



# Evidence to explain the trend in listeriosis cases

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# OVERVIEW

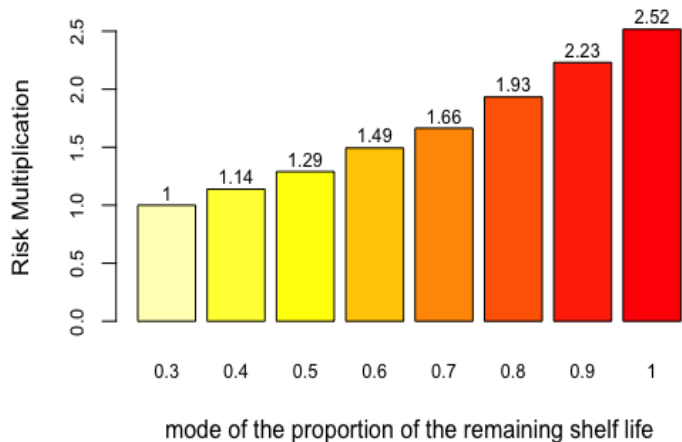
- Importance analysis
- Empirical evidence/indicator data
- Synthesis
- Conclusions
- Recommendations

# Importance analysis

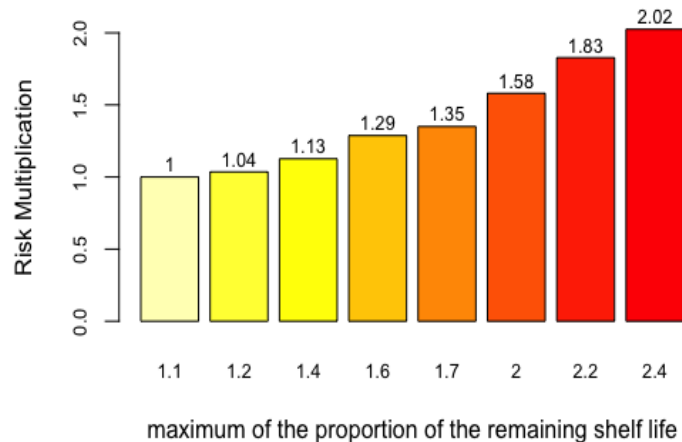
# IMPORTANCE ANALYSIS

## Proportion of remaining shelf-life

### Mode

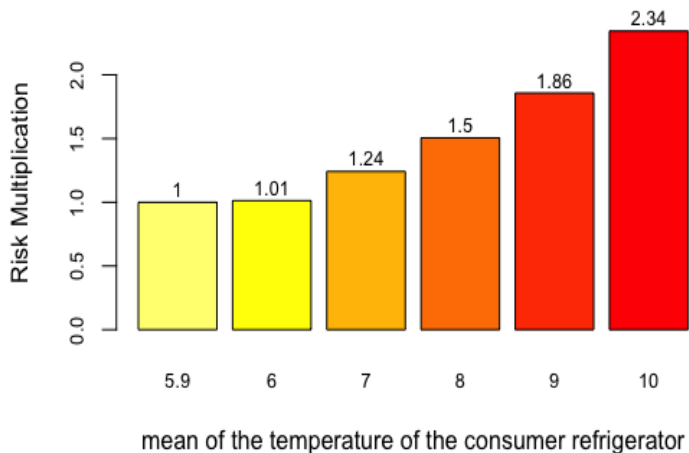


### Maximum

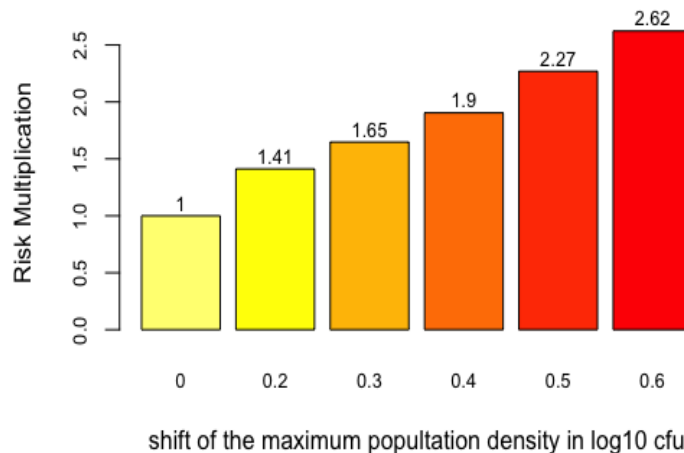


# IMPORTANCE ANALYSIS

## Mean temperature consumer refrigerator



## Max. population density (MPD)

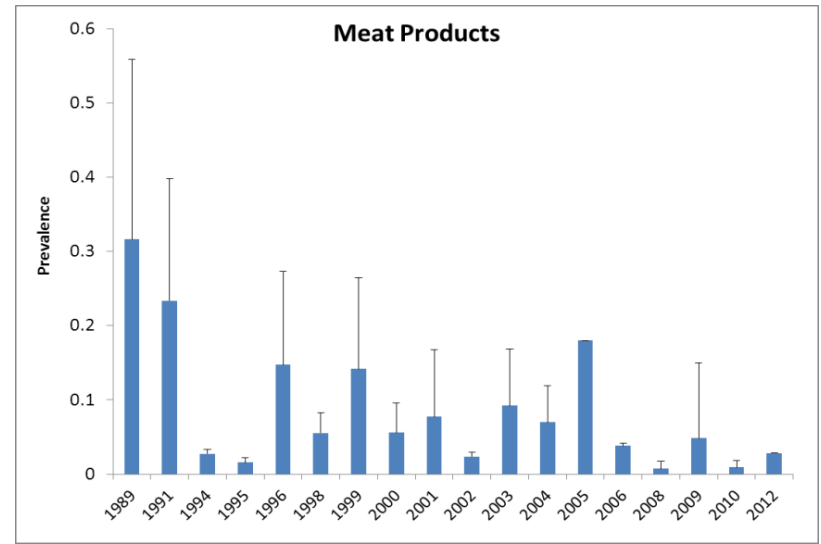
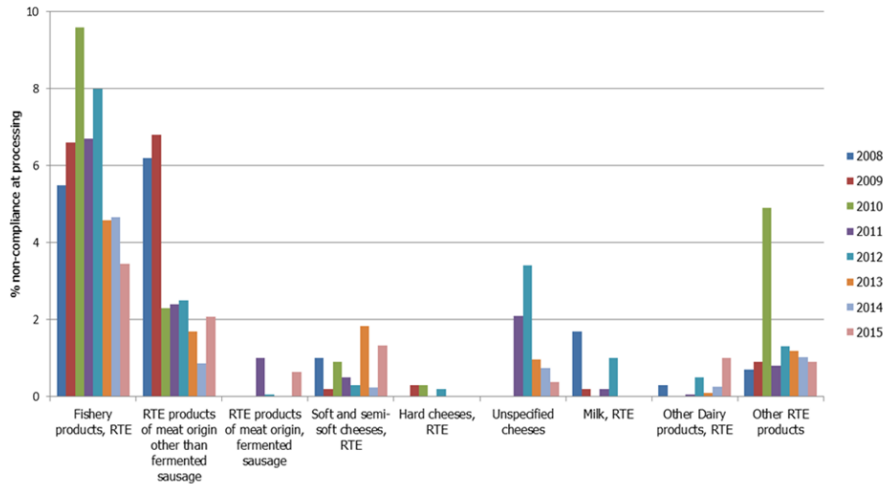


**Empirical evidence/indicator data**

# PREVALENCE

- EFSA monitoring data (percentages non-compliance) and literature data
- No evidence to suggest an increase of the prevalence or non-compliance over time
- Uncertainty is high due to data limitations

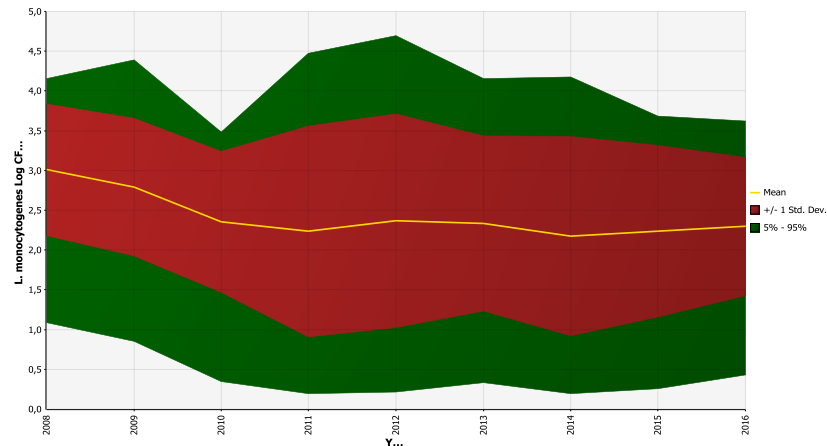
Activity 11 an extensive literature search and data selection with data selection on the wide range of RTE foods. (EFSA, 2014)



# CONCENTRATION

- RASFF data (too few activity 1)
  - No obvious trend over the period
  - Variability and uncertainty are large
- Recall example fish and fish products

**Activity 1:** an extensive literature search and study selection with data extraction on Lm in a wide range of RTE foods  
 • www.efsa.europa.eu/efsajournal  
 • 3/12/2015-20/10/2016





# CONSUMPTION

- EFSA consumption database – some support, vary between countries, uncertainty, no general conclusion

Gender		Change in mean no of servings per person and year			
		Denmark	Finland	The Netherlands	Sweden
<b>Females</b>	Cooked meat	117	14	-42	114
<b>Females</b>	Heat-treated sausages	147	-66	-12	-24
<b>Females</b>	Pâté	174	-5	-3	-143
<b>Females</b>	Smoked fish	-5	-6	-7	-5
<b>Females</b>	Gravad fish	ND	ND	ND	7
<b>Females</b>	Soft and semi-soft cheese	123	22	2	22
<b>Females</b>	Mean (all food groups)	111	-8	-12	-5
<b>Males</b>	Cooked meat	114	15	-16	134
<b>Males</b>	Heat-treated sausages	257	-85	3	-7
<b>Males</b>	Pâté	197	-5	4	-35
<b>Males</b>	Smoked fish	117	7	7	-16
<b>Males</b>	Gravad fish	ND	ND	ND	4
<b>Males</b>	Soft and semi-soft cheese	191	13	5	40
<b>Males</b>	Mean (all food groups)	175	-11	1	20

- FAO FishstatJ – indication smoked salmon increased, uncertainty

# SURVEILLANCE

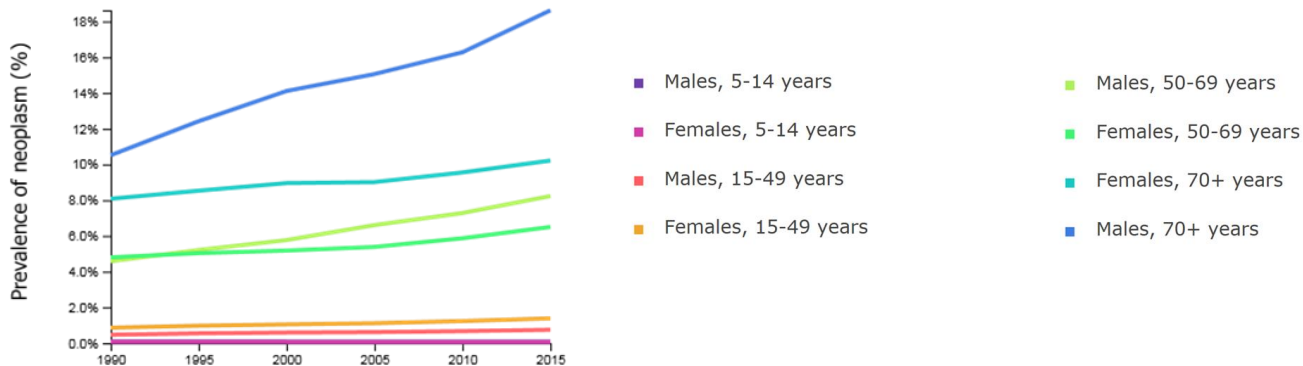
- Questionnaire to FWD-Net
- Two countries with a relatively high level of case reporting have improved their national surveillance
- Germany changed the case definition to a more sensitive one, an increase in the reimbursements for diagnostic tests
- Spain has improved so more regions report
- Thus, some changes, in particular for some countries with a relatively high level of reporting, which may have contributed to the increasing trend in confirmed listeriosis cases
- The changes in the diagnostic methods are not expected to have contributed to the trend

# VIRULENCE

- New insights on relation clonal complexes and virulence, and sequencing data may allow this hypothesis to be addressed but data were not yet available
- TESSY data: not possible to conclude whether virulence/pathogenicity has changed over time period due to data limitations. Case fatality rates (CFRs) appear not to have increased

# SUSCEPTIBILITY

- Older population (>75 years) increase: 41.6 (8.1%) to 47.1 million (9.0%)
- Birth rate declined (10.8 to 10.0 per 1,000 persons)
- Death rates decreasing, cancer rates increase with age, and increase in prevalence of several underlying conditions support susceptibility increase



# UNCERTAINTY gQMRA MODEL AND TSA

## Several sources of uncertainties identified

- **gQMRA** model used to assess mainly importance analysis (impact of various factors)
- Impact of uncertainty expected to be lower for importance analysis since it is expressed as the relative number of cases in two scenarios
- **TSA:** can lead to under- or overestimation of the observed trends
- Due to available data, age and gender used as proxies for susceptible populations and countries not included as covariate
- Means observed trends may hide trends among subgroups or be true for only a subset of the age–gender–country population

# **Synthesis in relation to AQ's**

# HOST RELATED

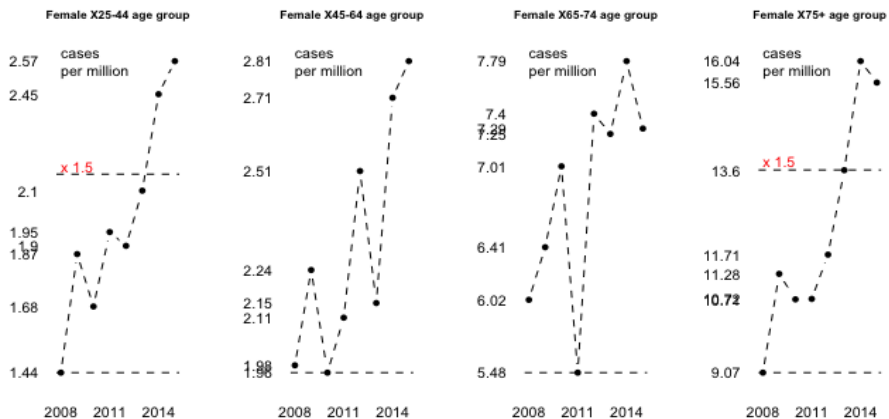
- An increase in the number of susceptible persons (age or susceptibility) increase the number of cases by the same amount (everything else being equal)
- If only numbers increased, observed incidence rates would not show an increasing trend
- For this to occur, proportions of characteristics that affect risk of listeriosis within age–gender group would have to change
- Increase in female 25-44 yo indicate general factors involved – susceptibility not changed



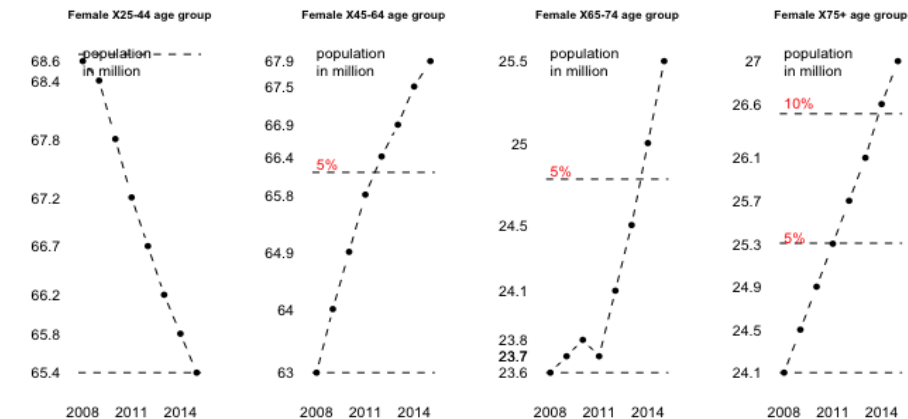
# HOST RELATED

- Female 25–44 age groups population decreased 5%
- All other increased;  $\geq 75$  yo by  $\sim 10$ -22%
- If population increase only factor, increase of  $> 50\%$  required

## Incidence



## Numbers





# FOOD RELATED

## Prevalence

- Impact is direct
- gQMRA model indicates that overall prevalence in the generic RTE food weighted to reflect consumption increases with ages > 25–44 yo
- This suggests that part of the increase in listeriosis incidence with age can be explained by consumption
- Due to data gaps and limited indicator data it is not possible to conclude to what extent an increase of prevalence with time could explain the increasing trend



## Concentration

- gQMRA model indicates that concentration at retail and maximum population have a large impact on risk
- Some indicator data suggest that large numbers of servings exist on the market within dose range that may explain > 90% of cases (> 1,000 CFU/g)
- Limited data to determine the extent to which shifts in concentration, either in non-compliant foods, MPD or the concentration at retail, have contributed to the increased listeriosis trend

# FOOD RELATED

## Storage conditions

- gQMRA indicates large potential impact, esp. storage time
- Literature on food handling (incl. storage times and temperatures) indicated that the proportion of unsafe behaviors in risk groups is large, and sometimes related to age or socioeconomic factors
- Due to data gaps it is not possible to conclude that consumer storage conditions (times, temperatures) have changed during the time period and contributed to the increasing human listeriosis trends

# FOOD RELATED

## Consumption

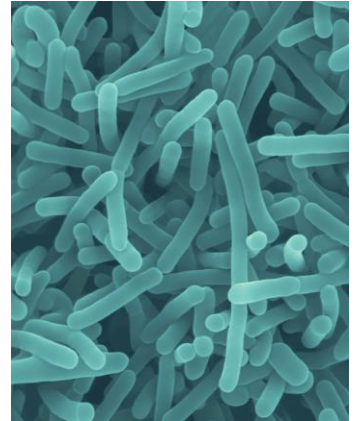
- The impact is direct (servings and serving size)
- Some support for increased consumption
- gQMRA model indicated that differences in consumption among age groups influenced the probability of exposure to *L. monocytogenes* through the effect on the prevalence
- Due to data gaps it is not possible to conclude whether serving sizes or the number of eating occasions have increased during the time period or to what extent it might have contributed to the increased trend of human listeriosis

# SURVEILLANCE

- The impact is direct
- Estimated underreporting in the same range as the increase in trends (1.7 to 2)
- Indicator data show changes in the surveillance in some countries may have contributed to an increased trend
- Not possible to draw conclusions on the quantitative impact of this on the observed trend

# BACTERIUM RELATED

- Available indicator data limited and the analysis could only be based on serogroups and mortality rates
- Data did not indicate an increase in the virulence / pathogenicity
- Based on the indicator data it is not possible to conclude that the virulence of *L. monocytogenes* has increased during the period
- With new data becoming available it should be possible to evaluate this factor more appropriately



# Conclusions

# EVIDENCE TO EXPLAIN TREND

Factors considered as **likely (66–90%)** were:

- An increased **proportion** of susceptible persons in age groups over 45 years for both genders (other factor as well)
- An increased **population size** of the elderly and susceptible population (except for the 25–44 female age group). This factor would **only** contribute to the **number** of listeriosis cases but **not** the increase in **incidence**



# EVIDENCE TO EXPLAIN TREND

## Factors considered **as likely as not (33–66%)**

were:

- An increased consumption (number of servings per person) of RTE foods in the EU/EEA
- An improved surveillance of human listeriosis in the EU/EEA

# EVIDENCE TO EXPLAIN TREND

**Inconclusive factors** were:

- *L. monocytogenes* prevalence and concentration in the three considered RTE food categories at retail
- *L. monocytogenes* virulence potential
- Storage conditions (time and temperature) after retail
- Due to data limitations the present evaluation was based on only three RTE categories which is a limitation of the assessment

# Recommendations

# RECOMMENDATIONS

- Raise awareness all stakeholders in food chain since the proportion of high-risk groups is expected to increase
- Generate data on *L. monocytogenes* in food comparable across MS's and time. Existing monitoring has other objectives and is not appropriate for evaluating trends over time
- Address the need for data to evaluate changes in consumption of RTE foods, and other food categories over time in the EU
- Improve information for risk assessment and risk management by collecting comparable data on human listeriosis cases that are more aligned with the concept of risk groups (number of cases in three groups, consumption habits, socio-economic–demographic data)