```
\label{lem:continuous} D\_0\_Bacteria; D\_1\_Actinobacteria; D\_2\_Actinobacteria; D\_3\_Corynebacteriales; D\_4\_Corynebacteriaceae
D_0_Bacteria;D_1_Actinobacteria;D_2_Actinobacteria;D_3_Micrococcales;D_4_Bogoriellaceae
D_0_Bacteria;D_1_Actinobacteria;D_2_Actinobacteria;D_3_Micrococcales;D_4_Cellulomonadaceae
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Actinobacteria; D\_2\_Actinobacteria; D\_3\_Micrococcales; D\_4\_Demequinaceae
        \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Actinobacteria; D\_2\_Actinobacteria; D\_3\_Micrococcales; D\_4\_Microbacteria ceae and the substitution of the substitution of
D_0_Bacteria;D_1_Actinobacteria;D_2_Actinobacteria;D_3_Micrococcales;D_4_Micrococcaceae
D_0_Bacteria;D_1_Actinobacteria;D_2_Actinobacteria;D_3_Pseudonocardiales;D_4_Pseudonocardiaceae
D_0_Bacteria;D_1_Actinobacteria;D_2_Coriobacteriia;D_3_Coriobacteriales;D_4_Coriobacteriaceae
D_0_Bacteria;D_1_Actinobacteria;D_2_Thermoleophilia;D_3_Gaiellales;D_4_uncultured
D_0_Bacteria;D_1_Actinobacteria;D_2_Thermoleophilia;D_3_Solirubrobacterales;D_4_Elev-16S-1332
D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;D_4_Bacteroidaceae
D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;D_4_Bacteroidales S24-7 group
       D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;D_4_Porphyromonadaceae
D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;D_4_Prevotellaceae
D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;D_4_Rikenellaceae
        D_0_Bacteria;D_1_Bacteroidetes;D_2_Bacteroidia;D_3_Bacteroidales;Other
D_0_Bacteria;D_1_Bacteroidetes;D_2_Cytophagia;D_3_Cytophagales;D_4_Cytophagaceae
D_0_Bacteria;D_1_Bacteroidetes;D_2_Flavobacteriia;D_3_Flavobacteriales;D_4_Flavobacteriaceae
D_0_Bacteria;D_1_Chlamydiae;D_2_Chlamydiae;D_3_Chlamydiales;D_4_Parachlamydiaceae
D_0_Bacteria;D_1_Chloroflexi;D_2_Anaerolineae;D_3_Anaerolineales;D_4_Anaerolineaceae
D_0_Bacteria;D_1_Chloroflexi;D_2_TK10;D_3_uncultured bacterium;D_4_
D_0_Bacteria;D_1_Cyanobacteria;D_2_Chloroplast;Ambiguous_taxa;D_4__
D_0_Bacteria;D_1_Cyanobacteria;D_2_Chloroplast;Other;Other
D_0_Bacteria;D_1_Cyanobacteria;D_2_Melainabacteria;D_3_Gastranaerophilales;Ambiguous_taxa
D_0_Bacteria;D_1_Cyanobacteria;D_2_Melainabacteria;D_3_Gastranaerophilales;D_4_uncultured bacterium
D_0_Bacteria;D_1_Cyanobacteria;D_2_Melainabacteria;D_3_Gastranaerophilales;Other
D_0_Bacteria;D_1_Cyanobacteria;D_2_Melainabacteria;D_3_Vampirovibrionales;Ambiguous_taxa
 D_0_Bacteria;D_1_Deferribacteres;D_2_Deferribacteres;D_3_Deferribacterales;D_4_Deferribacteraceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Bacillales;D_4_Alicyclobacillaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Bacillales;D_4_Bacillaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Bacillales;D_4_Family XII
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Bacillales;D_4_Paenibacillaceae
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Firmicutes; D\_2\_Bacilli; D\_3\_Bacillales; D\_4\_Planococcaceae
       D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Bacillales;D_4_Staphylococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Aerococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Carnobacteriaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Enterococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Lactobacillaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Leuconostocaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Rs-D42
D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;D_4_Streptococcaceae
       D_0_Bacteria;D_1_Firmicutes;D_2_Bacilli;D_3_Lactobacillales;Other
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Christensenellaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Clostridiaceae 1
        \verb|D_0_Bacteria; D_1_Firmicutes; D_2_Clostridia; D_3_Clostridiales; D_4\_Clostridiales \ vadinBB60\ group \\
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Defluviitaleaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Eubacteriaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Family XIII
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Gracilibacteraceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Lachnospiraceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Peptococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Peptostreptococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;D_4_Ruminococcaceae
D_0_Bacteria;D_1_Firmicutes;D_2_Clostridia;D_3_Clostridiales;Other
D 0 Bacteria;D 1 Firmicutes;D 2 Clostridia;D 3 Thermoanaerobacterales;D 4 Thermoanaerobacteraceae
D_0_Bacteria;D_1_Firmicutes;D_2_Erysipelotrichia;D_3_Erysipelotrichales;D_4_Erysipelotrichaceae
    D 0 Bacteria;D 1 Proteobacteria;D_2_ARKICE-90;D_3_Mesorhizobium sp. enrichment culture clone SA_NR7_1;D_4_
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhizobiales;D_4_Bradyrhizobiaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhizobiales;D_4_Hyphomicrobiaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhizobiales;D_4_Methylobacteriaceae
D 0 Bacteria;D 1 Proteobacteria;D 2 Alphaproteobacteria;D 3 Rhizobiales;D 4 Methylocystaceae
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Alphaproteobacteria; D\_3\_Rhizobiales; D\_4\_Phyllobacteria ceae
        \verb|D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhizobiales;D_4_Rhizobiaceae| \\
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Alphaproteobacteria; D\_3\_Rhizobiales; D\_4\_Rhodobiaceae
D 0 Bacteria;D 1 Proteobacteria;D 2 Alphaproteobacteria;D 3 Rhizobiales;D 4 Xanthobacteraceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhodobacterales;D_4_Rhodobacteraceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rhodospirillales;D_4_DA111
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Alphaproteobacteria; D\_3\_Rhodospirillales; D\_4\_Rhodospirillaceae and the proteobacteria; D\_1\_Proteobacteria; D\_2\_Alphaproteobacteria; D\_3\_Rhodospirillales; D\_4\_Rhodospirillaceae and the proteobacteria; D\_3\_Rhodospirillaceae and the proteobacteriae and the proteobacteriae and the proteobacteriae and the prote
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rickettsiales;D_4_Rickettsiales Incertae Sedis
D_0_Bacteria;D_1_Proteobacteria;D_2_Alphaproteobacteria;D_3_Rickettsiales;D_4_uncultured
       \label{local_problem} $D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Alphaproteobacteria; D\_3\_Sphingomonadales; D\_4\_Sphingomonadaceae $(D_1)_{AB} = (D_1)_{AB} = (D_1)_
 D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Burkholderiales;D_4_Alcaligenaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Burkholderiales;D_4_Burkholderiaceae
        \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Betaproteobacteria; D\_3\_Burkholderiales; D\_4\_Comamonadaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Burkholderiales;D_4_Oxalobacteraceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Methylophilales;D_4_Methylophilaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Neisseriales;D_4_Neisseriaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Betaproteobacteria;D_3_Rhodocyclales;D_4_Rhodocyclaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Bdellovibrionales;D_4_Bacteriovoracaceae
 D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Desulfurellales;D_4_Desulfurellaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Desulfuromonadales;D_4_Desulfuromonadaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Desulfuromonadales;D_4_Geobacteraceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Myxococcales;D_4_KD3-10
D_0_Bacteria;D_1_Proteobacteria;D_2_Deltaproteobacteria;D_3_Oligoflexales;D_4_Oligoflexaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Cellvibrionales;D_4_Porticoccaceae
 D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Chromatiales;D_4_Chromatiaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Enterobacteriales;D_4_Enterobacteriaceae
 D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Legionellales;D_4_Legionellaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Methylococcales;D_4_Methylococcaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Pseudomonadales;D_4_Moraxellaceae
       \label{eq:decomposition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Gamma proteobacteria; D\_3\_Pseudomonadales; D\_4\_Pseudomonadaceae
       \label{lem:condition} D\_0\_Bacteria; D\_1\_Proteobacteria; D\_2\_Gamma proteobacteria; D\_3\_Vibrionales; D\_4\_Vibrionaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;D_3_Xanthomonadales;D_4_Xanthomonadaceae
D_0_Bacteria;D_1_Proteobacteria;D_2_Gammaproteobacteria;Other;Other
D_0_Bacteria;D_1_Saccharibacteria;D_2_Unknown Class;D_3_Unknown Order;D_4_Unknown Family
D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Anaeroplasmatales;D_4_Anaeroplasmataceae
 D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Entomoplasmatales;D_4_Spiroplasmataceae
D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Mollicutes RF9;Ambiguous_taxa
D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Mollicutes RF9;D_4_uncultured bacterium
       D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Mollicutes RF9;D_4_uncultured rumen bacterium
D_0_Bacteria;D_1_Tenericutes;D_2_Mollicutes;D_3_Mollicutes RF9;Other
D_0_Bacteria;D_1_Verrucomicrobia;D_2_Verrucomicrobiae;D_3_Verrucomicrobiales;D_4_Verrucomicrobiaceae
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D_0_Bacteria;Other;Other;Other;Other
Unassigned;Other;Other;Other;Other

D_0_Archaea;D_1_Euryarchaeota;D_2_Methanobacteria;D_3_Methanobacteriales;D_4_Methanobacteriaceae
D_0_Bacteria;D_1_Acidobacteria;D_2_Solibacteres;D_3_Solibacterales;D_4_Solibacteraceae (Subgroup 3)