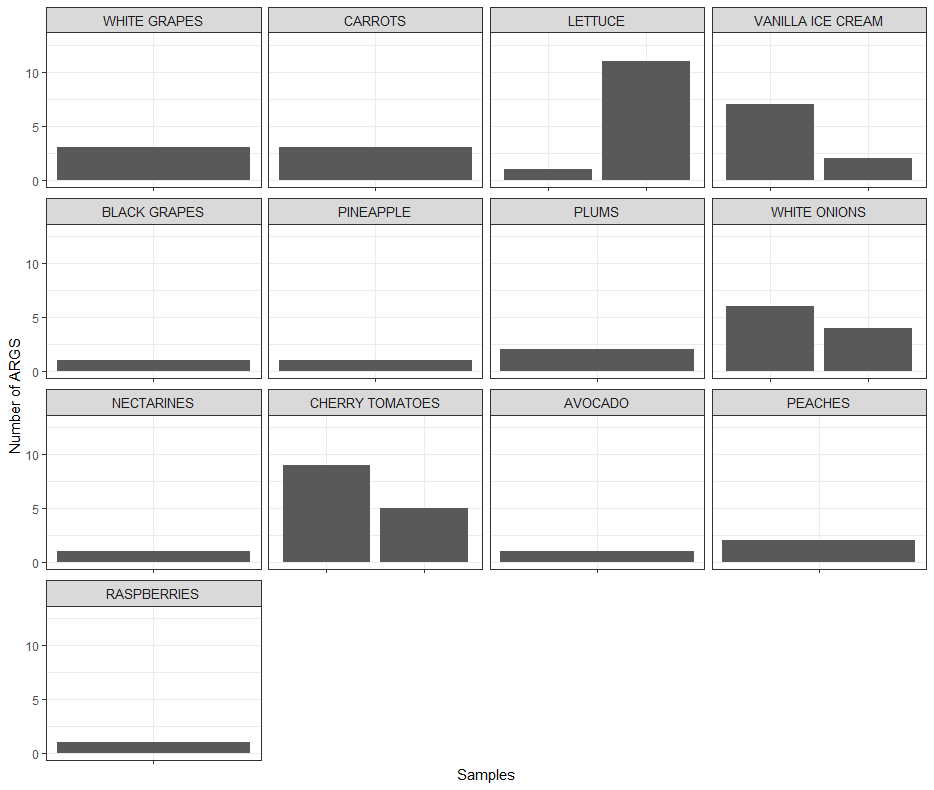
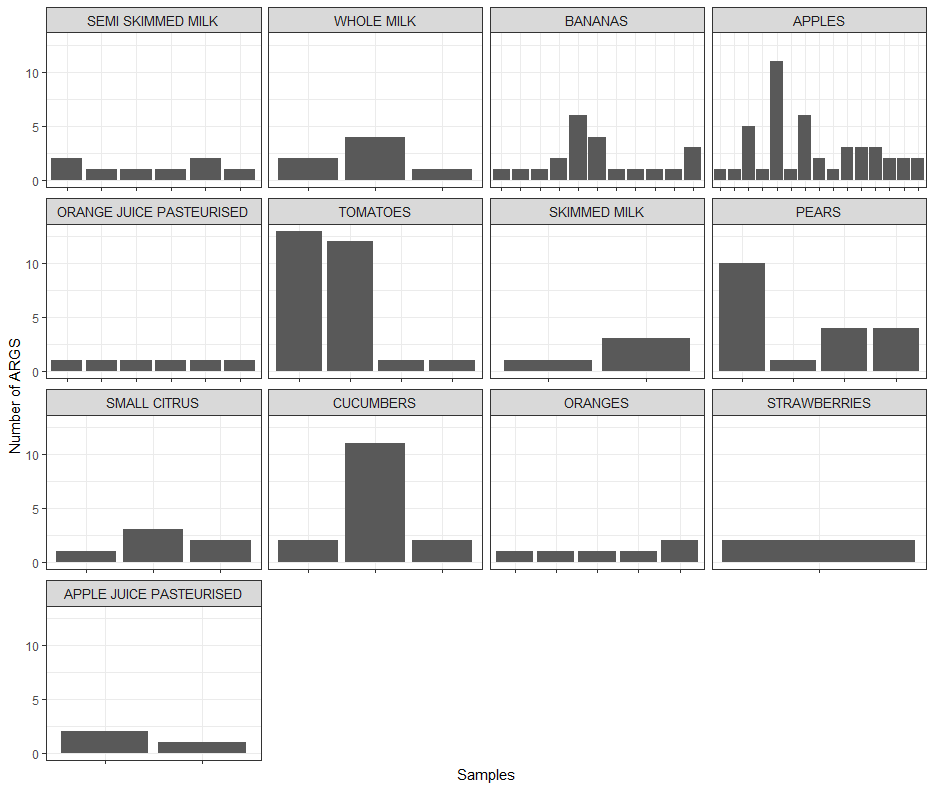
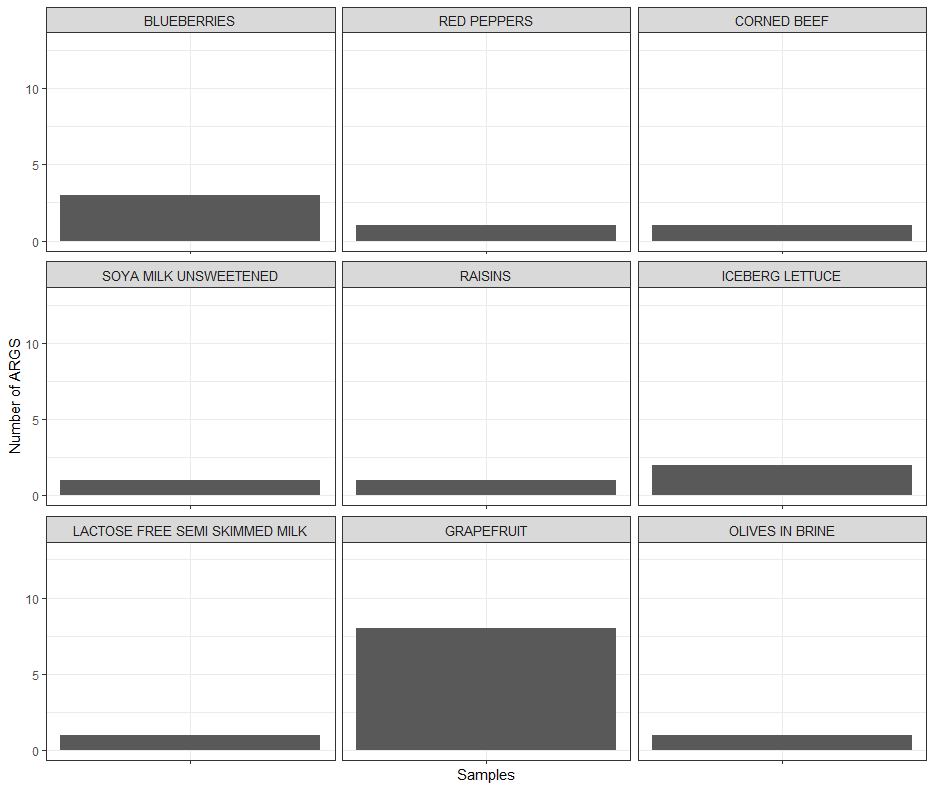
  

Figure 13. Numbers of potential ESBL activity ARGs found in individual samples

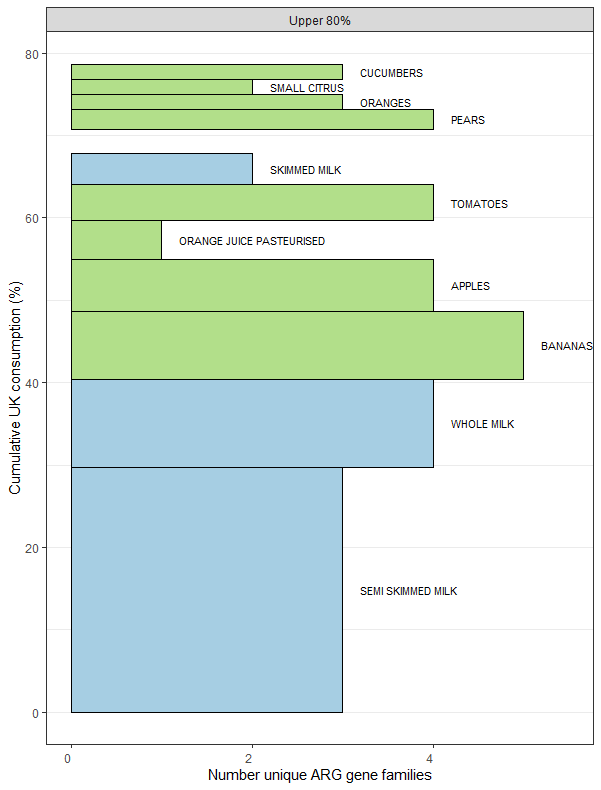
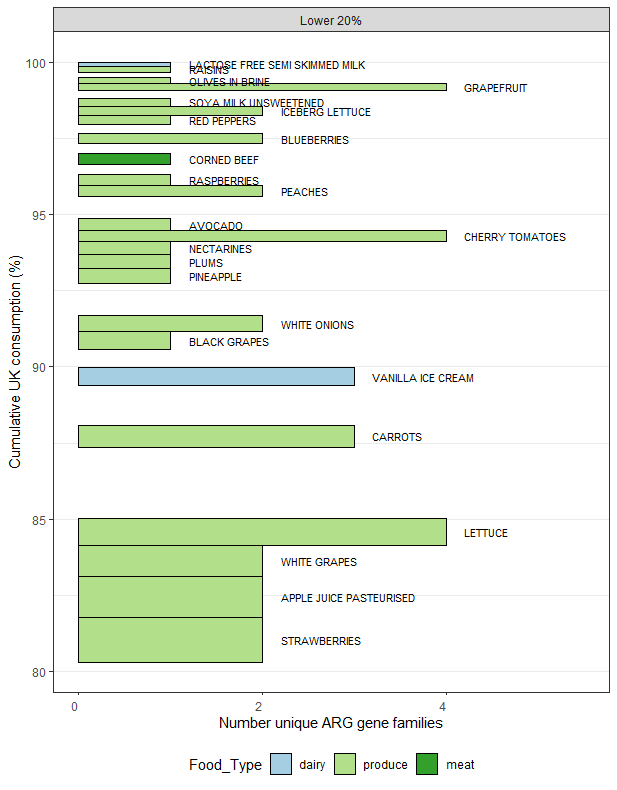
 

Figure 14. Number of potential ESBL activity ARGs found per food type. These are ordered by overall consumption amounts and bar widths indicate the relative contribution of the different ready to eat items to the total UK consumption.

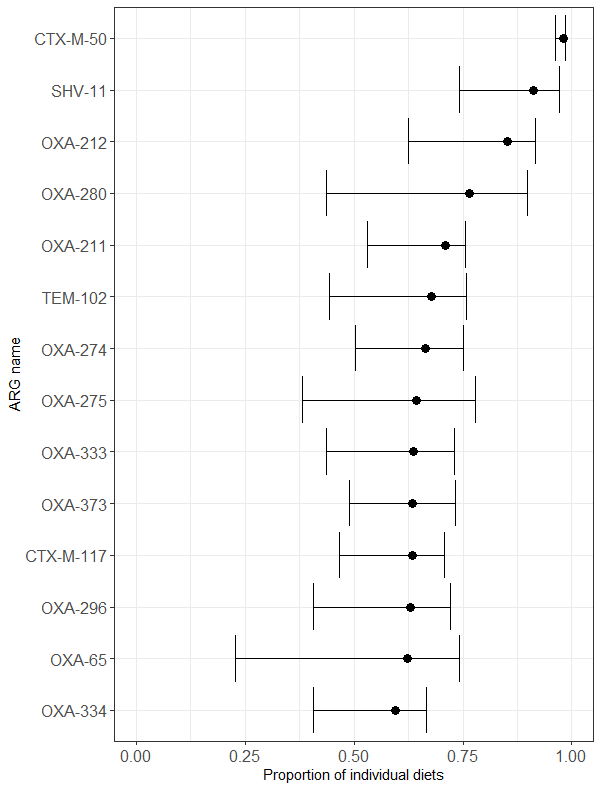
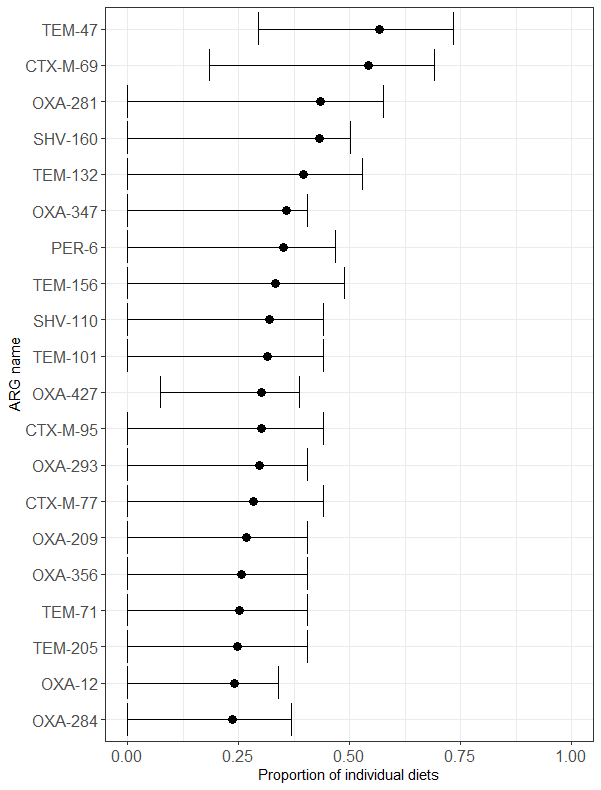
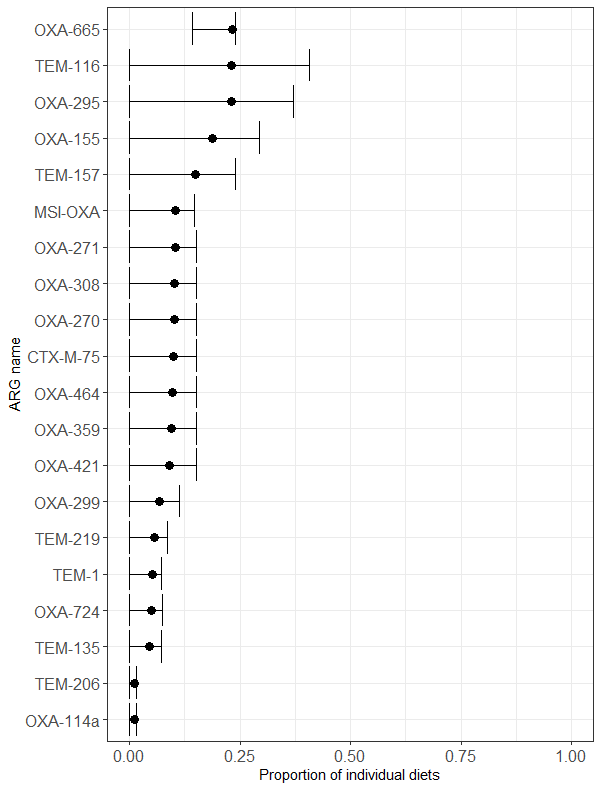
  

Figure 15. Estimated proportion of individual UK diets containing particular ARGs classed as potential ESBL activity. Mean and 80% confidence intervals are shown, estimated from 100 bootstrap samples. For better readability, the plots have been divided into roughly equally numbers of points, with panels ordered from highest prevalence ARGs at the top to lowest prevalence ARGs at the bottom.

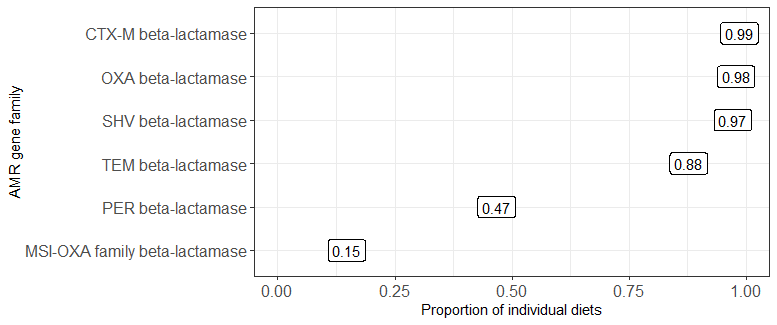


Figure 16. Estimated proportion of individual UK diets containing particular ARG gene families linked to potential ESBL activity.

### Fluoroquinolone resistant ARGs

The following results relate to Section 3.6.11 “Fluoroquinolone resistant ARGs” of the main report. Figure 17 shows the number of ARGs found within each individual sample. Figure 18 summarises the proportion of individual diets containing each individual ARG and Figure 19 shows the proportion of diets containing one or more ARG from each individual ARG family.

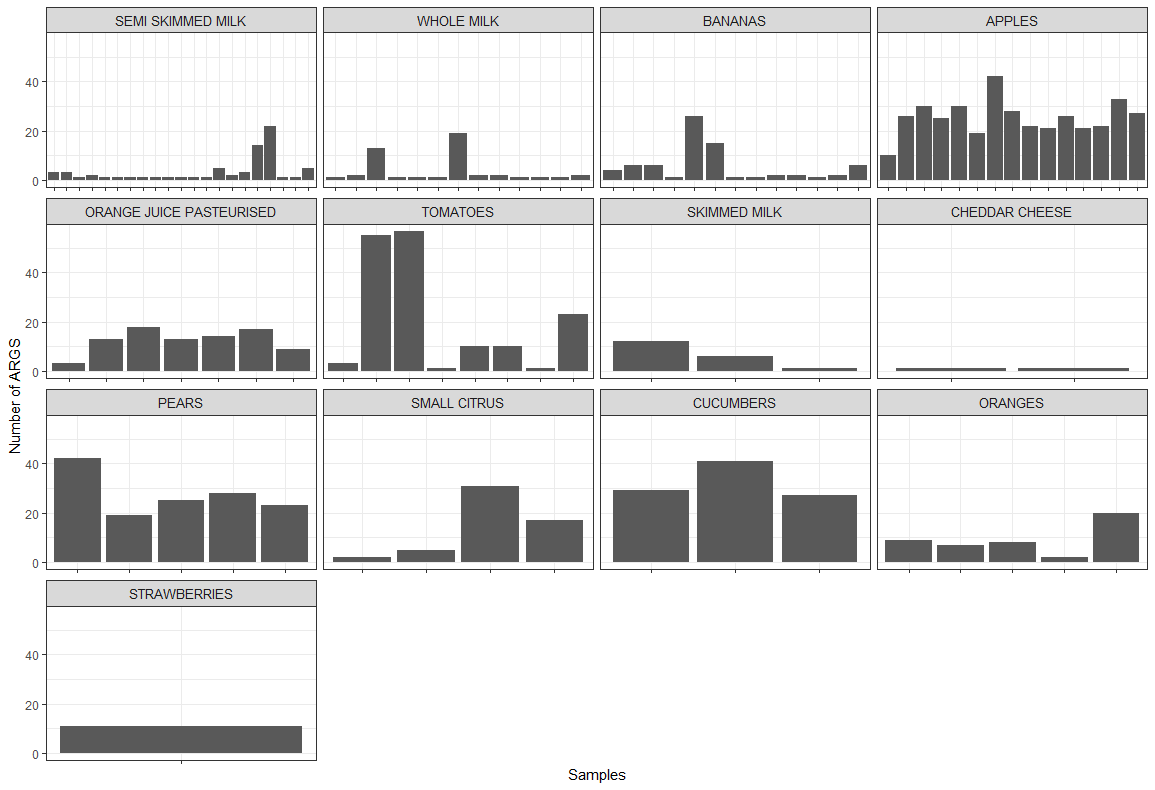
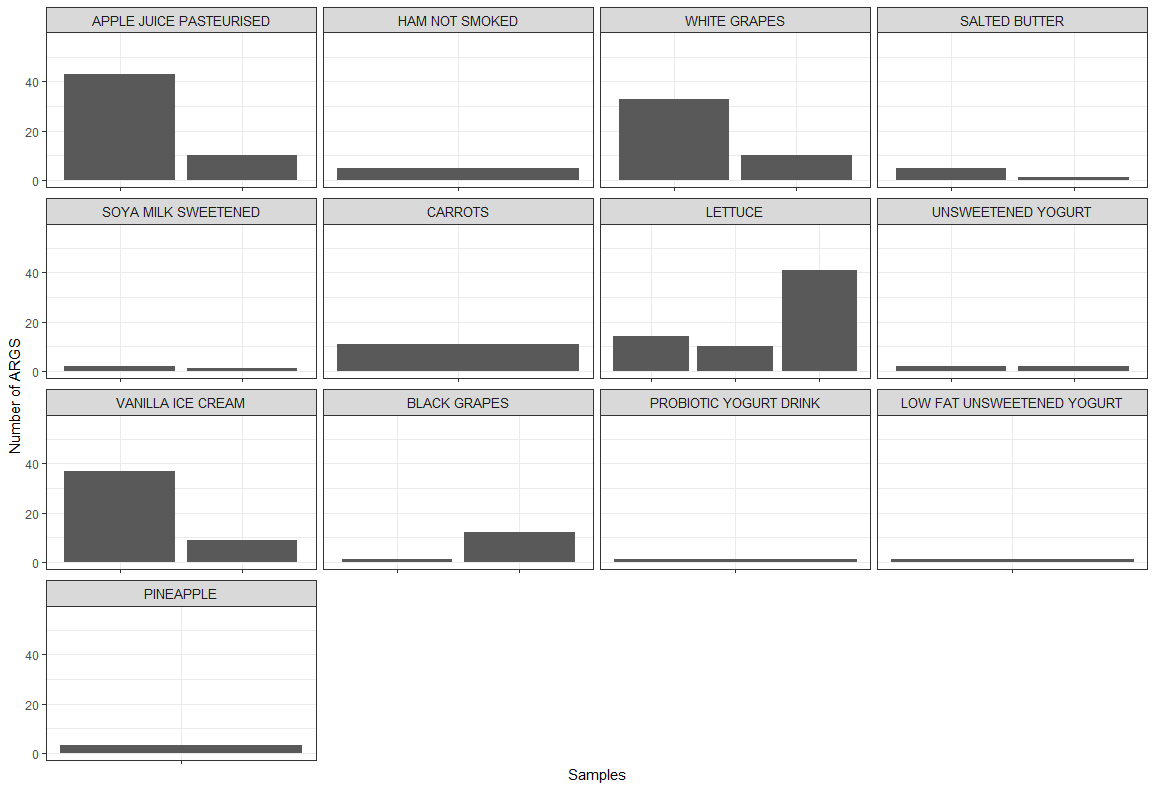
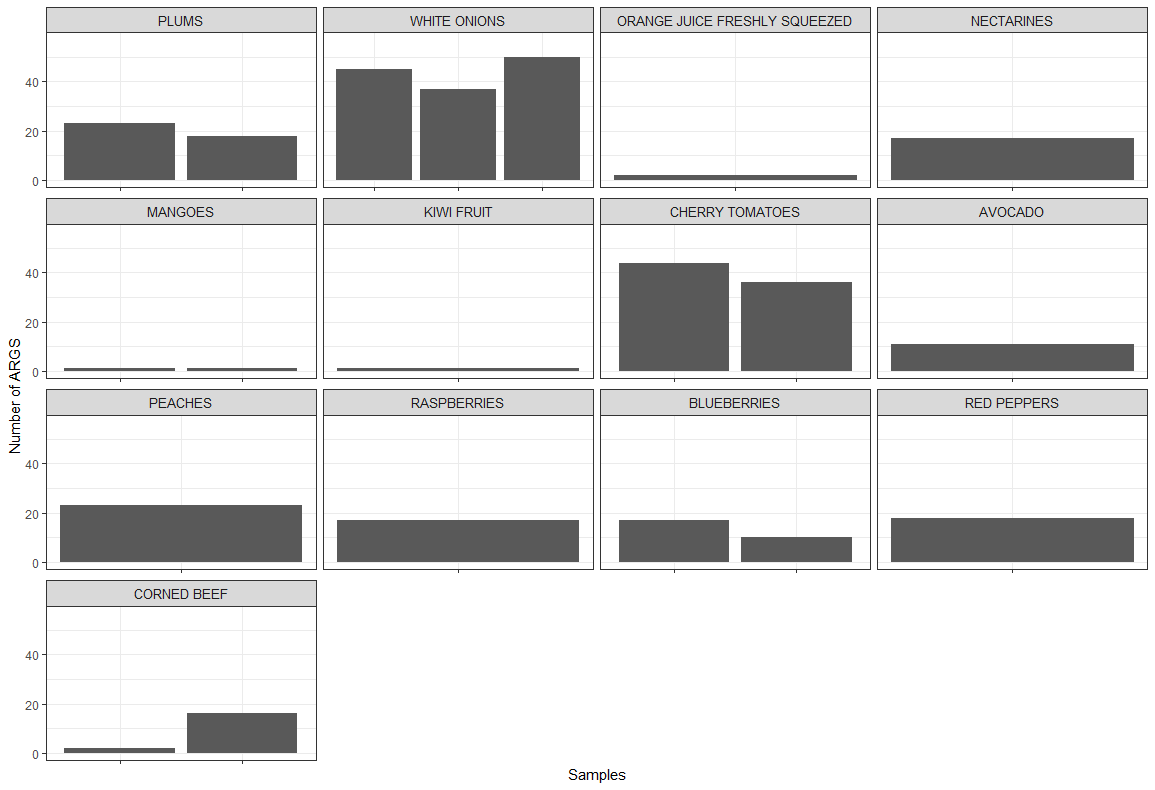
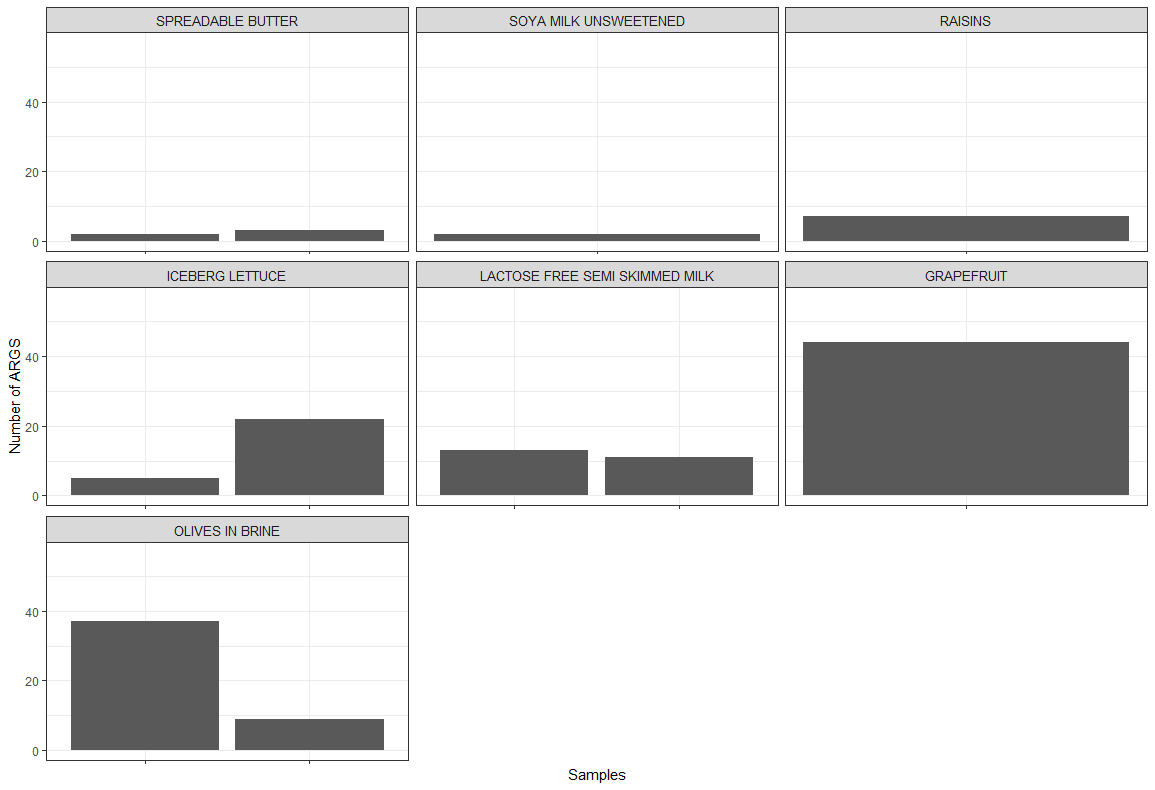
   

Figure 17. Numbers of fluoroquinolone resistant ARGs found in individual samples.

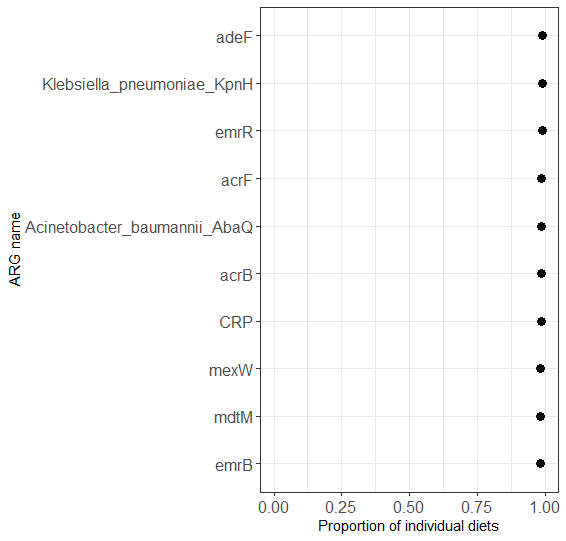
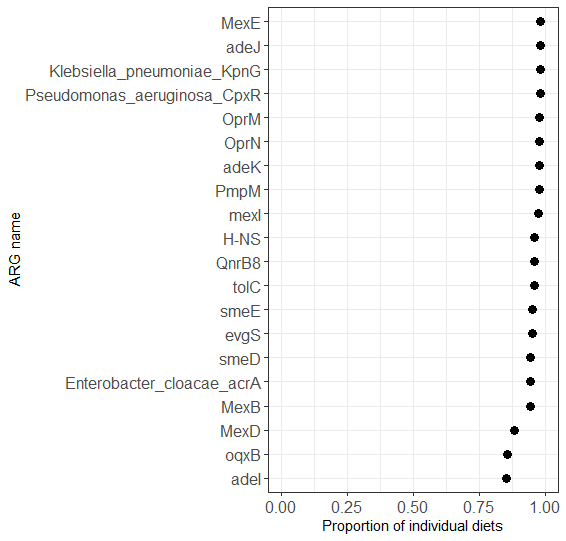
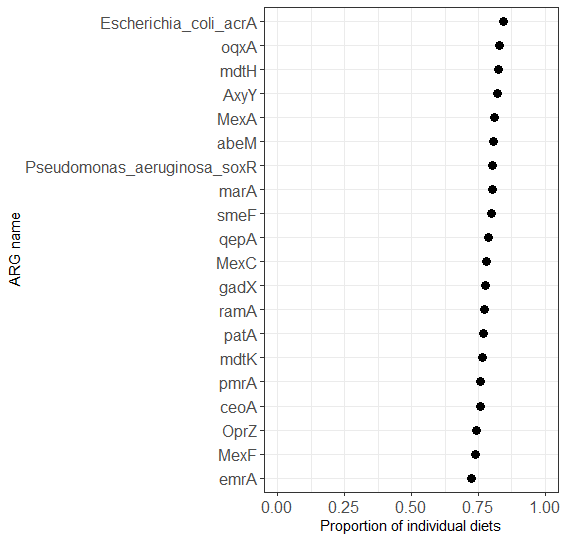
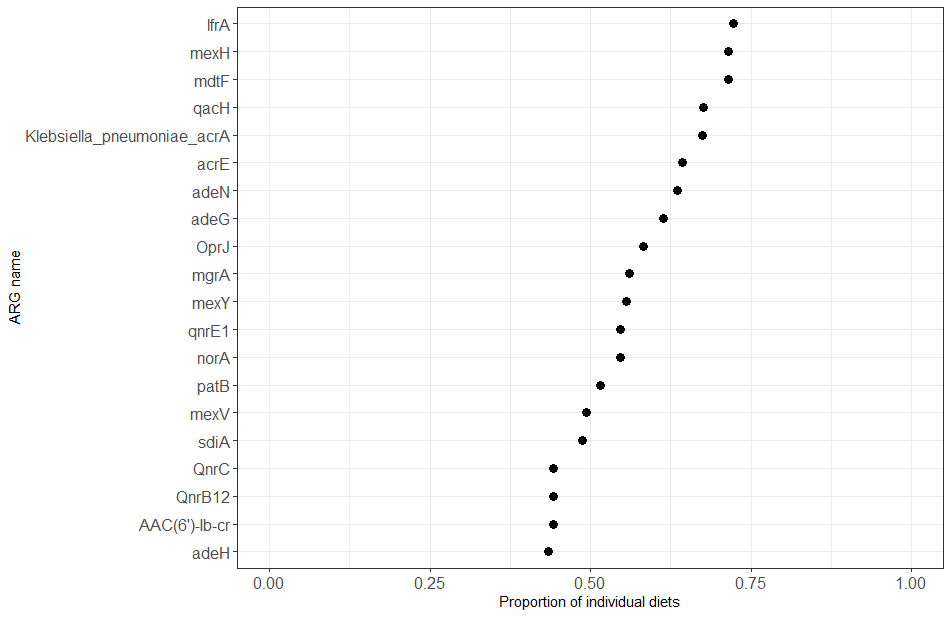
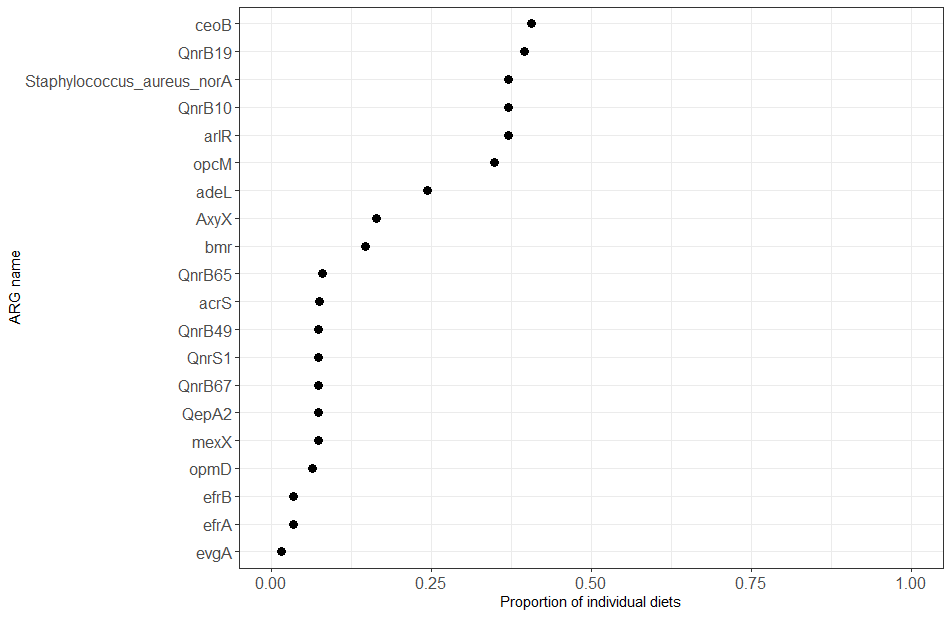
    

Figure 18. Estimated proportion of individual UK diets containing particular fluoroquinolone resistant ARGs. For better readability, the plots have been divided into roughly equally numbers of points, with panels ordered from highest prevalence ARGs at the top to lowest prevalence ARGs at the bottom.

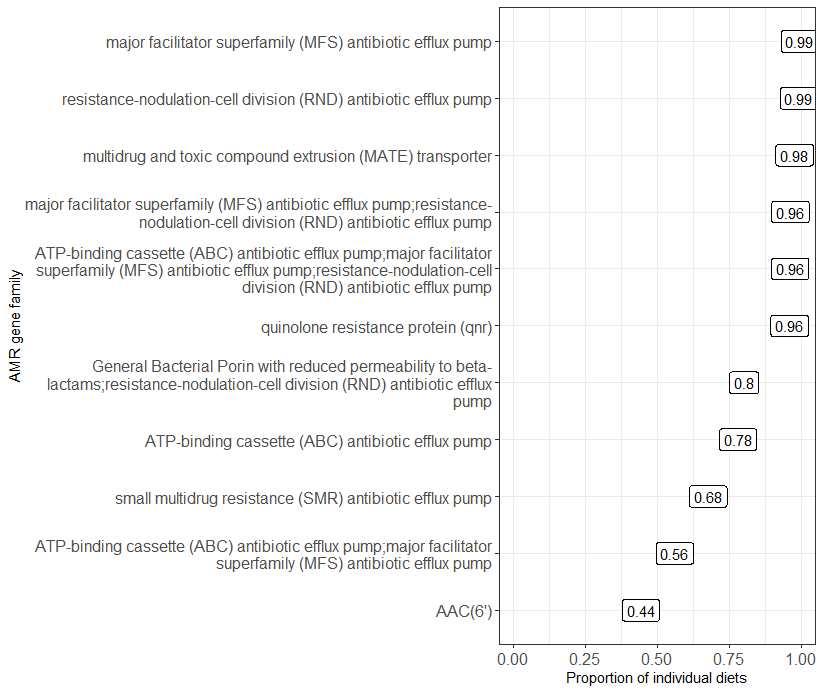


Figure 19. Estimated proportion of individual UK diets containing particular ARG gene families linked to fluoroquinolone resistance.