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Temperatures in domestic refrigerators: an important parameter to consider in shelf-life studies

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Introduction and objectives

Stage of cold chain	Storage (incubation) temperature	
From the manufacture until the arrival to the display cabinet	Temperature justified by detailed information*	Or if not known 8 7°C
Retail: Display cabinet	Temperature justified by detailed information**	Or if not known 12 7°C
Consumer storage	Temperature justified by detailed information**	Or if not known 12°C

Listeria monocytogenes (Lm) is a pathogenic bacteria able to grow at refrigerated temperatures, widely distributed in the environment and thus likely to contaminate various food products of which Ready To Eat (RTE) foods are a high-risk category. Temperatures used in shelf-life studies is a critical part of challenge tests and have to be justified and documented.

Amendment of the EURL Lm Technical Guidance Document for conducting shelf-life studies on Lm in RTE foods (2019) led to the revision of the storage temperature at different steps of the cold chain.

The goal of this study was to gather available data on domestic refrigerator temperatures and to update the "consumer storage" temperature.

Extract from the EURL Lm Technical Guidance Document for conducting shelf-life studies on *L. monocytogenes* in ready-to-eat foods

Methods

Inquiry to National Reference Laboratories (NRLs) for Lm in 2019

Scientific literature review (2002 – 2020)

Data on the domestic refrigerator temperatures in Europe

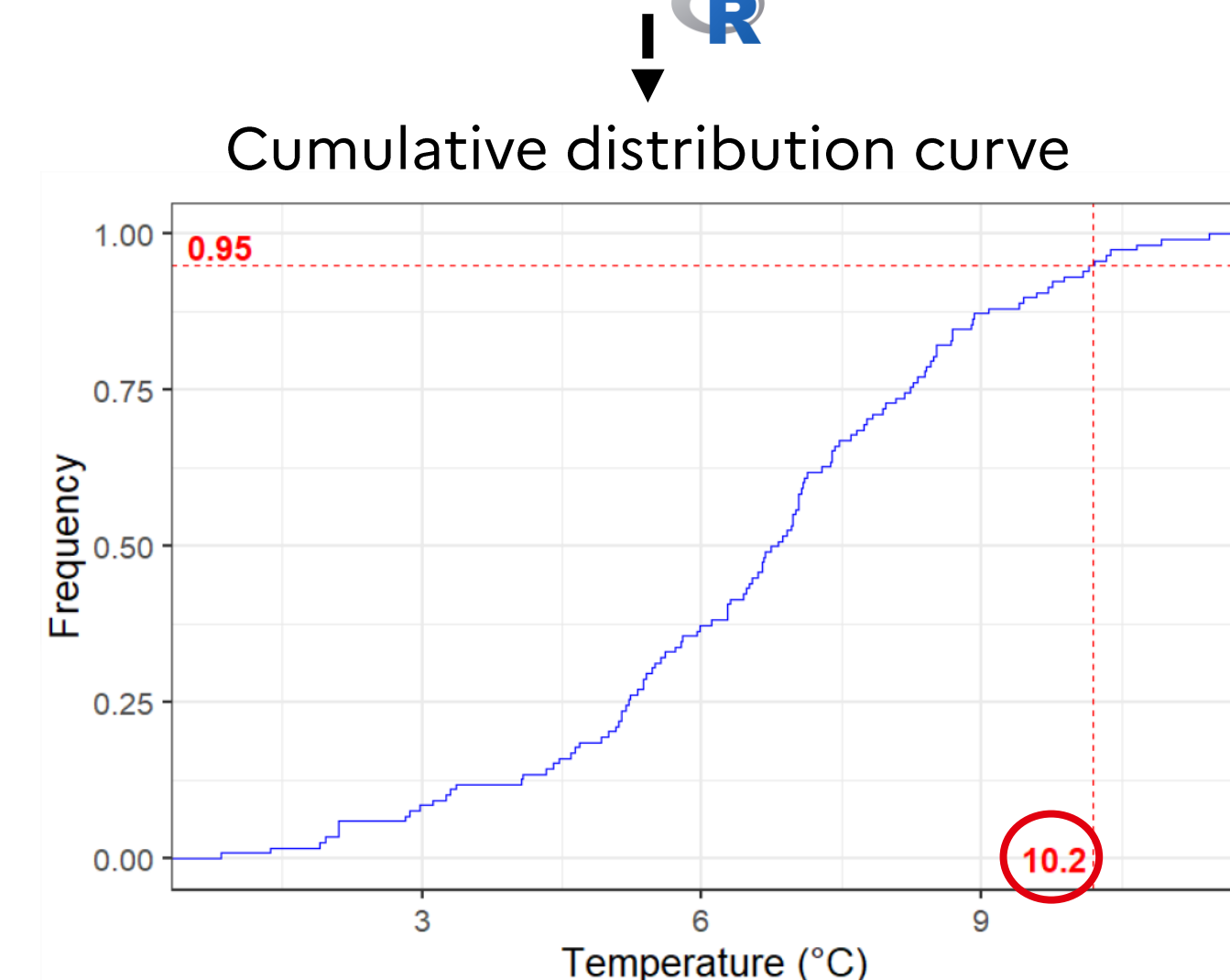
Distribution of the T°
75th & 95th percentiles determined

Determination from raw data

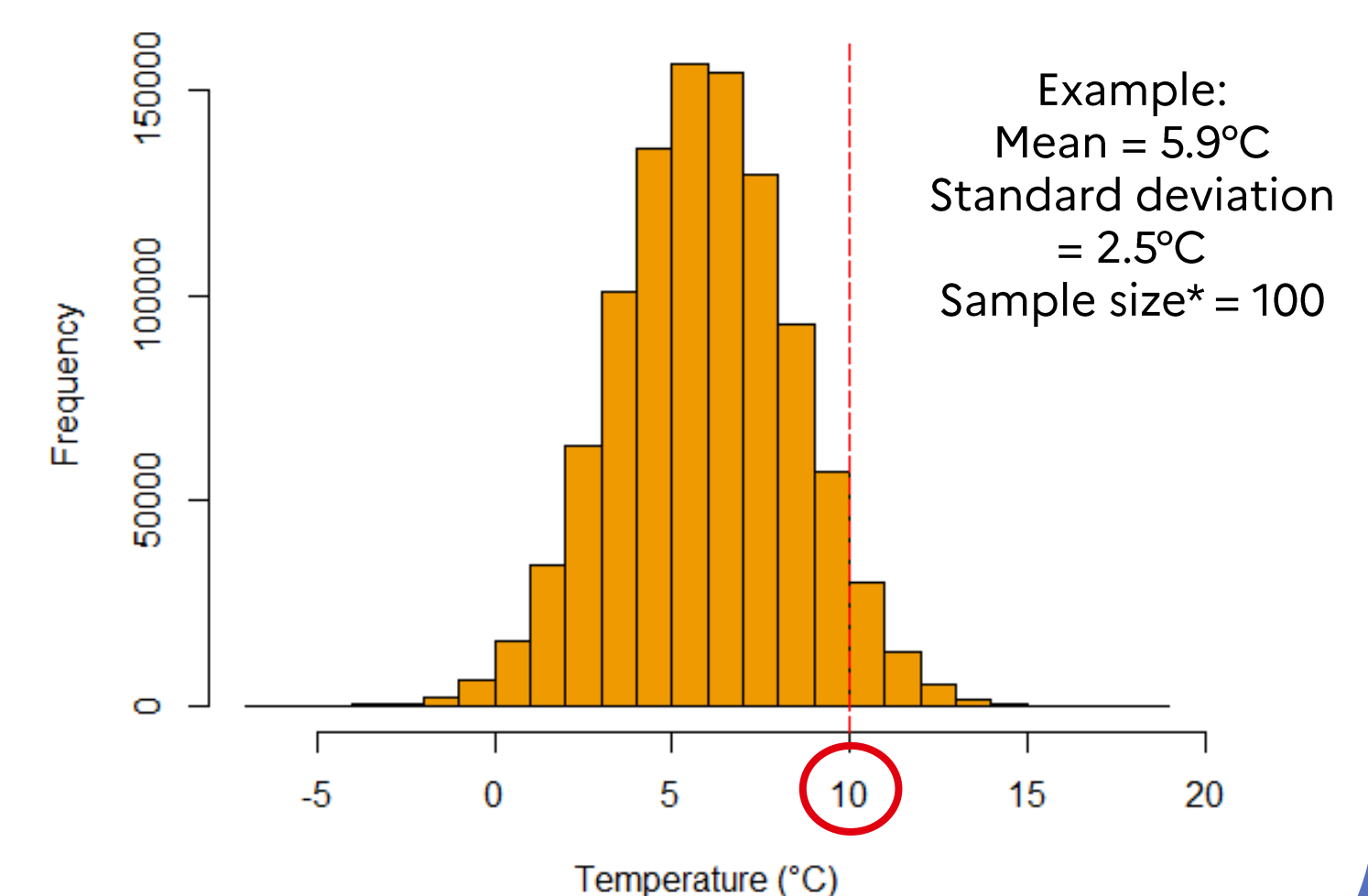
Estimation from temperature distribution graphs

Values given in the study

Estimation from random simulation



Random simulation of temperature distribution (10 000 iterations)



Results

24 studies identified

8 enquiries
16 scientific articles

Conducted in

14 European countries



Country	DE	DK	ES	FR	GR	IE	IT	NL	NO	PT	RO	SE	SI	UK	Total
Number of refrigerators	100	77	302	4326	620	100	684	326	13	152	14	102	100	206	7 122

Number of studies selected for 75th and 95th percentile determination

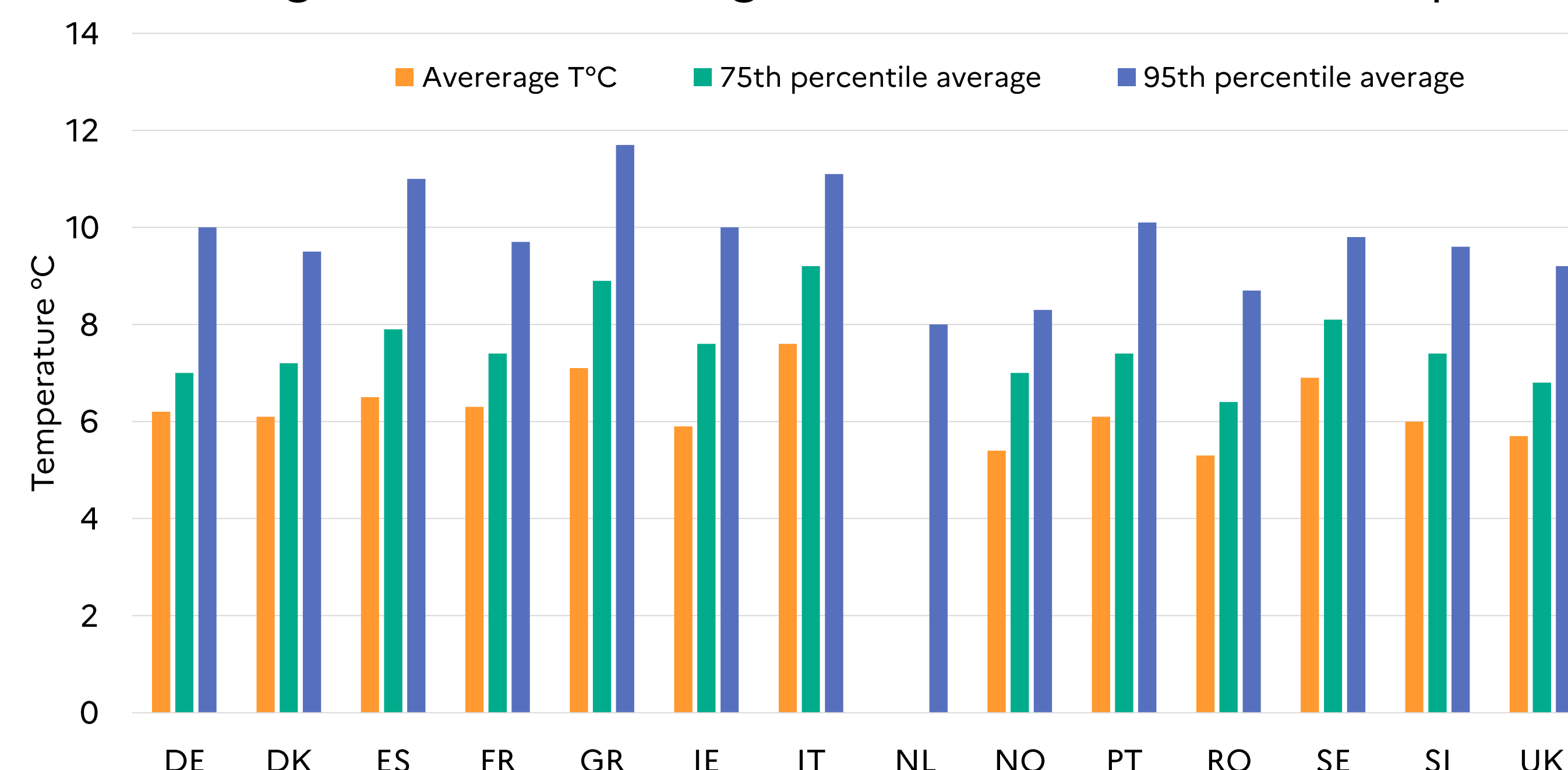
Determination from raw data = 13

Estimation from T° distribution graphs = 5

Values given in the study = 3

Estimation from random simulation = 3

Histogram showing for each country, the average of the temperature of the refrigerators, the average of the 75th and of the 95th percentile



Average Temperature = 6.2°C
Average 75th percentile = 7.6°C
Average 95th percentile = 9.8°C

Conclusion

Based on the obtained data representing the temperature of refrigerators in 14 European countries, it was proposed to decrease the default temperature to be used in challenge tests assessing the growth potential, from 12°C to 10°C, to better mimic the storage at consumer level.

This change was included into the latest version of the EURL Lm Technical guidance document on shelf-life studies (version 4) endorsed by EC Standing Committee on Plants, Animals, Food and Feed on 01/07/2021.

