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Introduction

- Medicines account for 25% of NHS greenhouse gas emissions.
- Product-level medicine carbon footprint data is limited, hindering efforts to reduce emissions related to medicines.
- To address this, we have created Medicine Carbon Footprint (MCF) Classifier, a suite of applications to measure, classify, benchmark, and visualise medicine carbon footprints ¹.

MCF Classifier

MCF Classifier includes five components as shown in the Table below.

MCF Classifier	
MCF Method	An automated pipeline to calculate carbon emissions per dose for small molecule medicines in gCO ₂ e.
MCF Ratings	A RAG-style, log-based system that classifies carbon emissions per dose into one of four emission categories: LOW, MEDIUM, HIGH, VERY HIGH.
MCF Products	Medicine products for which MCF Method is used to calculate the gCO ₂ e per dose and MCF Ratings have been applied.
MCF Warehouse	A cloud store of all input and calculated data, optimised for rapid analytics across all medicines and ratings.
MCF Formulary	A searchable web-application to visualise MCF Ratings by therapeutic indication.

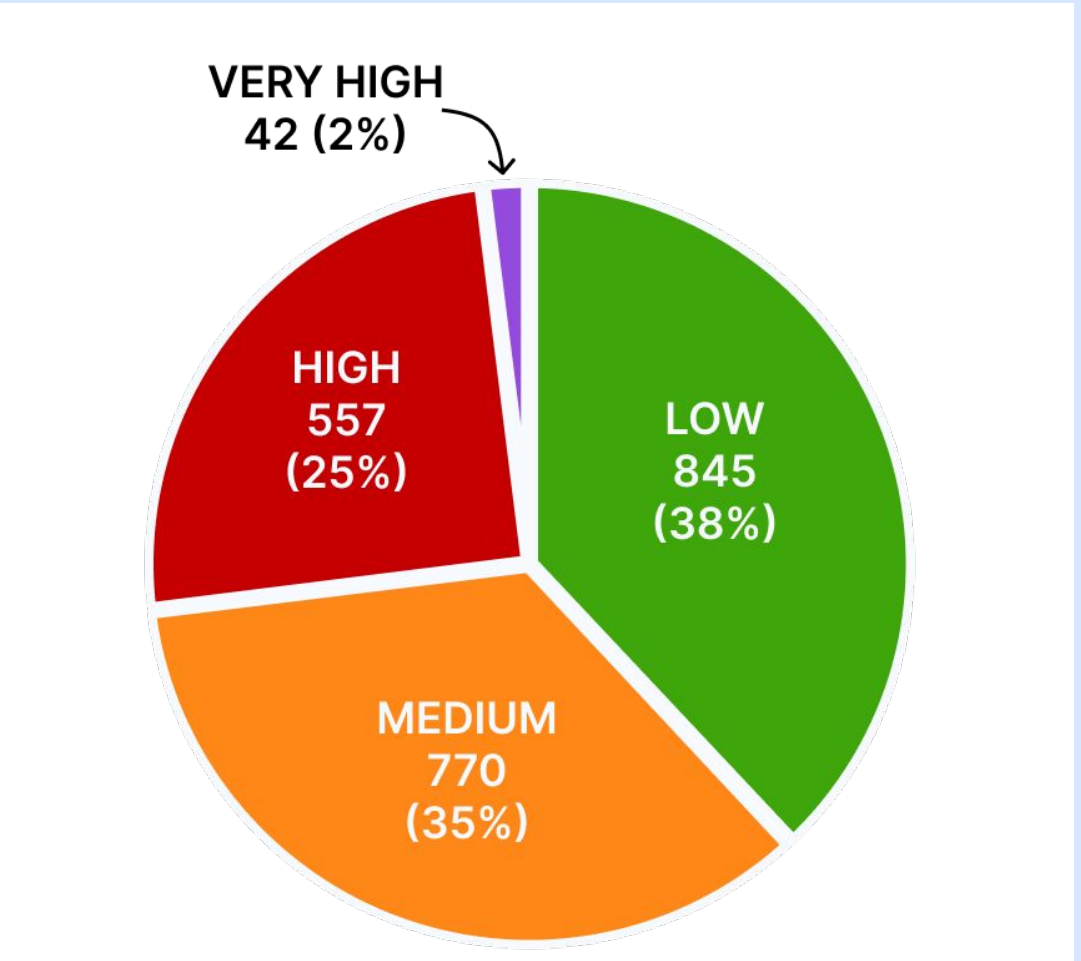


Fig 1: Distribution of 2214 medicines by MCF Ratings

- We leveraged green chemistry metrics to build an automated pipeline, called MCF Method ²⁻⁵.
- We used MCF Method to calculate standardised emissions per dose for 2214 medicines.
- We stratified the emissions per dose into four categories called MCF Ratings following a log₁₀ scale. The rating categories are LOW (<10gCO₂e per dose), MEDIUM (≥10-100), HIGH (≥100-1000), VERY HIGH (≥1000).
- The distribution of 2214 products by MCF Ratings is shown in Fig 1.

MCF Formulary

- We built MCF Formulary, an interactive web application, to provide a user-friendly and practical interface for people to explore MCF Ratings.
- MCF Formulary shows the MCF Rating of the searched medicine and the ratings of other medicines used in similar therapeutic indications, as defined by the BNF.
- For each medicine, the most prescribed product is shown by default. Ratings of other products for that medicine are available as a dropdown.

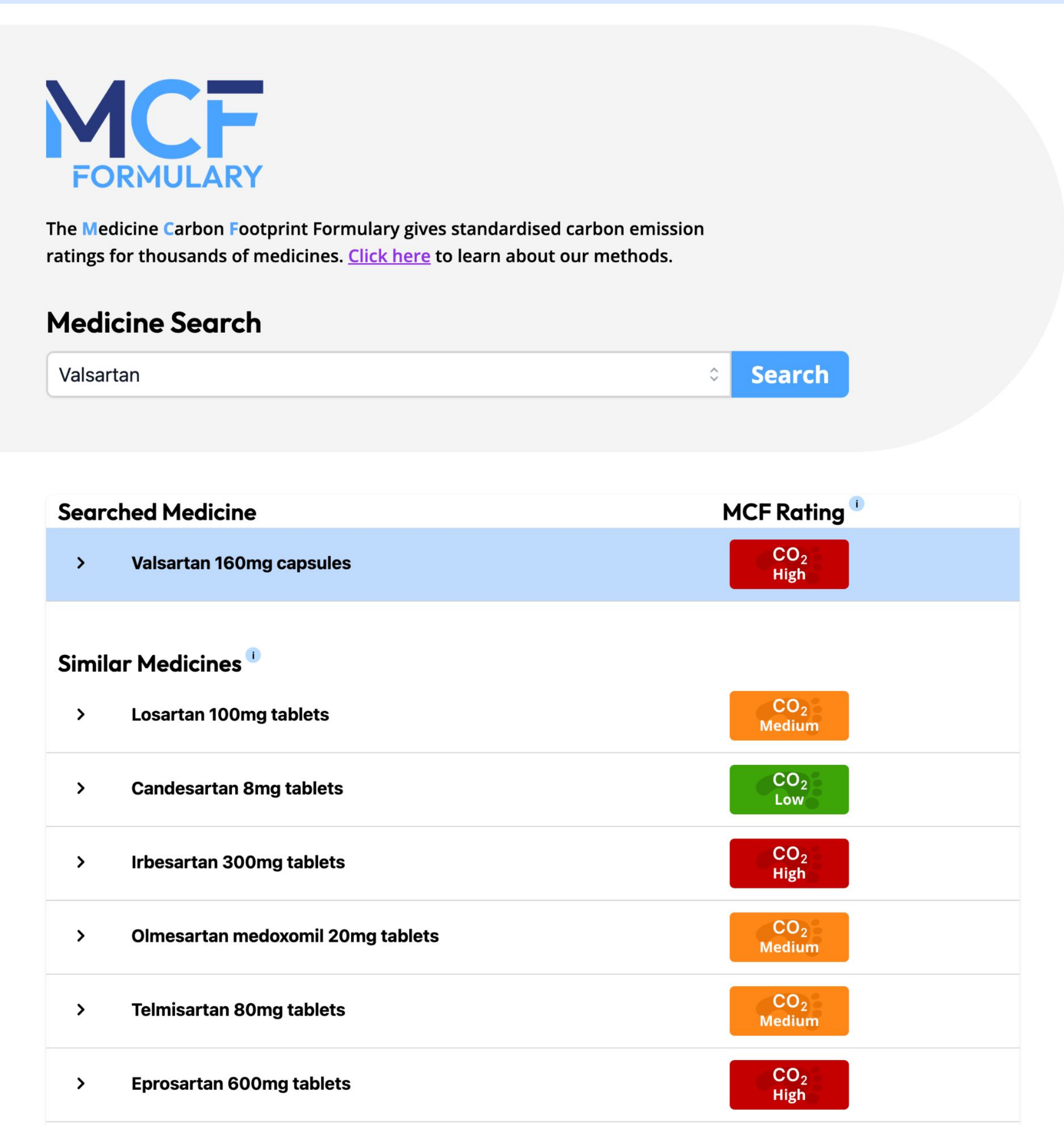


Fig 2: Screenshot of MCF Formulary

How we are using MCF Classifier

We have used MCF Classifier to:

- Build MCF Formulary.
- Perform a comprehensive landscaping analysis of medicine carbon footprints.
- Analyse the distribution of gCO₂e per dose by therapeutic indication.
- Calculate the product attributable emissions for NHS primary and secondary care prescriptions.
- Identify priority medicines and therapeutic areas for carbon reduction interventions.
- Generate benchmarking medicine emission reports for NHS primary and secondary care organisations.

To access MCF Formulary
email: mcf@yewmaker.com

Conclusions

- To reach net zero the NHS must optimise medicines use to reduce the 25% of emissions related to medicines.
- MCF Classifier provides standardised, product-level, per dose medicine emissions ratings for >2000 medicines, searchable in MCF Formulary.
- These applications can help carbon-informed medicines prescription and prioritisation of carbon-reduction interventions.

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