"Incidenten met gevaarlijke stoffen: chemie of hysterie"
CGC en NVMM – 's Hertogenbosch – 25.09.2008

Eerst dioxines en nu Coca-Cola!

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Arbeids-, Milieu- en Verzekeringsgeneeskunde
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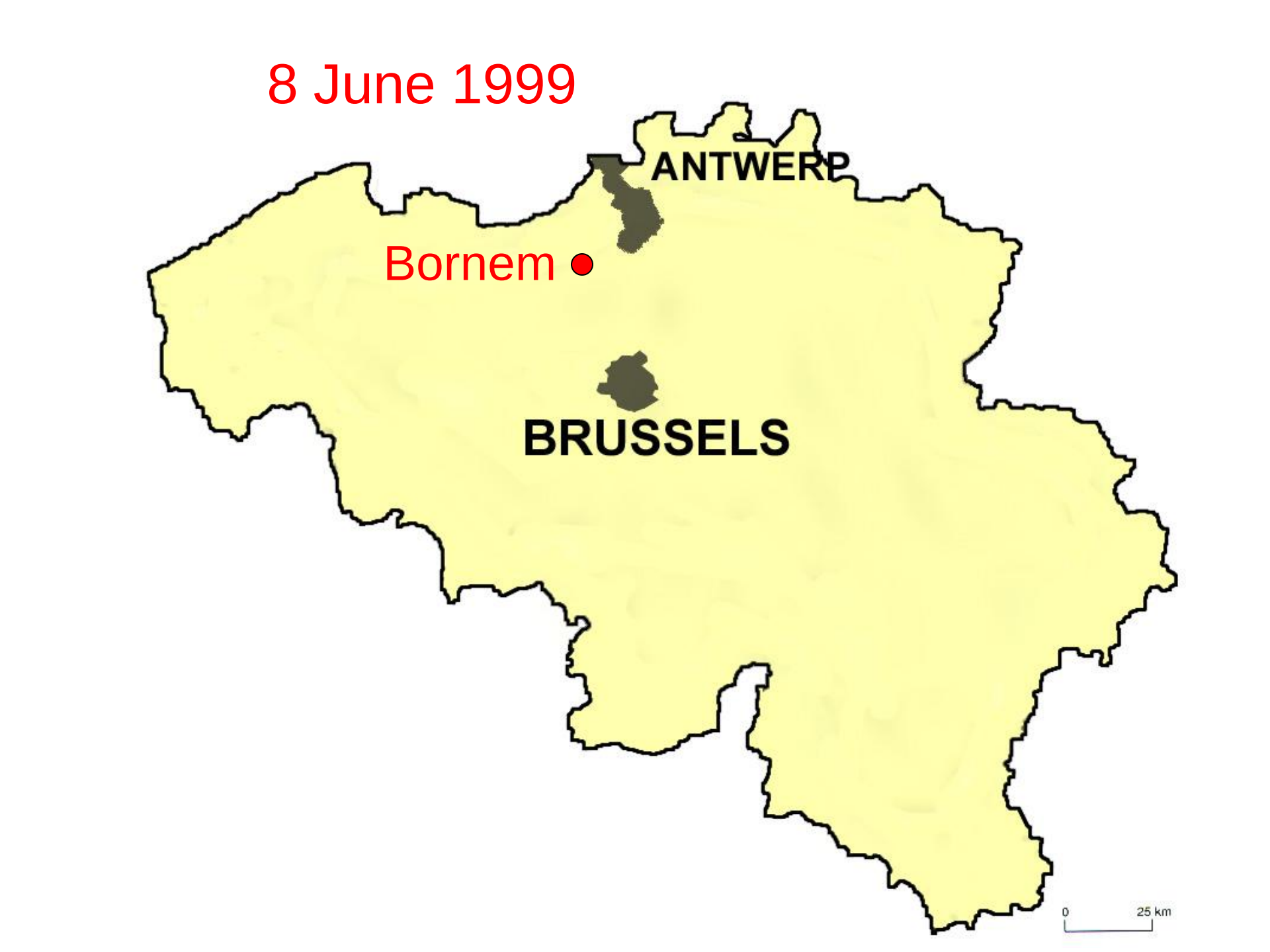
Eerst dioxines en nu Coca-Cola!

Nemery B., Fischler B., Boogaerts M., Lison D., Willems J. The Coca-Cola incident in Belgium, June 1999.

Food and Chemical Toxicology, 2002, 40, 1657-1667.

“Initial event”

- 8 June 1999
- secondary school in Bornem (179F,101M)


8 June 1999
ANTWERP
Bornem
BRUSSELS
0
25 km

“Initial event”

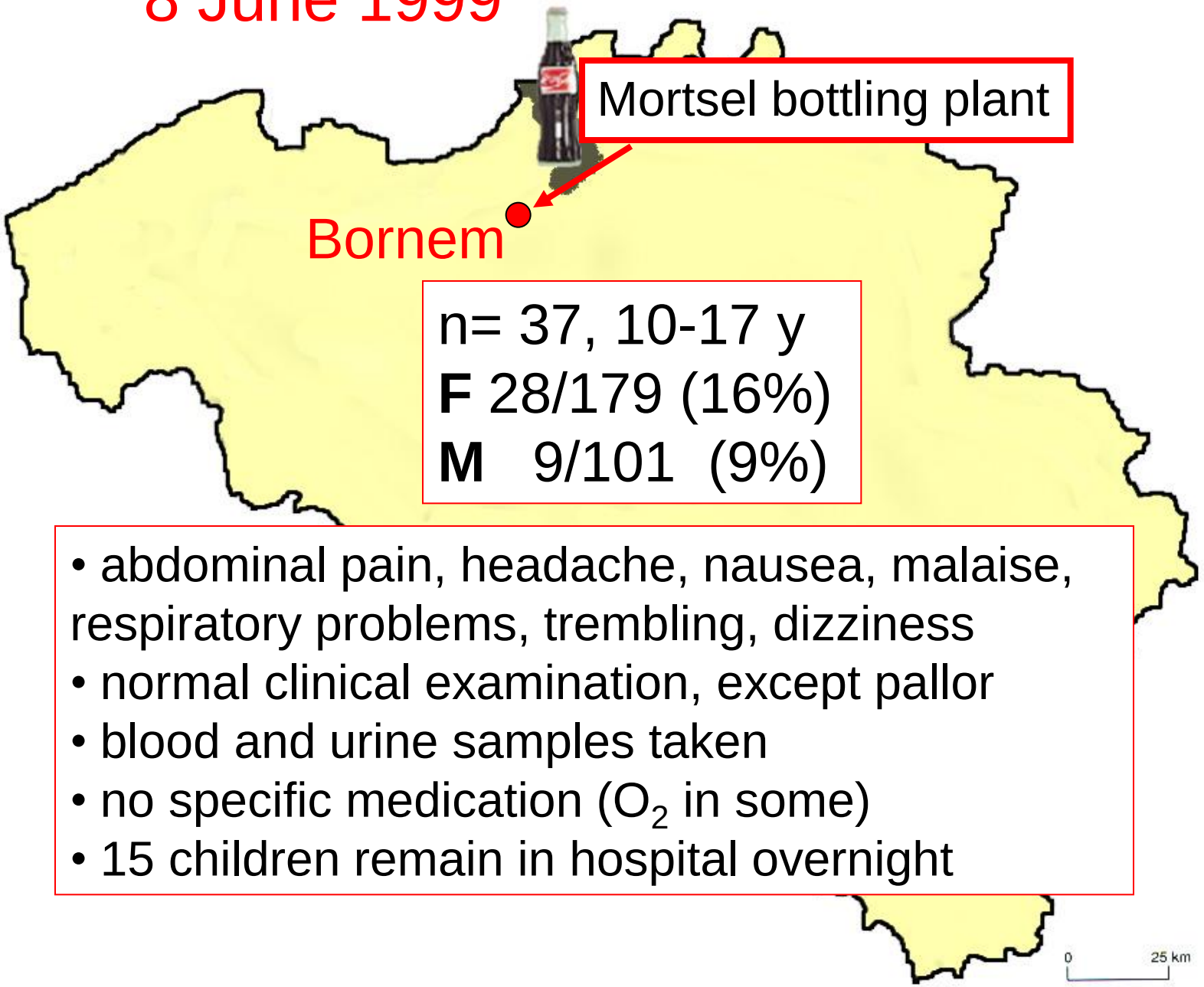
- ~10 children report sick after lunch
- staff & school nurse incriminate Coca-Cola, with bad smell, drunk at lunch time
- checking in all classrooms

➢ 22 children (16F,6M) sent to local hospital

+ 11 pupils (8F,1M) during the evening

+ 6 new cases (5F,1M) report next day

8 June 1999



n= 37, 10-17 y
F 28/179 (16%)
M 9/101 (9%)

- abdominal pain, headache, nausea, malaise, respiratory problems, trembling, dizziness
- normal clinical examination, except pallor
- blood and urine samples taken
- no specific medication (O_2 in some)
- 15 children remain in hospital overnight

“Initial event”

- crates of Coca-Cola taken for analysis by Coca-Cola & by Food Inspection
- recall of production related to incident

Context

- “Dioxin crisis” in Belgium
  - February 1999: chicken farms: reduced hatching and increased lethality in chicks
  - March-April 1999: diagnosis of contamination of feed by dioxins / PCBs
  - 25 May 1999: leak to media

Dioxin crisis (cont'd)

- Major political crisis
  - resignation of ministers of Health and Agriculture
  - in the wake of important general election 13 June 1999

➢ *"one more mismanagement after several other scandals"*

➢ lack of confidence in authorities

Dioxin crisis (cont'd)

- Major health scare

  recall + stop sale and export of Belgian

  - eggs & chicken
  - then all meat, dairy products, …

➢ *"even minimal amounts (ppb) of dioxins are hazardous (in the long term)"*

➢ extensive media coverage of issue of safety of modern food

The Belgian PCB/Dioxin crisis (references)

- Bernard *et al.* Food contamination by PCBs and dioxins. *Nature*, 1999, 401, 231-232 (Erratum: 446)
- Van Larebeke *et al.* The Belgian PCB and dioxin incident of January-June 1999: exposure data and potential impact on health. *Environ Health Persp*, 2001, 109, 265-273
- Bernard *et al.* The Belgian PCB/dioxin incident: analysis of the food chain contamination and health risk evaluation. *Environ Res,* 2002, 88, 1-18
- Vrijens et al. Probabilistic intake assessment and body burden estimation of dioxin-like substances in background conditions and during a short food contamination episode. *Food Add Contam*, 2002, 19, 687-700


ANTWERP
8 June
Bornem
n=37
BRUSSELS
0
25 km

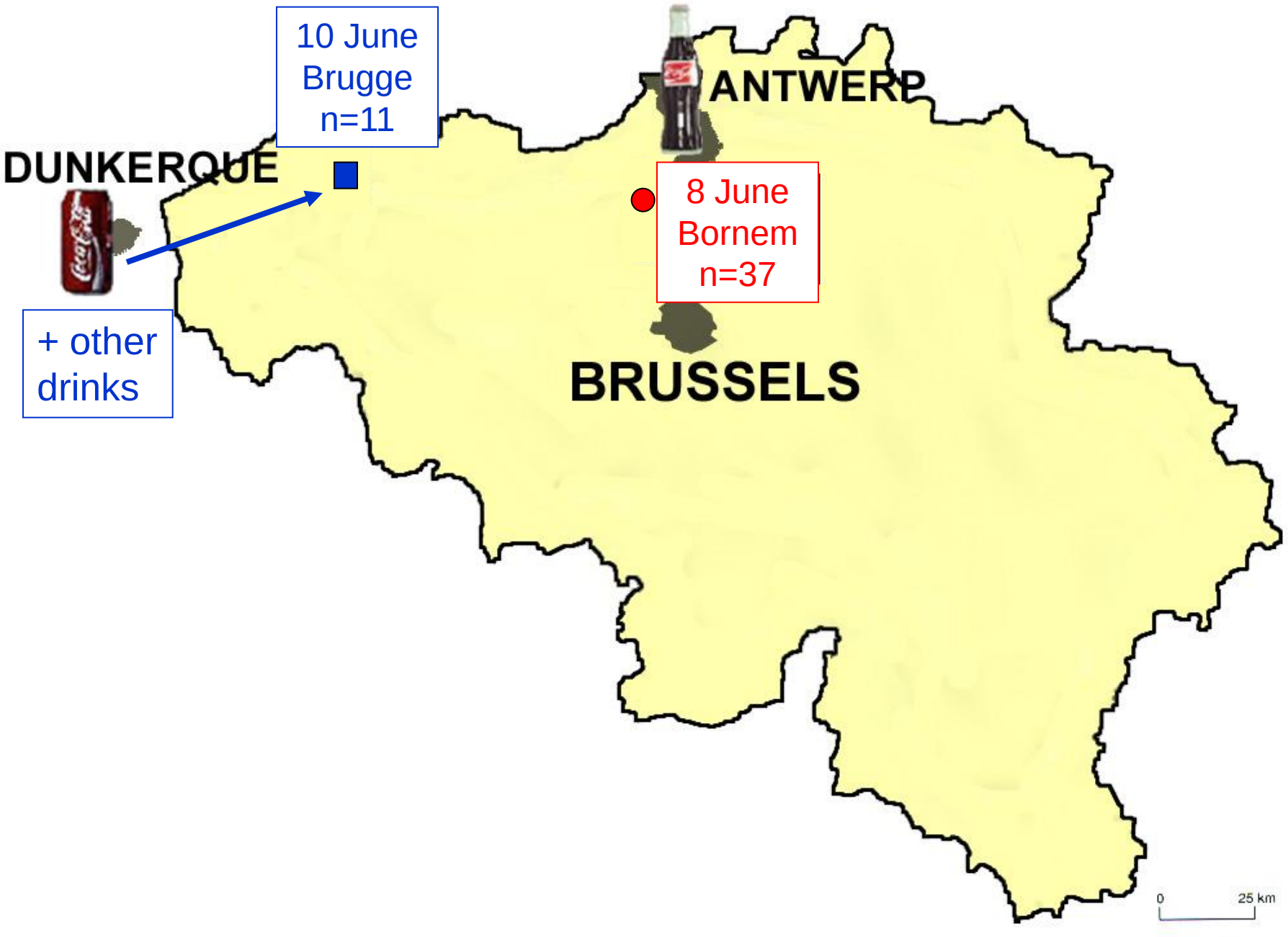
“Initial event”

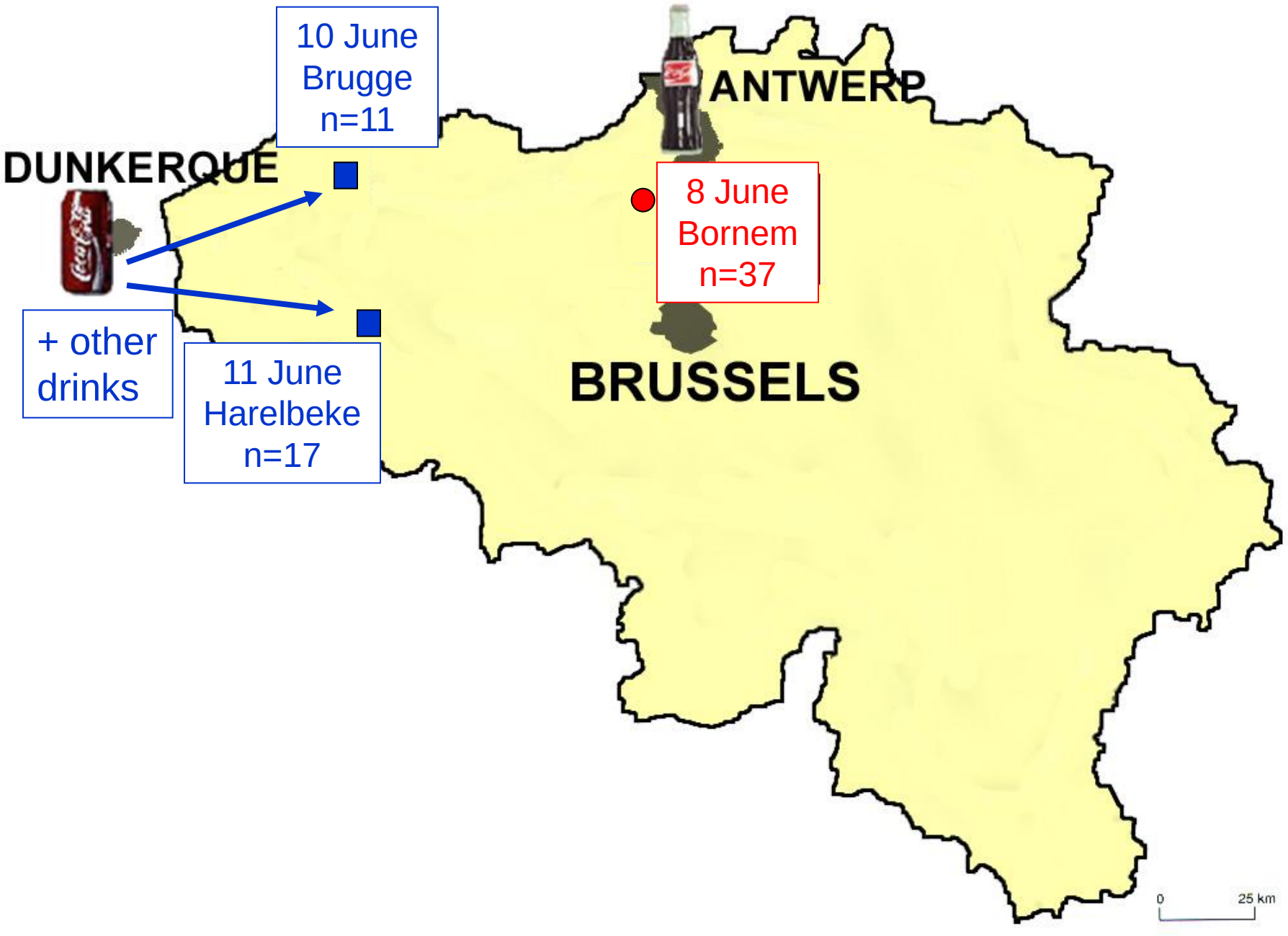
- crates of Coca-Cola taken for analysis by Coca-Cola & by Food Inspection
- recall of production related to incident
- incident reported by media (evening TV)

Coca-Cola as a symbol

"The soft drink is as highly charged with symbolism as with CO_2"

Pendergrast M. *For God, Country and Coca-Cola. The definitive history of the great American soft drink and the company that makes it* (2nd Ed). Basic Books, New York, 2000


10 June
Brugge
n=11
ANTWERP
DUNKERQUE
8 June
Bornem
n=37
+ other
drinks
BRUSSELS
0
25 km


10 June
Brugge
n=11
ANTWERP
DUNKERQUE
8 June
Bornem
n=37
+ other
drinks
11 June
Harelbeke
n=17
BRUSSELS
0
25 km

Minister laat Coca-Cola uit rekken halen

Oorzaak problemen nog onbekend

Coca-Cola moet praktisch alle flesjes en blikjes terugtrekken die in België werden geproduceerd. Daar komt de mededeling van de minister van Volksgezondheid, Luc Van den Bossche, vrijdagavond, na overleg met de frisdrankenproducent, op neer. Intussen doken vrijdag nieuwe klachten op na het drinken van producten van Coca-Cola.

Christoph BOVAL

MINISTER Luc Van den Bossche heeft vrijdagavond beslist in overleg met de top van Coca-Cola België en Europa alle 20 centiliter-flesjes van Coca-Cola, Coca-Cola Light en Fanta, die geproduceerd worden in Gent en Wilrijk, uit de handel te nemen. De flesjes zijn onderaan herkenbaar door de letters G (Gent) of W (Wilrijk). Gent en Wilrijk zijn de twee productievestigingen van Coca-Cola in België.

Alle blikjes van Coca-Cola, Coca-Cola Light, Fanta en Sprite, geproduceerd in het Franse Duinkerke, net over de grens, worden eveneens uit de handel genomen. Die zijn herkenbaar onderaan de blikjes met de letters DU, DV of DW.

Dat betekent dat zowat de hele productie voor België uit de handel gaat. In welke mate de bevoorrading kan worden overgenomen door buitenlandse productiecentra, was gisteren nog niet duidelijk. Het overleg tussen Coca-Cola en de minister ging na de persmededeling van de minister voort.

Van den Bossche beklemtoonde dat er geen enkel gevaar bestaat voor de volksgezondheid, en dat het om een voorzorgsmaatregel gaat.

In het Franse departement Nord/Pas-de-Calais is ondertussen een onderzoek gestart om mogelijke kwaliteitsproblemen bij Coca-Cola-producten op te sporen. De Franse overheid besliste dat op vraag van de Belgische regering.

De zaak ging dinsdag aan het rollen, toen dertig leerlingen uit Bornem met zware misselijkheid in het ziekenhuis werden opgenomen nadat ze Coca-Cola in flesjes hadden gedronken. Daarop liet Coca-Cola 2,5 miljoen flesjes, de productie van drie dagen, terughalen.

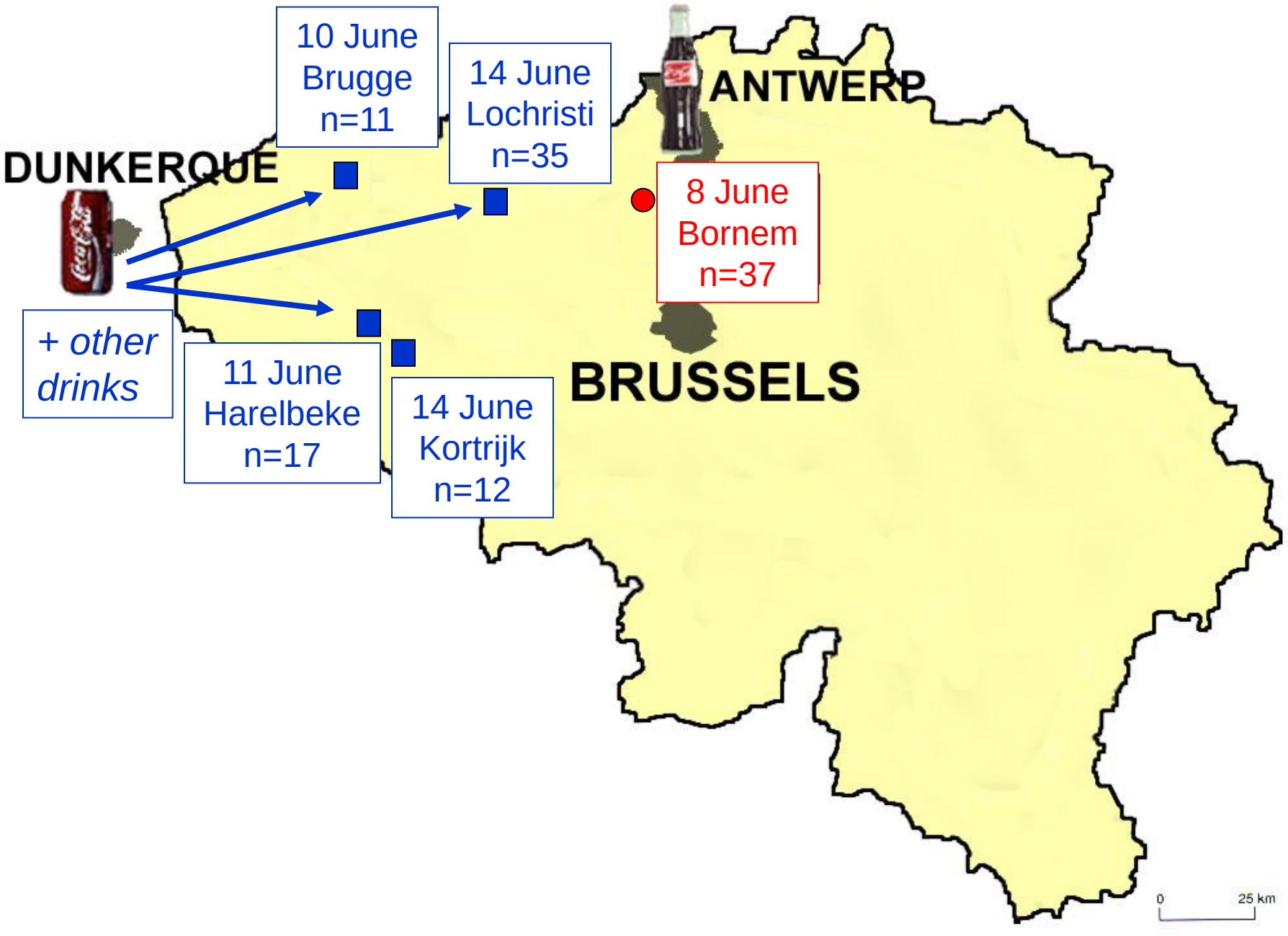
Sindsdien is er geen dag voorbijgegaan zonder nieuwe klachten, ook over blikjes.

Vrijdag nog werd in het Heilig-Hartinstituut in Harelbeke misselijkheid en braakneigingen vastgesteld bij scholieren. Voorlopig houdt men de oorzaak op het drinken van flesjes Cola. Dertien jongeren werden naar het ziekenhuis gebracht.

Bij een plasticbedrijf in Pittem heeft Coca-Cola vrijdag een drankautomaat weggehaald. Enkele blikjes Coca-Cola roken naar olie. Niemand werd ziek. Ook in Belsele en bij Sidmar in Gent waren er problemen. Bij Sidmar werden 40 automaten weggehaald.

Dertien leerlingen van het Heilig-Hartinstituut in Harelbeke hadden medische zorgen nodig na het drinken van Coca-Cola. Ambulances uit Kortrijk en Harelbeke brachten hen naar ziekenhuizen in de omgeving. © Patrick Holderbeke

De Standaard, 12-13 June 1999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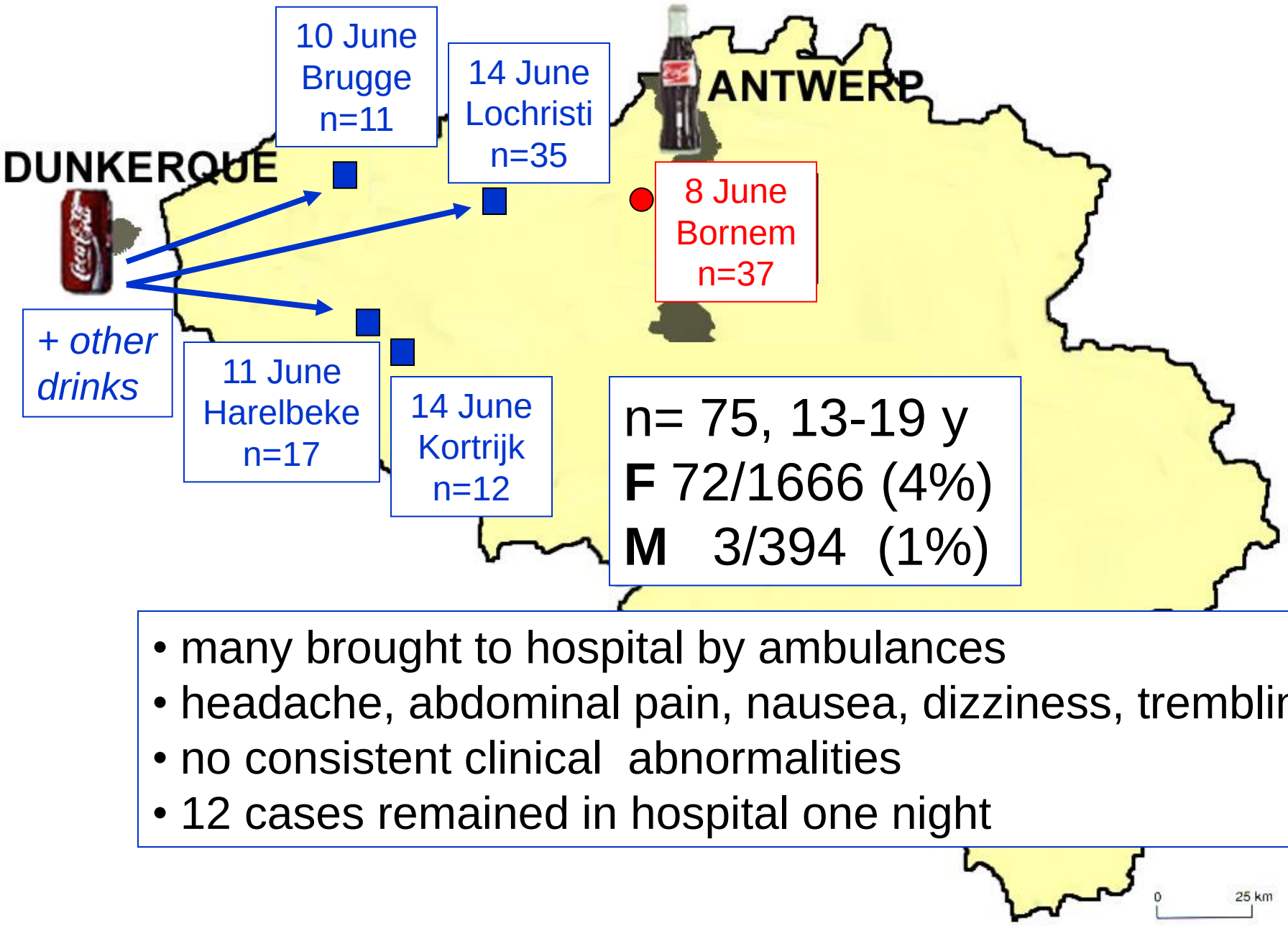
DUNKERQUE
8 June
Bornem
n=37
+ other
drinks
11 June
Harelbeke
n=17
14 June
Kortrijk
n=12
BRUSSELS
0
25 km



- many brought to hospital by ambulances
- headache, abdominal pain, nausea, dizziness, trembling
- no consistent clinical abnormalities
- 12 cases remained in hospital one night

Data from Coca-Cola

- Bottled Coca-Cola:
  - “off-odour”
  - sniffing technique + GC (?)

    COS (5-14 µg/L) → H_2S (8-17 µg/L)

    “contamination of CO_2”
- Cans from Dunkerque
  - external contamination of cans by 4-chloro-*m*-cresol (“fungicide on pallets”) (< 1 µg/can)

Media coverage

- Extensive coverage by radio, TV & press
  - Coca-Cola crisis + dioxin crisis
  - interviews & pictures of “victims”
  - press conferences
  - international consequences (spread to northern France)


Brüssels
Manneken-Pis . . .
Coke
Nach Dioxin- und Coca-Cola-Skandal
ist den Belgiern der Appetit gründlich vergangen . . .

Coca-Cola Company

- symbol of “modern” food
- symbol of youth, freshness, life ...

But poor crisis communication

- “secrecy” of formula
- appeared overwhelmed (two unrelated problems of quality at the same time!)
- did not realise specific context of dioxin crisis

Northern Ireland Seeks a Peace Dividend

Drugs Online • Classic Growth Stocks

FORTUNE

Crunch Time for Coke

The soft drink maker's troubles run deeper than its recent European fiascoes

www.fortune.com

Health authorities

- Diversion from management of dioxin crisis
- new minister wants to be seen as capable of rapid decisions to protect public health
- uncertainty about real cause

➢ recall of <u>all</u> Coca-Cola products

La Peste (M. CAMUS)

“Il faut que nous prenions la responsabilité d’agir comme si la maladie était une peste.” (Dr. Richard, p. 63)

Gallimard, Paris (360th Ed.)

General public

- Information based on report by National Poison Centre (unpublished)

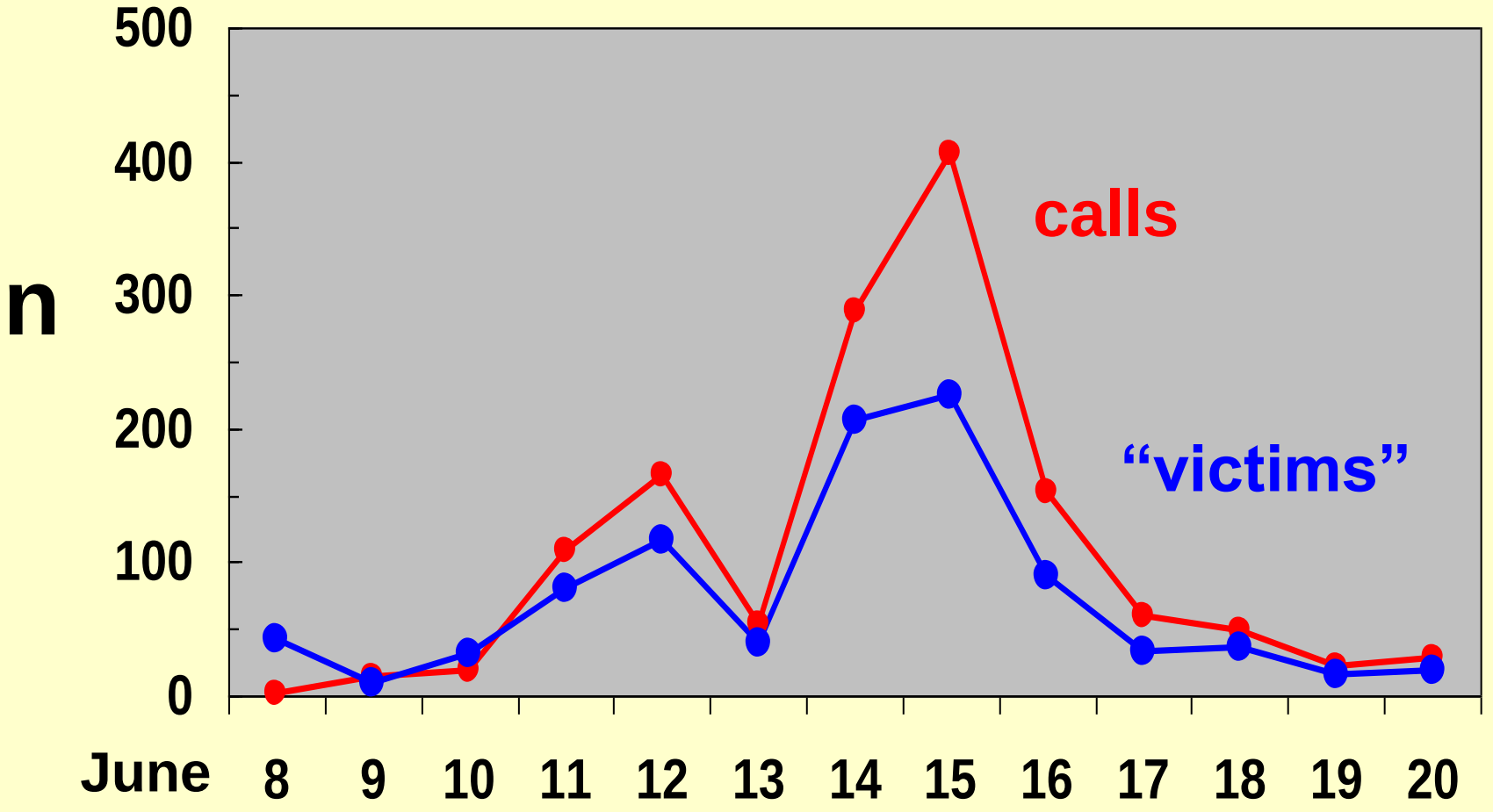
National Poison Centre

- receives telephone calls from
  - members of the public
  - doctors & health professionals
- manned by physicians, 24h/24h
  - telephone number noted (area code)
  - characteristics of caller (quality, age, sex)
  - reasons for calling (information or reporting)
  - symptoms & clinical information
  - suspected or incriminated substance

National Poison Centre

- Between 8 and 20 June 1999
  - 1,418 calls related to soft-drinks
    - 848 Coca-Cola
    - 67 Fanta
    - 29 Sprite
    - 53 other drinks
  - 685 requests of information
  - 783 concern one or more persons with symptoms (“victims”): total 943 persons

National Poison Centre



total: 1418 calls, 783 with “victims” (n = 943)

Characteristics of callers/“victims”

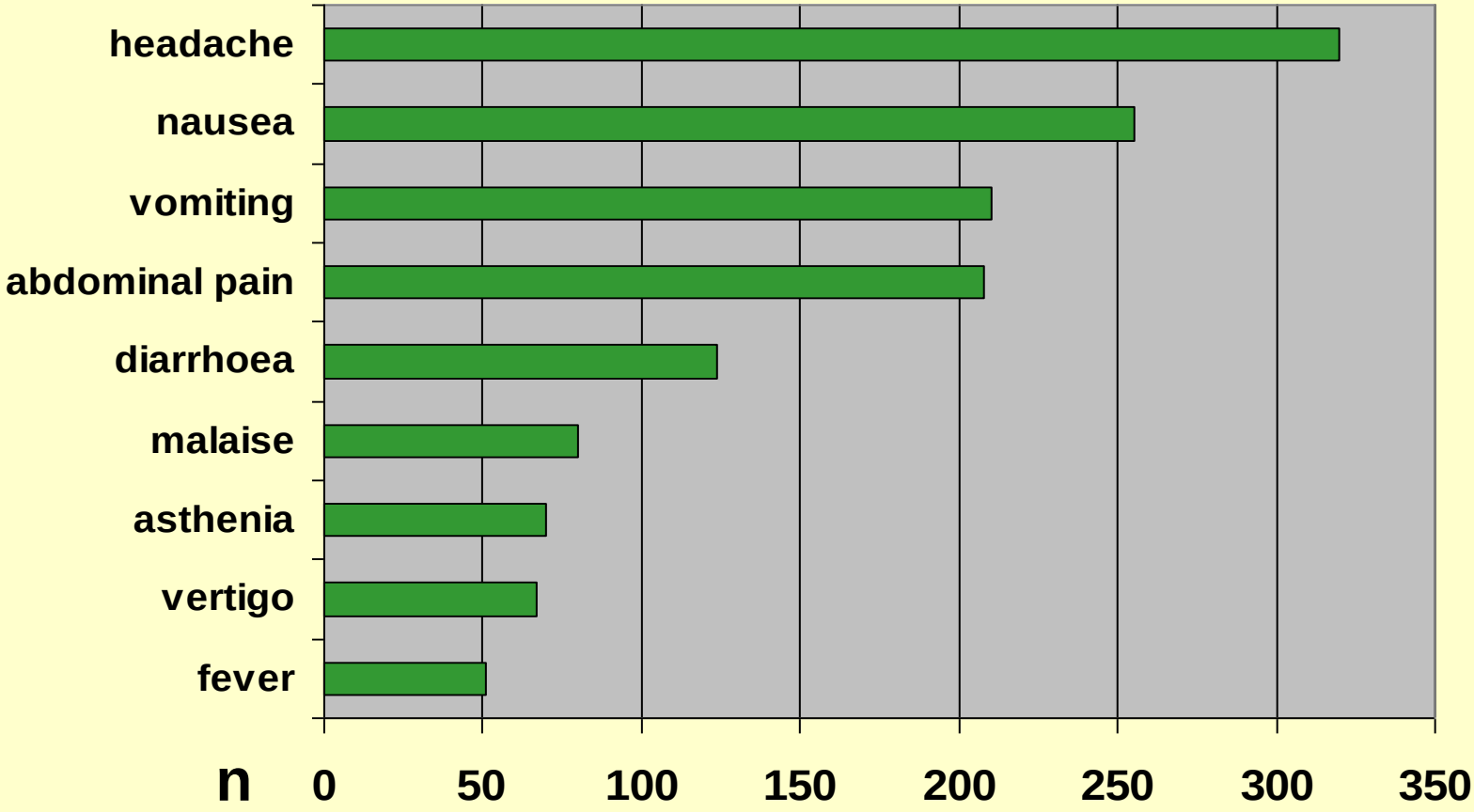
- **F** = 52% - M = 37% - unknown = 11%
- < 15y = 25%

  0-4y n=52

  5-10y n=66
- evenly distributed throughout country
- 81% = members of public

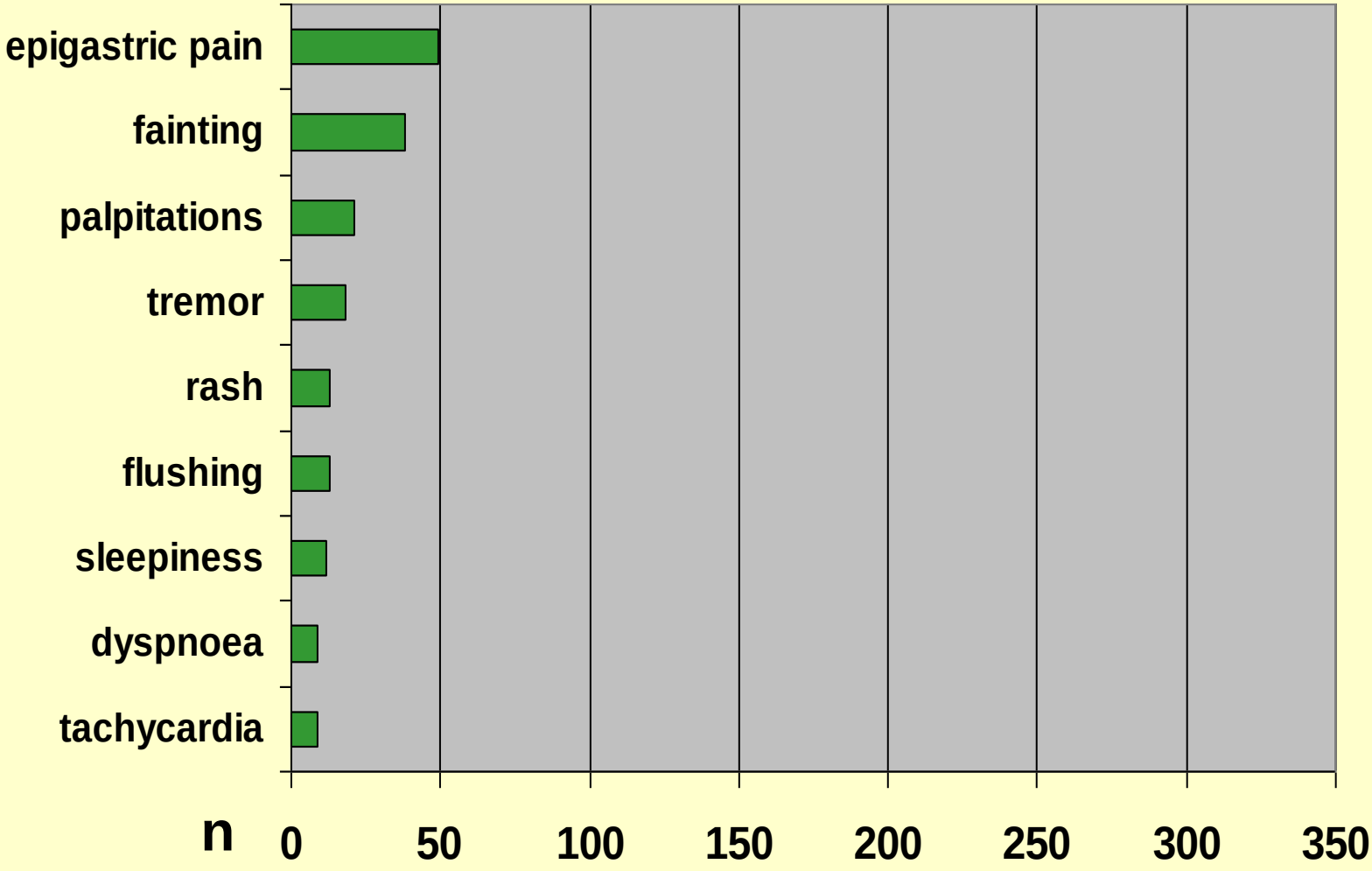
  19% = physicians & other health professionals

Reported symptoms



no evidence for serious disease

Reported symptoms (cont'd)



“Collective intoxications”

- 4/5 schools described above
- 2 other schools
- 1 birthday party at doctor’s home
  - 13 June
  - 6/22 children (2-12y) became ill
  - next day: headache & diarrhoea
  - “only those who drank Coca-Cola” (cans or PET bottle)

“Unusual cases”

- “more severe” neurological signs
  - ataxia (2.5y, 48y, 12y, 14y)
  - convulsions (2 adults)
  - confusion (2 adults)
  - paresis (1 adult, 1 boy)
  - memory loss (31y)
  - vertigo & fatigue (1 adult)
- liver injury (44y)
- haemolysis (5y, 1 adult)

Haemolysis?

- 11 June:
  - child 5y with increased bilirubin & LDH
  - physician *asks* NPC if other Coca-Cola cases had haemolysis?

  ➢ haemolysis is mentioned as possible effect by minister at press conference
- 17 June:
  - 10 cases of “haemolysis” in one hospital

  analysis of hospital records by team of haematologists: no “haemolysis” (artefact)

De Geruchten (Hugo CLAUS)

“Wij moeten voorzichtig zijn met geruchten. Zij worden zo gauw een waarheid, een soort waarheid.” (p.78)

De Bezige Bij, Amsterdam, 1996

Hypotheses

- 16 June (1st meeting of “ad hoc group”):
  - report of available clinical data
  - report of available toxicological data
    - no evidence of serious toxicity
    - incriminated agents (COS & “fungicide”) are unlikely to have caused systemic poisoning at reported concentrations
    - odour-related reactions likely
  - outbreak has characteristics of “mass sociogenic illness”

Mass sociogenic illness

- Mass sociogenic/psychogenic illness

  "constellation of symptoms suggestive of an organic illness, but without identifiable cause, which occurs among two or more persons who share beliefs related to those symptoms"

  ["mass hysteria"]
- described in many settings (schools, offices, plants, communities)

Mass sociogenic illness

Criteria

- rigid authoritarian administration + lack of social support
- unusual stress + non-toxic levels of aversive chemicals
- primarily among (pre)adolescents
- preponderance of females
- transmission by “line of sight”, media, health professionals, social & family network, telephone
- no illness among other group(s) sharing same environment
- unusual physical or mental stress in those reporting illness (stressor is threat to group’s integrity)
- benign morbidity & no clinical or laboratory evidence of illness
- hyperventilation & syncope
- relapses in the setting of the original outbreak
- rapid spread
- usually rapid resolution
- lengthy investigation & delay of disclosure may prolong or intensify outbreak

Mass sociogenic illness

- not all criteria must be fulfilled !
- positive criteria are not proof of MSI !

- hypothesis based not only on exclusion of “real” poisoning, but also on characteristics of outbreak

Mass sociogenic illness

- “risky” diagnosis, can never be “proven”
- not accepted easily by some victims, activists, authorities & treating physicians
- insufficiently known by “experts”
- not an excuse to stop investigations
- not against precautionary principle

Coca-Cola and MSI

- TV programme “Ter Zake” 23 June1999

  + extensive national media coverage

- Letter in *The Lancet*, 3 July 1999

  Nemery B, Fischler B, Boogaerts M, Lison D. Dioxins, Coca-Cola, and mass sociogenic illness in Belgium. *Lancet*, 1999, 354, 77

  + press release: considerable international media interest & reactions

Toxicological investigations

- Data from Coca-Cola
  - own laboratories
  - independent laboratories (TNO, …)
- Analyses in governmental and other laboratories
- Analyses of biological samples from patients

Toxicological investigations (cont'd)

- In general, very scant data
  - little or no information on
    - strategies to detect toxic agents
    - conditions of sampling & storage
    - methodology
    - quality control
    - detection limits
  - poor documentation
    - no formal reports
    - often faxed messages and loose notes

Further toxicological analyses

- No significant findings in beverages
  - no excess in routinely analysed chemicals

    pesticides, drugs, solvents, metals, other organics
  - no “suspect” compounds found

    including vegetable extracts *(variable)*
  - no microbiological agents detected
- No evidence of toxic agents in patients
  - but very poor documentation

M. Douglas Ivester

Mijn verontschuldigingen aan de Belgische consument.

Ik had ze u feitelijk al eerder moeten aanbieden. Sorry.

Elke dag drinken overal ter wereld meer dan een miljard mensen onze producten. Reeds meer dan een eeuw is ons succes gebaseerd op de garantie dat Coca-Cola telkens een moment van verfrissing biedt met een constante, hoge kwaliteit. Met andere woorden, meer dan een miljard keer vragen we het vertrouwen van al deze mensen. In eerste instantie willen we dus de hoge kwaliteit van onze producten garanderen en de veiligheid vrijwaren van de mensen die ze elke dag drinken. Wij hechten namelijk meer belang aan uw gezondheid dan aan onze zakenbelangen.

De voorbije dagen werden we echter geconfronteerd met twee problemen waardoor we deze belofte niet hebben gehaald.

We hebben dag en nacht gewerkt om de oorzaak op te zoeken, het probleem op te lossen en opnieuw


GRATIS
1 familiefles*
"Your
Coca-Cola
is back"
Your
Coca-Cola
is back
Coca-Cola
GRATIS
1 familiefles*

Summary

- The Belgian Coca-Cola crisis represented a major food scare
- The exact aetiology of the triggering event in the Bornem school remains unclear
- In the other schools and in the general public the hypothesis of mass sociogenic illness is the most plausible mechanism
- The context of the dioxin crisis (anxiety about food safety) was a critical factor

Summary

- The toxicological investigations were of limited quality
- The information provided by Coca-Cola was not satisfactory
- The co-ordination by the authorities was not ideal
- Toxicological crisis management must be improved

“Coca-Cola syrup and extract” Patent June 28, 1887

“This Intellectual Beverage and Temperance Drink […] makes not only a delicious, exhilarating, refreshing and invigorating Beverage […], but a valuable Brain Tonic and a cure for all nervous affections - Sick Head-Ache, Neuralgia, Hysteria, Melancholy, etc.”

from CC Archives *in* Pendergrast M. *For God, Country and Coca-Cola. The definitive history of the great American soft drink and the company that makes it* (2nd Ed). Basic Books, New York, 2000

Dank voor uw aandacht

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Mass sociogenic illness (references)

- Boss LP. Epidemic hysteria: a review of the published literature. *Epidemiologic Reviews,* 1997, 19, 233-242
- Philen RM et al. Mass sociogenic illness by proxy: parentally reported epidemic in an elementary school. *Lancet* 1989, ii, 1372-1376
- Barron R *et al.* The catastrophe reaction syndrome: trauma in Tbilisi. *Int J Law Psych* 1993, 16, 403-426
- Jones TF *et al*. Mass psychogenic illness attributed to toxic exposure at a high school. *N Engl J Med* 2000, 342, 96-100

+ Wessely S. Responding to mass psychogenic illness (Editorial). *N Engl J Med* 2000, 342, 129-30

Other instances of mass sociogenic illness

- Frequently reported in small communities (schools, workplaces, …)
- Large outbreaks
  - Israeli-occupied West-Bank, 1983
    - n = 949 (747 schoolgirls)
  - Kosovo, 1990
    - n = 3000 (Albanians, mainly female teenagers)
  - Tbilisi, (Soviet) Georgia, 1989

Catastrophe Reaction Syndrome

- to avoid loaded or offensive terms such as “psychogenic” or “hysteria”
- to acknowledge the traumatic events for the community (and the affected subjects)
- to imply no direct relationship with poison (explain and reassure)
- to give “medical” respectability to the condition
- translates well in most languages

Conditions for MSI

1. Stress in community + state of high affect somatic expression of feeling / being (politically) constrained
2. Period of calm where social fabric is maintained (all-out war disrupts social structures & struggle for survival will bury emotional responses)

MSI is sentinel indicator of community suffering in the context of political repression or fear

importance of unbiased third party when investigating MSI

Tbilisi, 1989

- Tbilisi, 09.04.1989: peaceful demonstration broken up by Soviet Army
  - 20 deaths + many injured
  - physical trauma & crush + alleged use of toxic agents
- Fact-finding missions (> 1 month later)
  - Physicians for Human Rights (Boston)
  - Médecins sans Frontières (Paris)

Tbilisi, 1989

- 2nd wave of hospital admissions (~1 week)
  - children from nearby school
  - mourners affected by transporting flowers “harbouring poison”
    - nonspecific constitutional symptoms & various neuropsychiatric symptoms
  - compatible with PTSD, conversion and psychosomatic conditions

Tbilisi, 1989

- 3^{d} wave of hospital admissions (~ 40th d)
  - 400 schoolchildren from various schools
  - rumour + official media (TV):
    - “CS & CN found in air and soil at several schools”
    - “Soviet military target Georgian schoolchildren”
- PHR & MSF: 43 hospitalized children
  - majority of adolescent girls
  - essentially psychogenic symptoms compatible with mass psychogenic illness

Tbilisi, 1989

- Factors favouring occurrence of MPI
  - tremendous anxiety, fear, and grief felt throughout community
  - denial and secrecy of Soviet army & Moscow
  - extensive TV and media coverage of past events and mourning ceremonies (40^{th} day)
  - emotional identification with victims of toxic gases
  - amplification by concerned adults, including local authorities & medical personnel

Tbilisi, 1989

- Intervention:
  - investigation of initial event: discovery of use of toxic gas (chloropicrin) in addition to CS and CN
  - involve local physicians
  - meetings with officials
  - TV broadcast

➢ Catastrophe Reaction Syndrome

Catastrophe Reaction Syndrome

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importance of unbiased third party when investigating MSI

Case-control study

- Scientific Institute of Public Health, Unit of Epidemiology (Dr. H. Van Oyen)
- case-control study in affected schools
- requested by Ministry of Health on 21June 1999
- interviews conducted 23-25 June
- Letter in *The Lancet* 21 August
- final report November 1999 - June 2000

IPH Case-control study

- Van Loock F, Gallay A, Van Der Heyden J, Van Oyen H. Outbreak of Coca-Cola-related illness in Belgium: a true association. *Lancet*, 1999, 354, 680-1
- Gallay A, Demarest S. Case control study among schoolchildren on the incident related to complaints following the consumption of Coca-Cola Company products. Belgium 1999. IPH/ EPI Reports Nr. 2000-001 http://www.iph.fgov.be/epidemio/
- Gallay *et al.* Belgian Coca-Cola-related outbreak: intoxication, mass sociogenic illnes, or both? *Am J Epidemiol*, 2002, 155, 140-147

IPH Case-control study (methods)

- Case-control study in 5 schools
  - cases: at least one of 7 pre-defined complaints on day of outbreak or day after
  - controls: children from same class
    - next on alphabetical list
    - present on reference day
    - not ill in preceding 2 weeks and next two days
- face-to-face interviews with standardised questionnaire (13 trained interviewers)

IPH Case-control study (methods)

- Standardised questionnaire
  - demographic data (gender, age)
  - food consumption (place, time)
  - beverage consumption on reference day (place, time, type, characteristics)
  - symptoms (time, type)
  - having friends who reported ill
  - mental health questions (SF36)
- later: interviews with school directors & physicians (+ check clinical notes)

IPH Case-control study (results)

- Bornem: 37 cases *vs* 34 controls

  other schools: 75 cases *vs* 130 controls
- odds of exposure to regular Coca-Cola

	cases	controls	O.R.
Bornem	34/37	8/34	36.8 (7.6-207)
others	31/75	22/130	3.5 (1.7-7.0)

- odds of exposure to other beverages

  not in Bornem, yes in other schools

IPH Case-control study (results)

- Bornem cases:
  - more “low mental score” (O.R.=2.4, NS)
  - more report of bad smell of drink (O.R.=40*) (“rotten”, “bizarre”, …)
- other schools cases
  - more “low mental score” (O.R.= 2.4*)
  - more report of bad taste (O.R.=22*)

IPH Case-control study (results)

- Stratification according to SF36 score (< or > median value)
  - no decreases in O.R.
- Multivariate analysis (age, sex, SF36)
  - Bornem O.R.=143 (13-1549)
  - other schools O.R.= 4.4 (2.1-9.0)

IPH Case-control study (conclusion)

- Bornem: “association between symptoms and consumption of Coca-Cola is so strong that it must be true, and MSI cannot be solely responsible”

  + criteria for MSI not all present
- other schools: association is weaker, so MSI is more likely

IPH Case-control study (limitations)

- recall bias
- (selection bias after first 12 pupils ?)
- SF36 questionnaire not well suited to evaluate somatisation tendency