

Boiling-water taps and the risk of burns

Research based on user characteristics



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Summary

The boiling-water tap is changing people's behaviour towards hot liquids. More traditional means of boiling water may be used less or differently. This may affect the incidence of accidents with hot liquids. The recent increase in fixed boiling-water taps is reason to investigate whether this has an impact on accidents with hot liquids. To date, too little was known about behaviour related to the use of boiling-water taps and about the socio-economic and demographic characteristics of boiling-water tap users. The outcomes of this research will show the level of risk of burns when using boiling-water taps, particularly among young children.

Previous research on burn injury incidents among children aged 0 to 4 years show that this is a high-risk age group (5 times higher than other age groups) in terms of admission to a burns unit. 80% of serious burn injuries among young children are caused by hot liquids. Kettles account for 5% and teapots for 4% of the most serious hot liquid burn injuries among young children. No incidents of burns through boiling-water taps have been found (van Zoonen, 2019).

The results of this research show that the most commonly fitted boiling-water tap in the Netherlands, the Quooker, is mostly used to make tea. Quooker users also make more tea than the average person. In making tea, the Quooker replaces the kettle and very few users still have a kettle. However, much use is still made of teapots. The Quooker appears to only replace the teapot to a limited extent.

It also showed that the average age of Quooker users is around 57 years and they have above average incomes and levels of education. The socio-economic and demographic characteristics of Quooker users thus differ from parents of children in the burns units (risk group).

It seems that using a boiling-water tap instead of a kettle reduces the risk of burn injuries. However, as Quooker users are not representative of parents of young children, it cannot be determined from this study that boiling-water taps reduces the risk of burn injuries among young children.

An estimate of the risk of burn injuries, whereby we looked at the percentage of parents with young children that have a boiling-water tap in the house (Annex B.), however does point towards fewer burns among children in households with boiling-water taps.

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Introduction

Boiling-water taps are relatively new in Dutch kitchens. The popularity of boiling-water taps has increased strongly over the last few years. Half of new kitchens in the Netherlands have been fitted with boiling-water taps (Quooker, 2017). This means that the traditional means of boiling water, such as the whistling kettle or the electric kettle, is increasingly being replaced by boiling-water taps.

Over 35% of all burns requiring admission in a burns unit are caused by hot liquids (Dokter, 2014). Children in the 0 to 4 year age group are especially likely (5 times higher than other age groups) of being admitted to a burns unit (Vloemans, 2011). Furthermore, 80% of the burn injury cases in this age group are caused by hot liquids (Vloemans, 2011). Most accidents with hot liquid among children aged 0 to 4 years who need admission in a burns unit are caused by (van Zoonen, 2019):

- hot tea from a cup (36% of the accidents with hot liquid);
- hot water from a pan (6% of the accidents with hot liquid);
- hot water from a kettle (5% of the accidents with hot liquid);
- hot tea from a teapot (4% of the accidents with hot liquid).

The behaviour when using a boiling-water tap changes in terms of handling hot liquids. Some traditional water boiling methods may be used less or in a different way. This affects the likelihood of accidents with hot liquids. As boiling-water taps have only recently been introduced, until now little was known about behavioural aspects in relation to their use.

Literature shows that certain socio-economic and demographic characteristics influence the likelihood of burn injuries. The known socio-economic and demographic risk factors are a: low income; low level of education; low SES (Socio-Economic Status); and a migration background (Alnababtah, 2016; Edelman, 2007; Park, 2008; Stirbu, 2006). Recent research in burns units in the Netherlands show that these risk factors in the literature parallel the risk factors in the patient population in the Netherlands (van Zoonen, 2019). To estimate the risk of burn injuries for certain sub-populations in the Dutch population, information on the socio-economic and demographic characteristics was needed. Up to now, little was known about the socio-economic and demographic characteristics of boiling-water tap users.

There are different brands of boiling-water taps on the market in the Netherlands. The tap manufacturer Quooker has the largest market share. An estimated 80-85% of the boiling-water taps in Dutch kitchens are Quooker taps. The way that boiling-water taps work and are made safe differ among the brands. There are also differences in operation and safety among the different models of the same brand. This research does not look at the technical specifications of boiling-water taps, but at the user characteristics of the boiling-water taps. The tap manufacturer Quooker has made its customer database available for this research.

In this research we assessed the extent to which actions or products with a higher risk of burn injuries are replaced by using boiling-water taps and we examined the accident mechanism. We also mapped the socio-economic and demographic characteristics of boiling-water tap users to estimate how these affect the risk of burn injuries. **The outcomes of this research inform the extent to which the risk of burn injuries is affected by the use of boiling-water taps.** In compiling the information, the risks for young children were prioritised, given that serious hot water burns are mostly prevalent in this age group.

The research and report are divided into four parts.

- Chapter 1
A questionnaire sent to Quooker users about the use of their boiling-water tap
- Chapter 2
A comparison of Quooker users with a random test from the Dutch population about the use of boiling water.
- Chapter 3
An in-depth assessment of burns caused by the Quooker boiling-water tap.
- Chapter 4
An analysis of the postal codes to map the socio-economic characteristics of Quooker users.

1. Use of the boiling-water tap

An invitation was sent to a random selection of 5,000 persons from Quooker's customer base inviting them to answer a questionnaire on their use of the boiling-water tap. 1,744 respondents filled in the online questionnaire. How and why the respondents use a boiling-water tap, their perception of safety and their safety behaviour were also assessed.

1.1 Reason for purchase

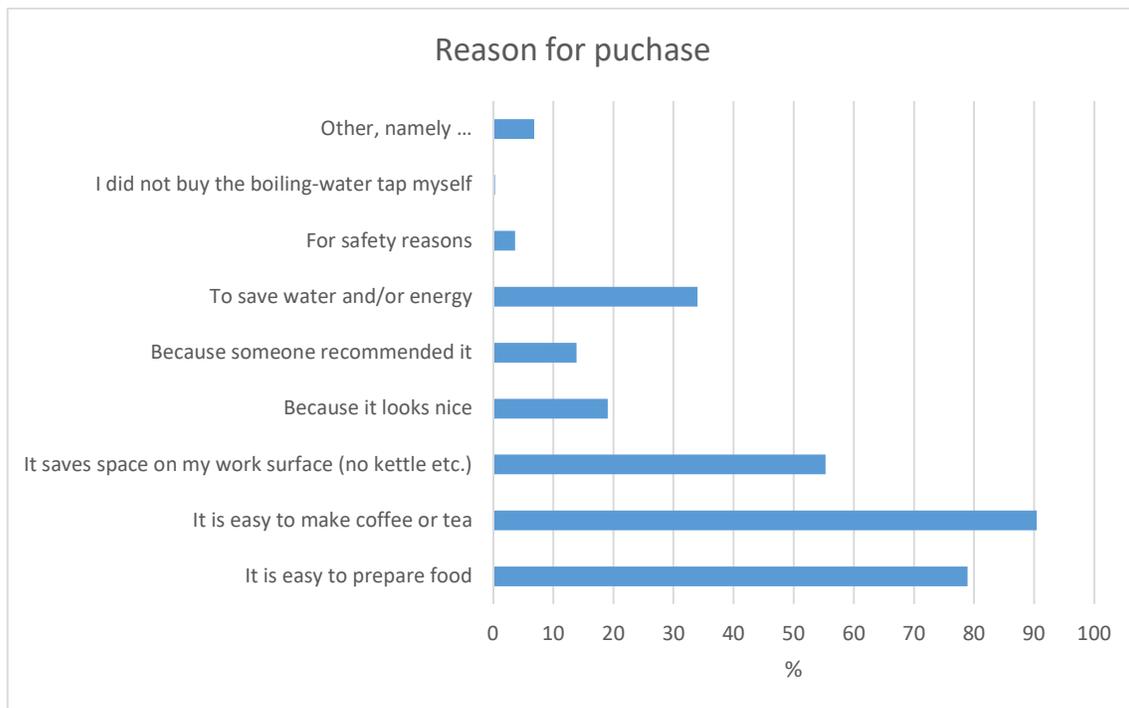


Fig. 1) 'Why did you purchase a boiling-water tap?'

The most commonly cited reason for the purchase of a boiling-water tap is that it is easy to make coffee or tea (90%), easy to use to prepare food (79%) and that it saves space on the work surface (55%).

1.2 Type of use

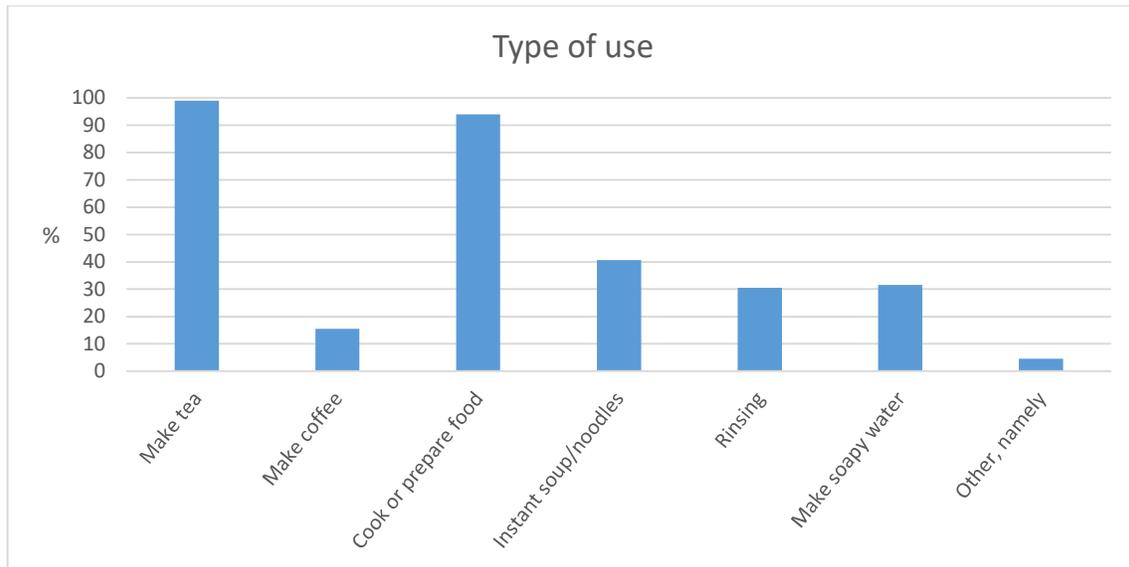


Fig. 2) 'What do you use the boiling water from the boiling-water tap for?'

The boiling-water tap is primarily used to make tea (99%) and for boiling or cooking food (94%).

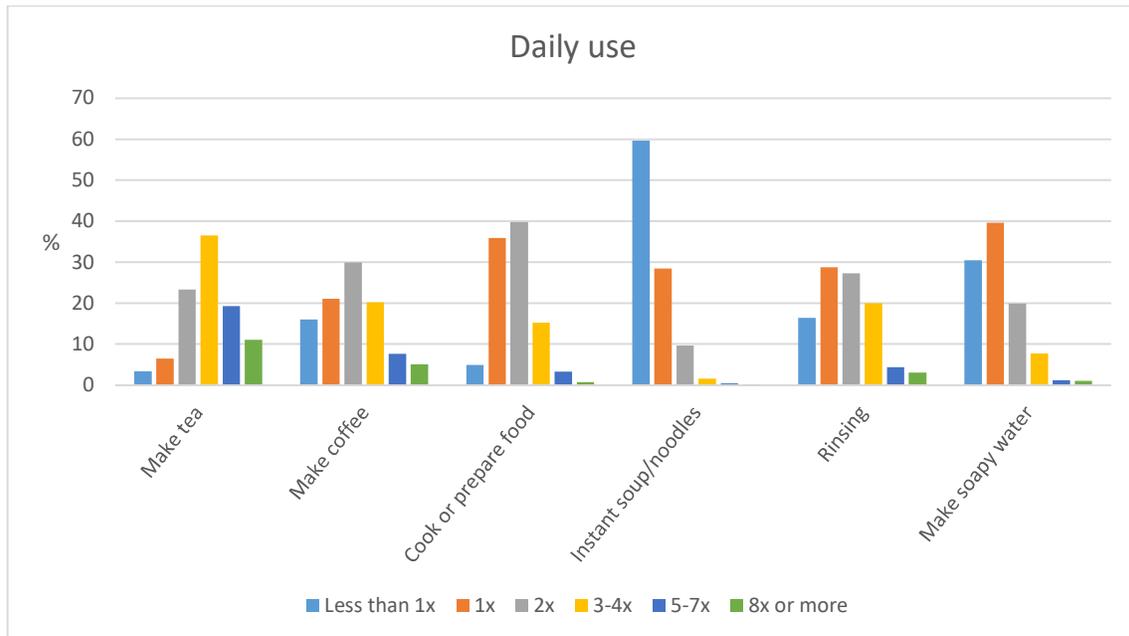


Fig. 3) 'About how many times a day do you use boiling water from the boiling-water tap for the purposes listed below?'

Making tea with the boiling-water tap is done 3-4 times a day on average.

1.3 Perception of safety

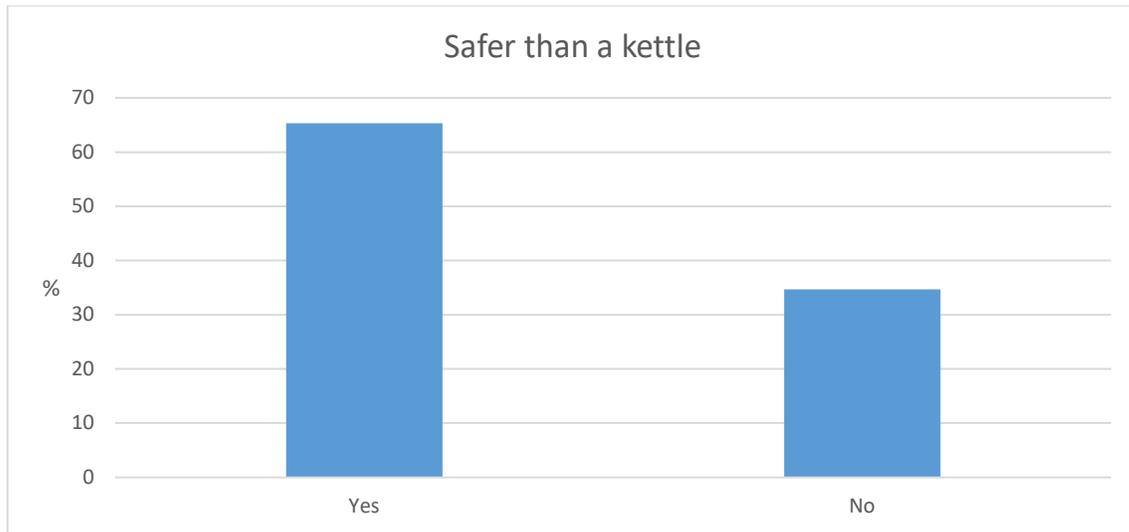


Fig. 4) 'Do you think that the boiling-water tap is safer than a kettle?'

65% of the respondents believe that the boiling-water tap is safer than a kettle; 35% do not think this is the case.

The main reason that the boiling-water tap is perceived as safer than a kettle is the safety ring mechanism on the tap and the fact that the tap is attached to the work surface.

Score	Number	Percentage
0	3	0%
3	2	0%
4	6	0%
5	17	1%
6	33	2%
7	155	10%
8	563	36%
9	522	33%
10	262	17%
Average	8.5	

Table 1) 'How safe do you think the boiling-water tap is to use?'

On a scale of 1 to 10 for the safety of the tap, the respondents gave an average score of 8.5.

1.4 Use by children

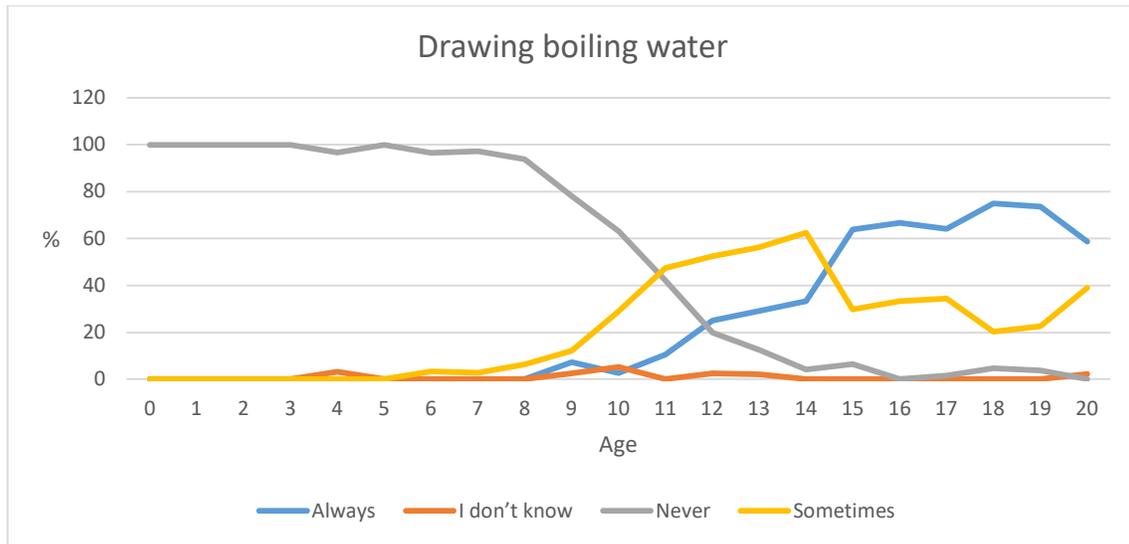


Fig. 5) 'Do children living at home draw boiling water from the boiling-water tap?'

The average age that children start to use the boiling-water tap is 11 years old.

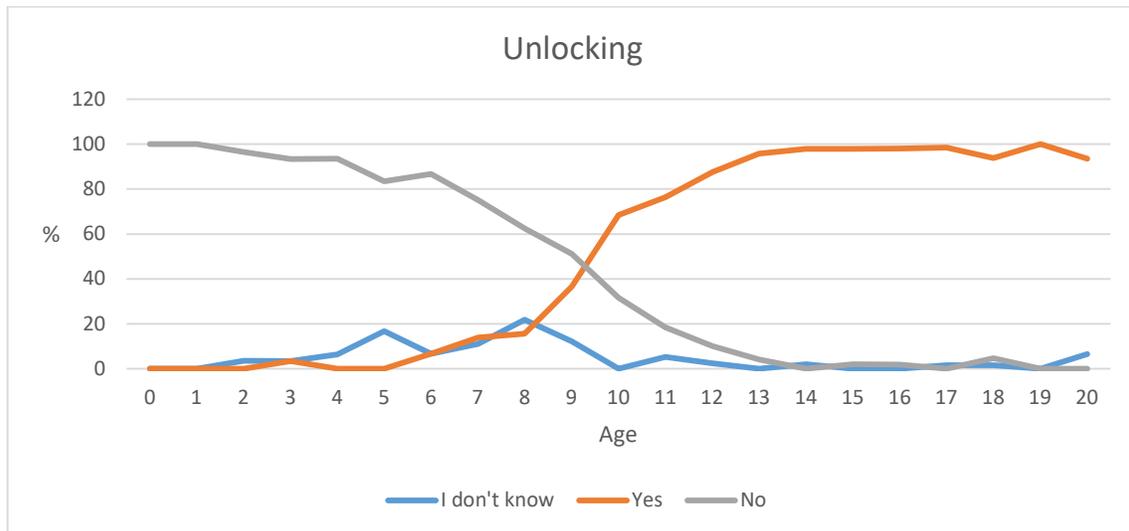


Fig. 6) 'Can children living at home unlock the safety function of the boiling-water tap?'

The average age that children start being able to unlock the boiling-water tap is 9 years.

1.5 Safety measures

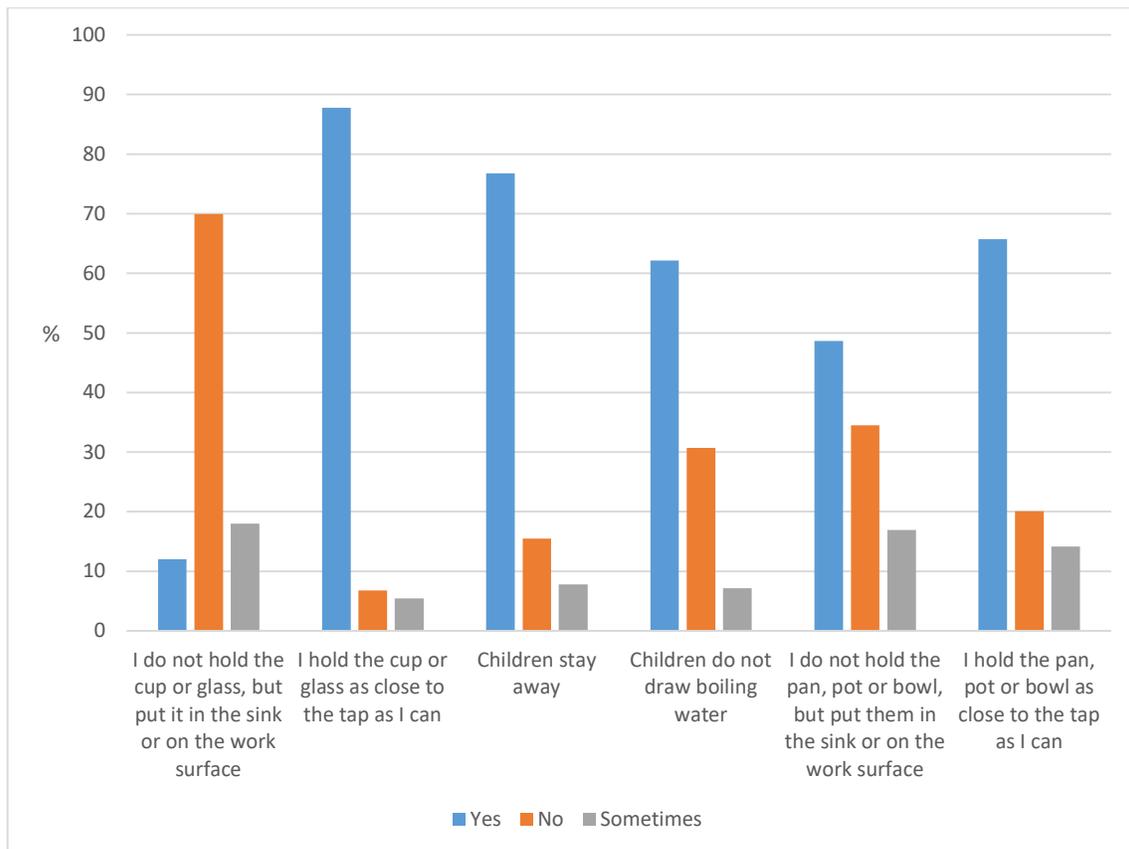


Fig. 7) 'Do you take the measures below when drawing boiling water?'

Most respondents (70%) do not put a cup or glass down in the sink or on the work surface when drawing boiling water but hold it. The cup or glass is usually (88%) held as close to the tap as possible.

Many respondents make sure that children stay away when they draw boiling water (77%) or make sure that children do not draw boiling water (62%).

2. Differences in the use of boiling water

The results of the online questionnaire among Quooker customers were compared to a random test (n = 1050) representative of the population of the Netherlands. In this random test, an online questionnaire containing similar questions was compiled about the use of boiling water. It primarily assessed the use of the kettle among the randomly selected respondents compared to the use of the boiling-water tap by the respondents in Quooker's customer base.

2.1 Type of use

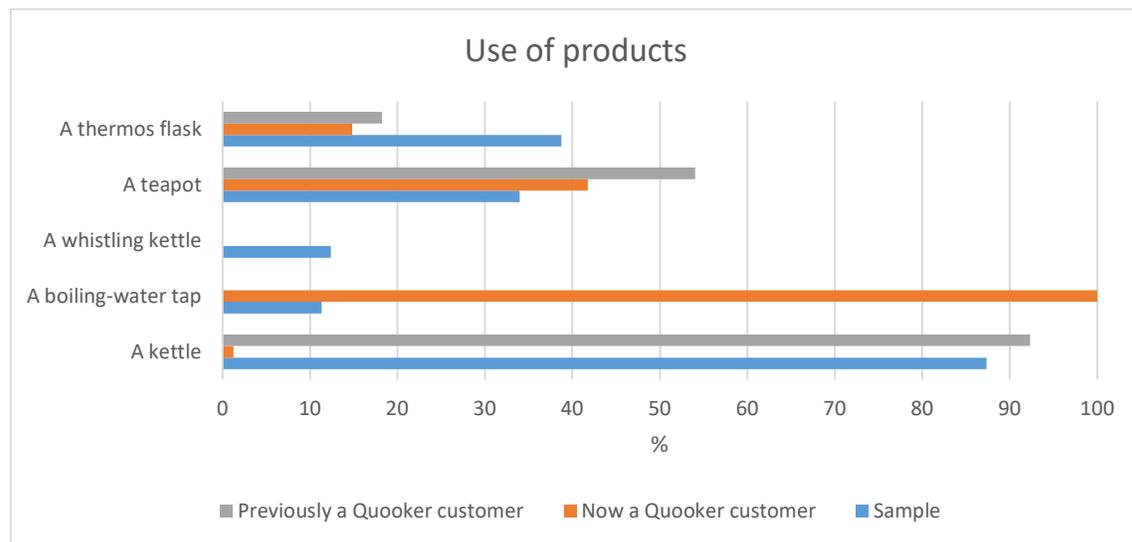


Fig. 8) 'Do you use the products below?'

After using the boiling-water tap, Quooker customers largely reduced their use of kettles. Previously, 92% of Quooker customers used a kettle. This is now 1.26%. The use of a kettle *before* purchasing a boiling-water tap among Quooker customers (92%) and the sample (87%) was about the same.

The drop in the use of the teapot after purchasing the boiling-water tap was smaller (from 54% to 42%).

Quooker customers use teapots more often (42%) than average (34%).

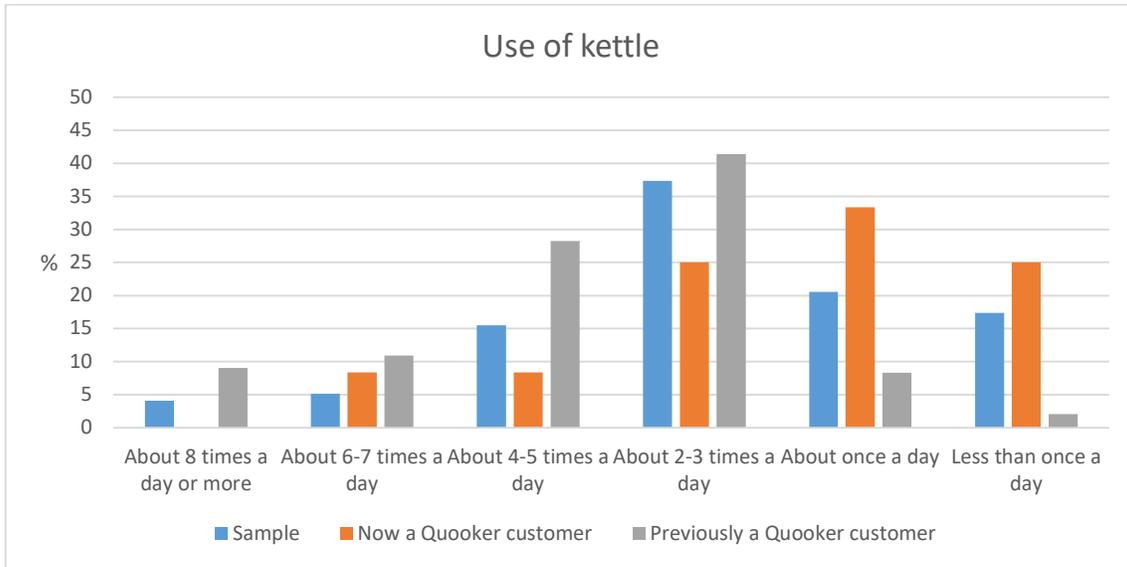


Fig. 9) 'How often do you use the kettle in one day (for this question, take a weekend day)?'

Before purchasing the boiling-water tap, Quooker customers used kettles more often than average.

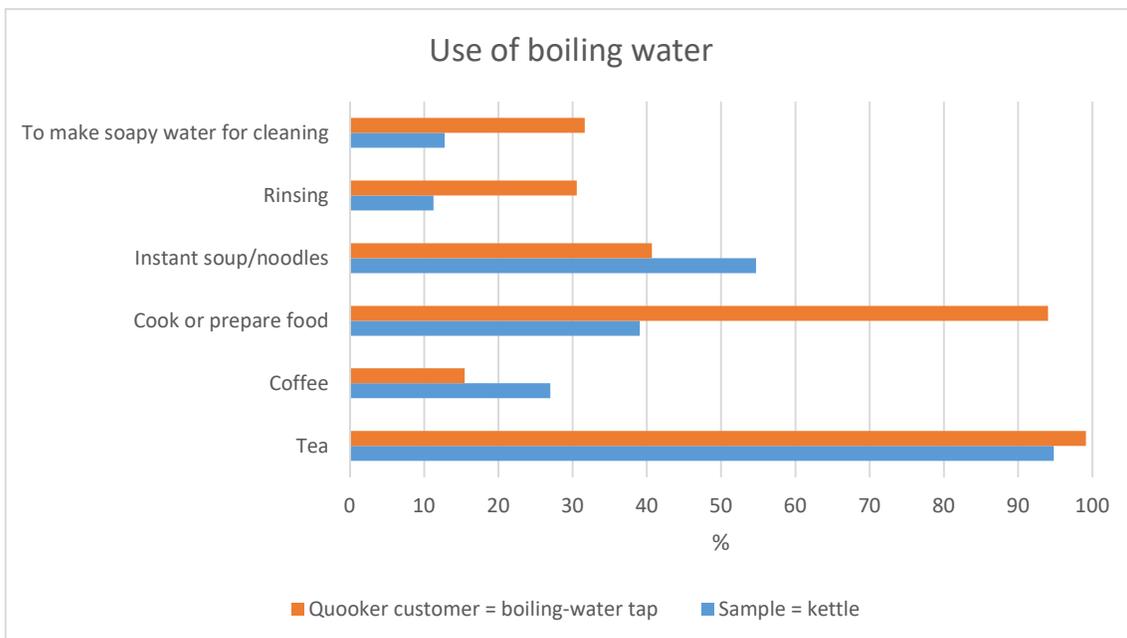


Fig. 10) 'Do you use the boiling-water tap/kettle to boil water for ...'

When soapy water is made for cleaning, this is done more often with boiling water among boiling-water tap users (32%) than among users with kettles (13%).

Boiling-water taps are used much more often (94%) for boiling water for cooking than kettles (39%).

2.2 Safety measures

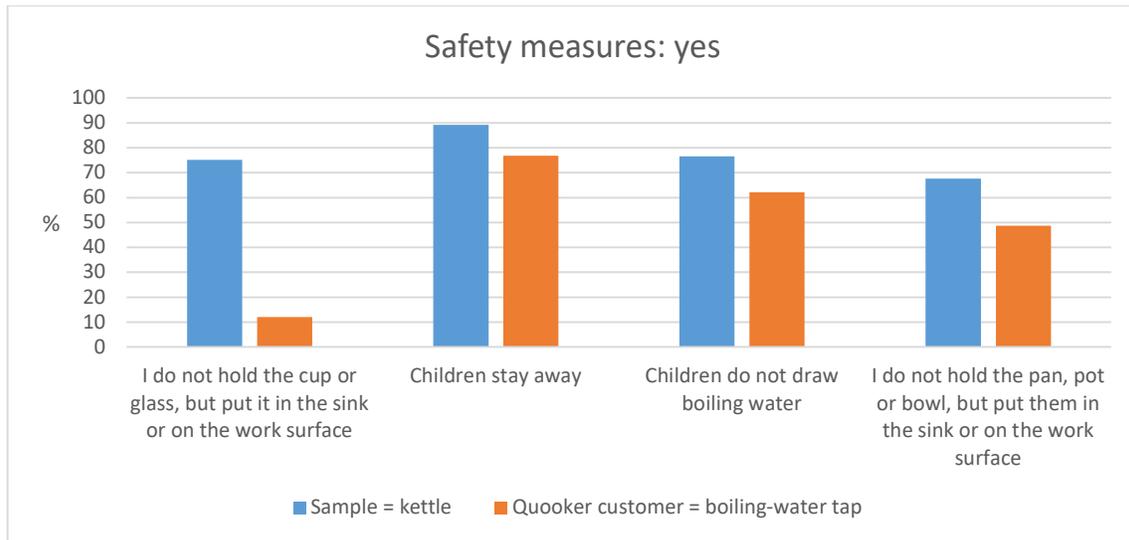


Fig. 11) 'Do you take the measures below when pouring boiling water?' Answer: 'Yes'

In general, Quooker customers take fewer safety precautions when using boiling-water taps than the sample takes when using kettles.

2.3 Use by children

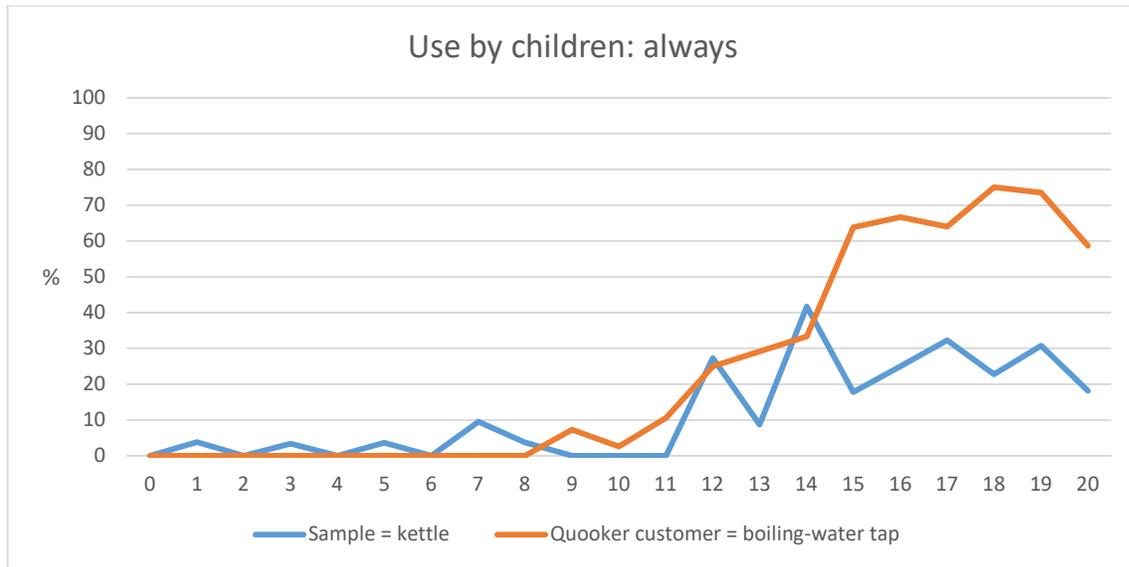


Fig. 12) 'Do your children living at home use the kettle/boiling-water tap?' Answer: 'Always'

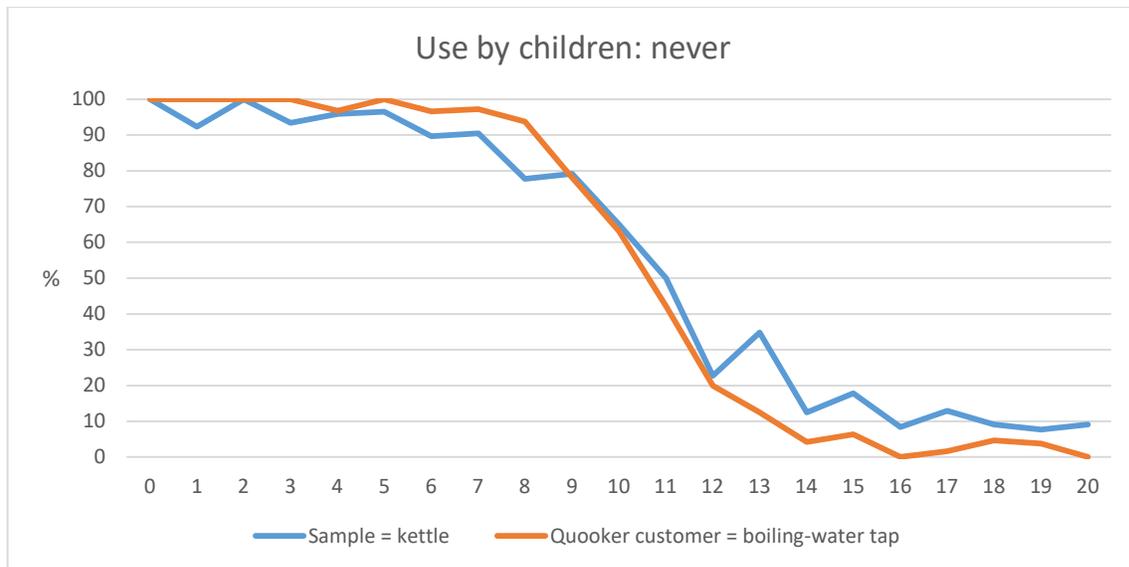


Fig. 13) 'Do your children living at home use the kettle/boiling-water tap?' Answer: 'Never'

The age at which children use boiling-water taps is the same as the age at which children use kettles: 11 years on average. What does stand out is that more older children (>15 years) use boiling-water taps than kettles.

3. Burns from boiling-water taps

The online questionnaire answered by 1,744 Quooker customers enquired about any burn incidents, regardless of the severity, caused by the boiling-water tap. The respondents who answered 'yes' were then asked for their contact details. These respondents were then invited to fill in an online questionnaire containing more detailed questions about the burn incident. In total, 37 victims answered this questionnaire.

3.1 Characteristics of the victims

Burn	Number	Medical care required	Number	Take part in the survey
Burn	100	Not necessary	92	33
		Doctor/health centre	4	3
		Emergency	2	
		Other	2	1
No burns	1,458			
I don't know	12			
Missing	174			
Total	1,744		100	37

Table 2) List of the number of burns caused by the boiling-water tap and required care.

Age		
	With burn	Total respondents
Average	51	57
Standard deviation	15.47	11.52
Median	52.5	58
Minimum value	15	18
Maximum value	75	100

Table 3) Age of the respondents with burns caused by boiling-water taps

The average age of the burn victims (51) is more or less the same as the average age of the 1,744 Quooker customers who had filled in the previous questionnaire (57).

3.2 Cause

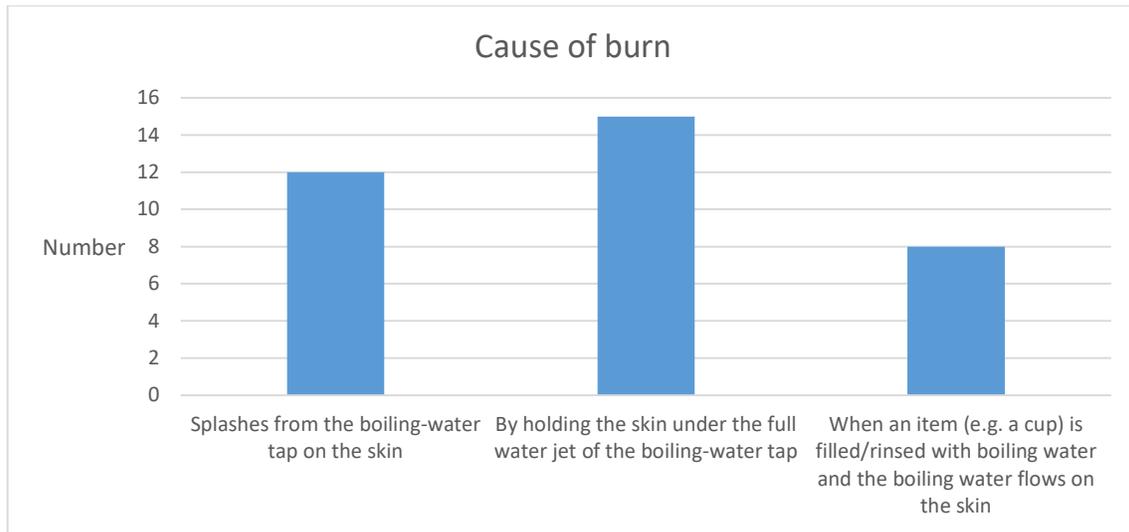


Fig. 14) 'How did the burn come about?'

In answer to the question if the skin was consciously held under the boiling-water tap, 6 persons answered 'yes'. 3 of them were not aware that the water was so hot. 28 victims did not consciously hold their hands under the tap. None of the victims had tested whether they could move their hands through the jet of water.

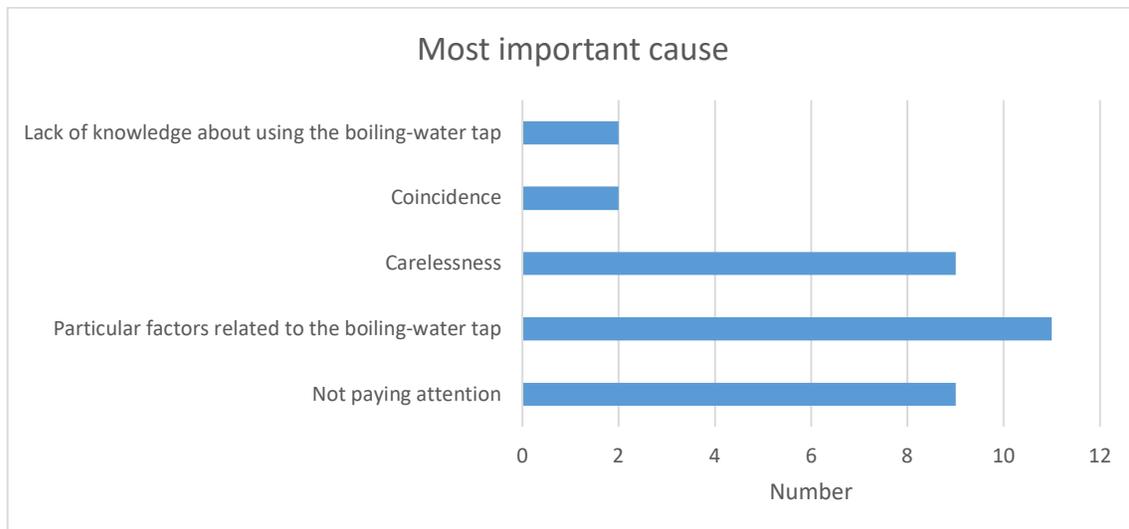


Fig. 15) 'What do you perceive to have been the most important cause of the burn incident?'

Of the 11 victims that answered that the most important cause of the incident was 'particular features of the tap', 7 described the splashing of the tap as the cause.

3.3 Influential factors

1 of the victims had a physical disability at the time of the burn incident. In the case of the other 32 victims there were no physical disabilities, reduced judgement ability, dementia or mental disability. 4 respondents did not answer this question.

None of the victims said that they were under the influence of anything that may have affected their judgement (e.g. alcohol or drugs) at the time of the incident. 4 respondents did not answer this question.

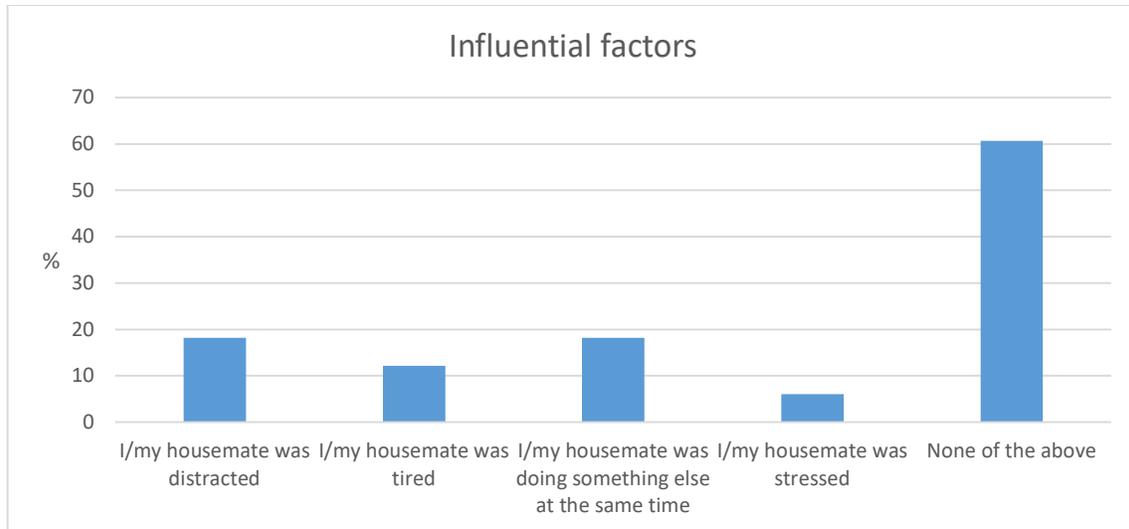


Fig. 16) 'Did the factors below have any effect on the burn incident?'

Psychological factors such as stress, fatigue or distraction affected about 40% of the cases of burn incidents.

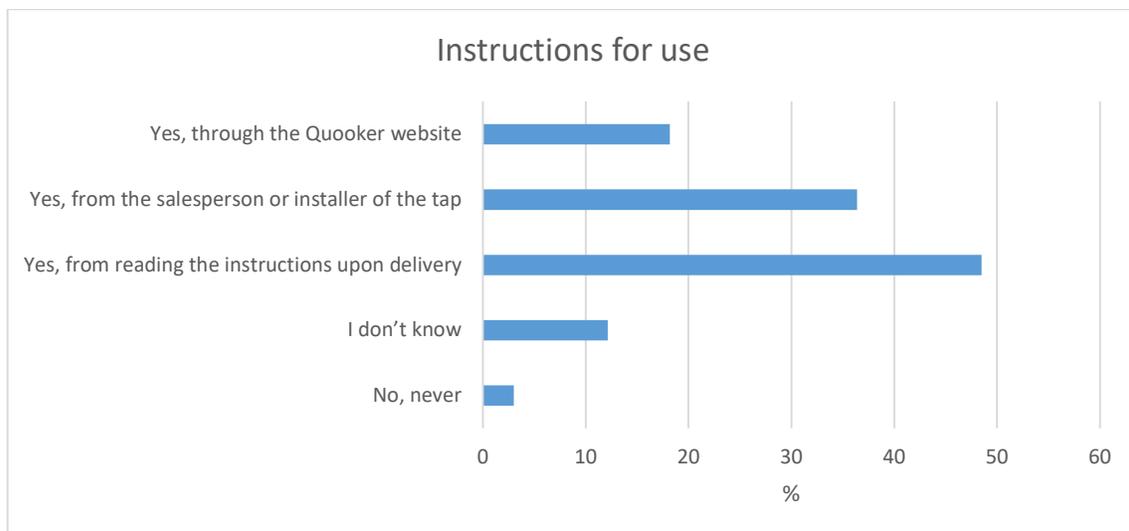


Fig. 17) 'Did you/members of your household receive instructions on the correct use of the boiling-water tap?'

1 victim said not have been informed about the correct use of the tap. The other victims received instructions through different channels or looked up the correct use of the tap.

3.4 Safety conscious

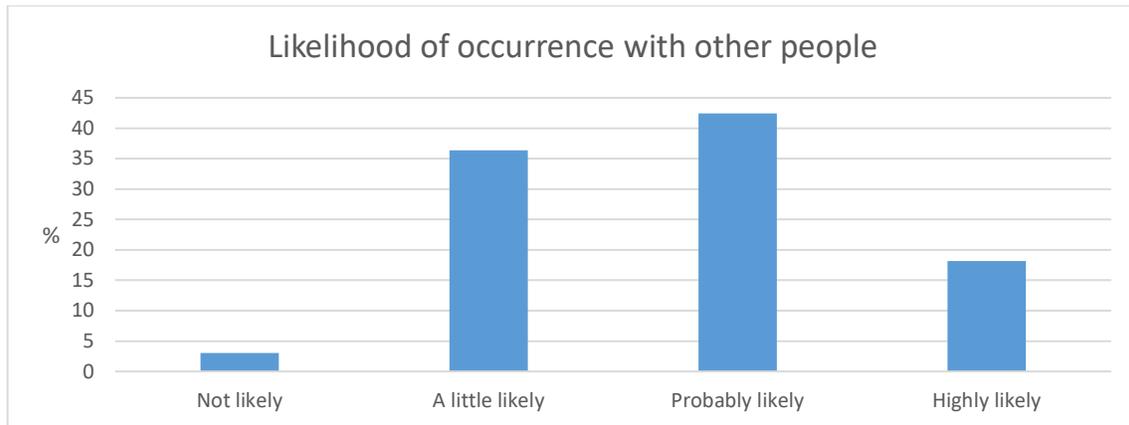


Fig. 18) 'Do you think there is a chance that this burn incident could happen to other people?'

42% of the victims believe that there is a realistic chance that the burn incident could also happen to other people.



Fig. 19) 'Finally, we would like to ask you what fire safety equipment you have at home?'

The number of fire safety equipment items that victims have at home is about the same as the number of fire safety equipment items that the average person has. This shows that the degree of safety awareness among victims is about the same as that of the general population.

3.5 Symptoms of the burn

Number respondents	Care	Number x 1-euro coin	Number x 1 bank card	Symptoms
1	Doctor/health centre		10	Redness
1	Doctor/health centre		2	Blisters
1	Doctor/health centre		4	Blisters
1	Doctor/health centre	1		Redness
2	Not necessary	Forgot		Redness
1	Not necessary		1	Blisters and open wound
1	Not necessary		1	Redness
4	Not necessary	1		Redness
1	Not necessary	2		Blisters
7	Not necessary	2		Redness
2	Not necessary	3		Redness
1	Not necessary	4		Blisters
1	Not necessary	<1		Blisters
11	Not necessary	<1		Redness
1	Not necessary	<1		None
1	-	-	-	-

Table 4) Overview of the size, care required and the symptoms of the burn.

Most victims (n = 32) did not need professional care for the burn and in most cases (n = 28) the burn was no larger than 1 or a few 1-euro coins. The symptoms were mostly redness and/or blisters. There was 1 open wound.

Case 1:

A 22-year-old with a burn the size of 4 x a bank card with blisters. The care of a doctor or healthcare centre was needed. She was startled by the splashing of the tap after being turned off (splashes on her hand) and spilt a mug of tea with boiling water causing the water to run down her stomach. She had been given instructions by her mother on using the tap.

Case 2:

A 55-year-old with a burn with blisters the size of 2 bank cards. The care of a doctor or healthcare centre was needed. The person was washing a pan under the boiling-water tap and was distracted. The most important reason: not paying attention. Information on the use of the tap had been gathered from Quooker's website.

Case 3:

A 64-year-old with a burn with redness the size of 10 x a bank card. The care of a doctor or healthcare centre was needed. The person was startled by workers on the balcony. The shock response caused the burn. Had received instructions on the use of the tap from the installer.

Case 4:

A 54-year-old with a burn with redness the size of 1-euro coin. The care of a doctor or healthcare centre was needed. While filling a measuring cup boiling water flowed over the hand. Is now more careful when using the tap. Was given instructions by the installer. Indicates a lack of knowledge about the use of the tap as the most important cause.

Case 5:

A 66 year old with a burn with blisters and an open wound the size of 1 bank card. Did not need medical care. Held the affected skin under the water jet. Was doing something else at the time of the accident and was stressed. Cooks a lot and is often busy, in haste and not careful. Received instructions about the use of the tap by reading the instructions on the Quooker website. The most important reason: not paying attention.

Table 5) The most serious burns case

4. Socio-economic and demographic characteristics of boiling-water tap users

Quooker customers that register the boiling-water tap for a guarantee are required to submit their postal codes. Of these registered customers (n = 64400), the first 4 figures of the postal code (neighbourhood level) were used for a postal code analysis. The postal code analysis was done by comparing the average socio-economic data of neighbourhoods in the Netherlands with the socio-economic data of the neighbourhood in which the boiling-water tap user lives. The data on the status score according to postal codes came from the Sociaal Cultureel Planbureau (The Netherlands Institute for Social Research). The data on income, percentage of non-Western migrants and urbanisation according to the postal code came from the Centraal Bureau voor de Statistiek (Statistics Netherlands).

The questionnaire on the use of the boiling-water tap also asked the age and the level of education of the respondents. These data were compared to figures from the Centraal Bureau voor de Statistiek about the age and the level of education of the Dutch population.

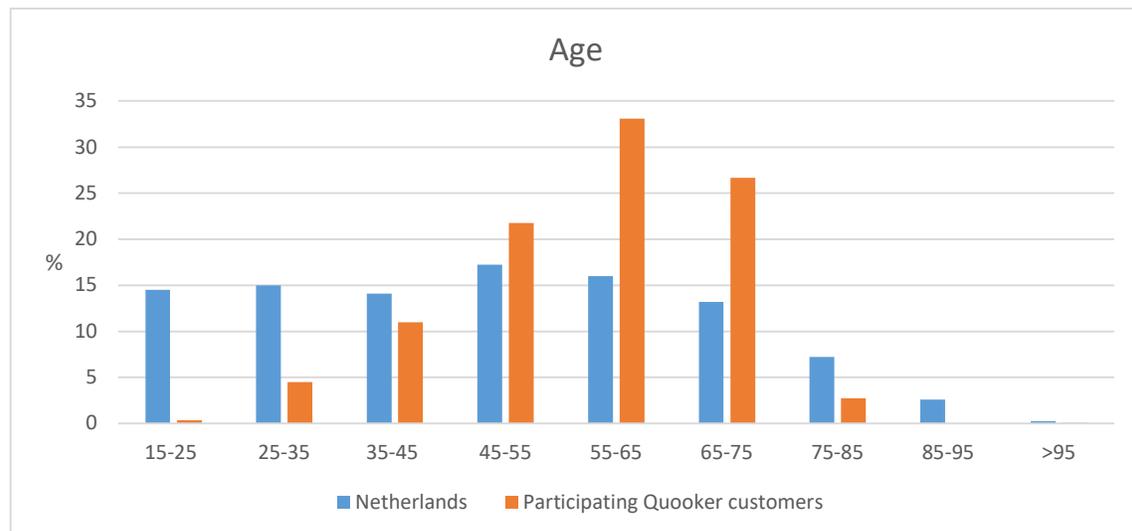


Fig. 20) Age distribution of the Quooker customers who filled in the questionnaire and of the Dutch population.

The age of the 1,544 respondents from Quooker's customer database is not representative of the Dutch population aged 15 years and above. The average age of the respondents is significantly older.

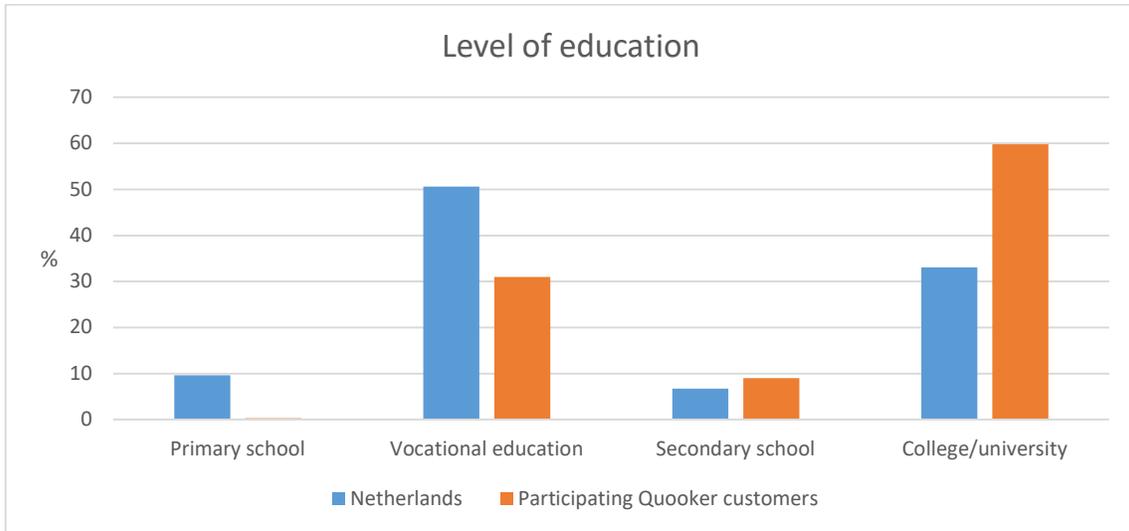


Fig. 21) Educational level distribution of the Quooker customers who filled in the questionnaire and of the Dutch population.

The level of education of the 1,544 respondents from Quooker’s customer database is not representative of the Dutch population aged 25 years and above. On average the respondents are more highly educated.

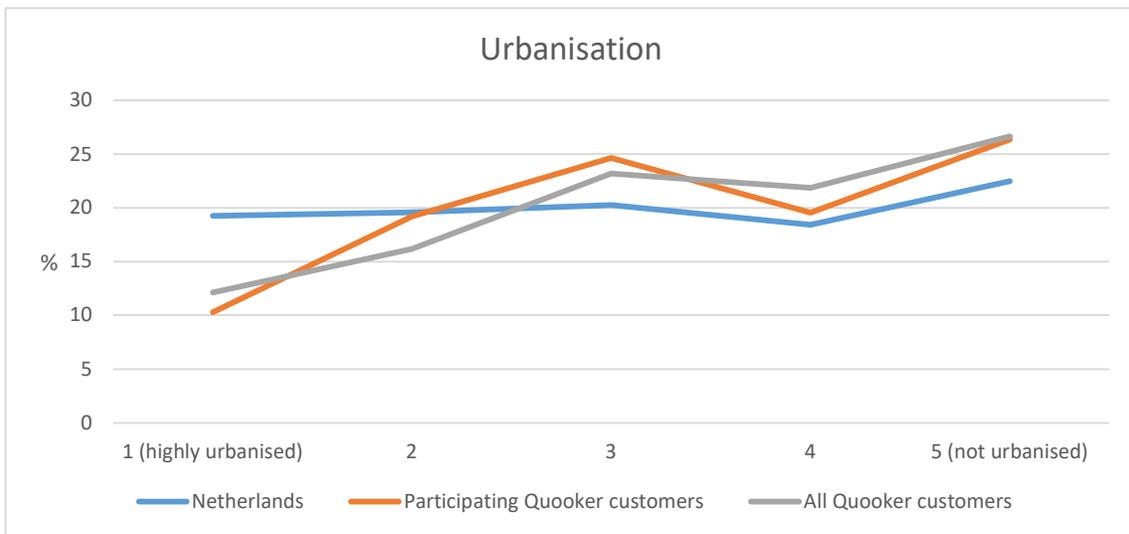


Fig. 22) Distribution of the degree of urbanisation in the postal code areas of the Quooker customers who filled in the questionnaire, all Quooker customers and of the Dutch population.

On average, boiling-water tap users live more often in less urbanised to non-urbanised areas than the average person in the Netherlands.

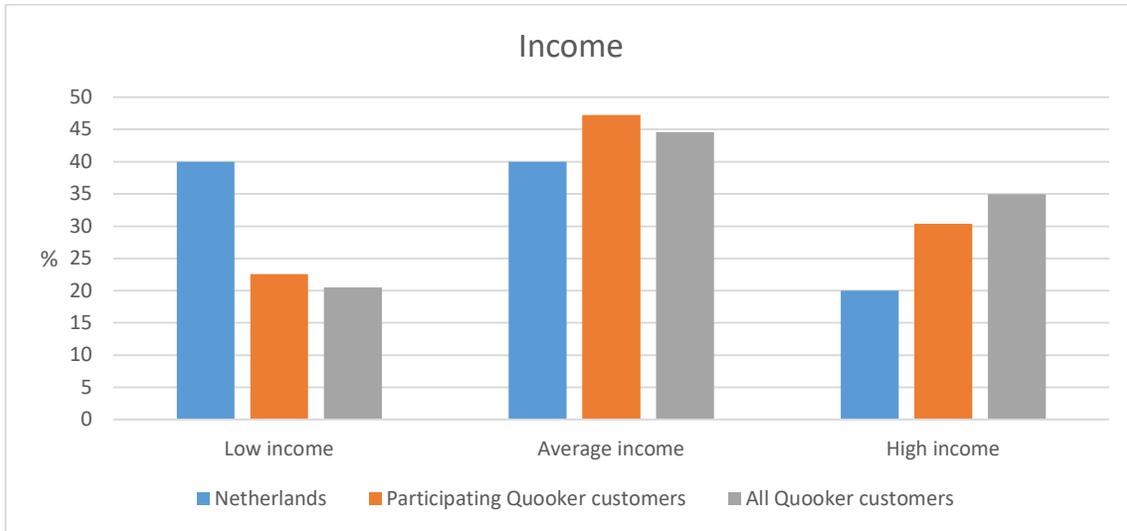


Fig. 23) Distribution of income in the postal code areas of the Quooker customers who filled in the questionnaire, all Quooker customers and of the Dutch population.

The incomes in the neighbourhoods of boiling-water tap users are on average higher than in the neighbourhoods of the average person in the Netherlands.

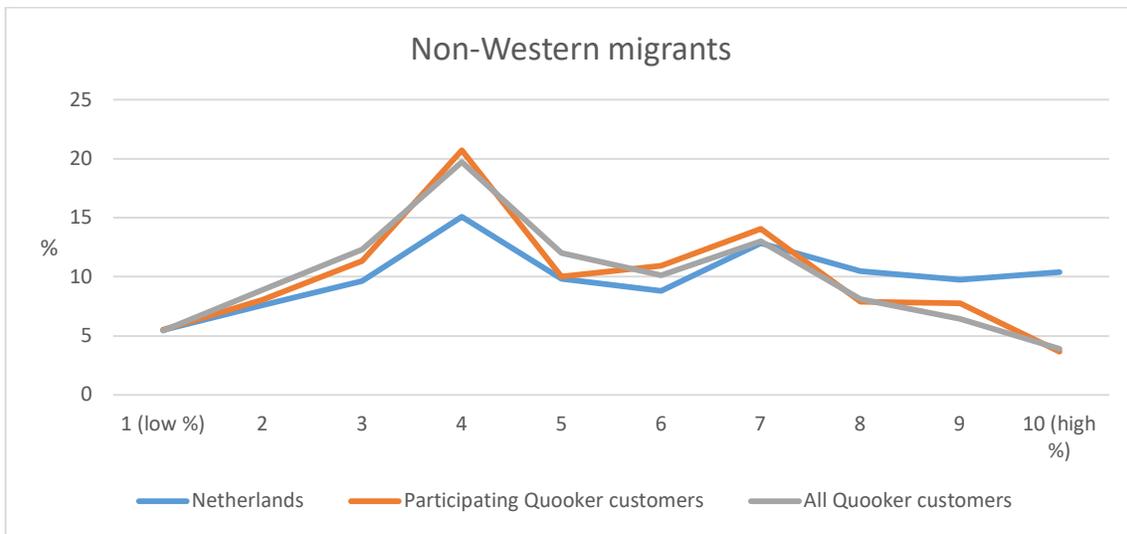


Fig. 24) Distribution of the percentage of non-Western migrants in the postal code areas of the Quooker customers who filled in the questionnaire, all Quooker customers and of the Dutch population.

On average, boiling-water tap users tend to live in neighbourhoods with a lower percentage of non-Western migrants than the average person in the Netherlands.

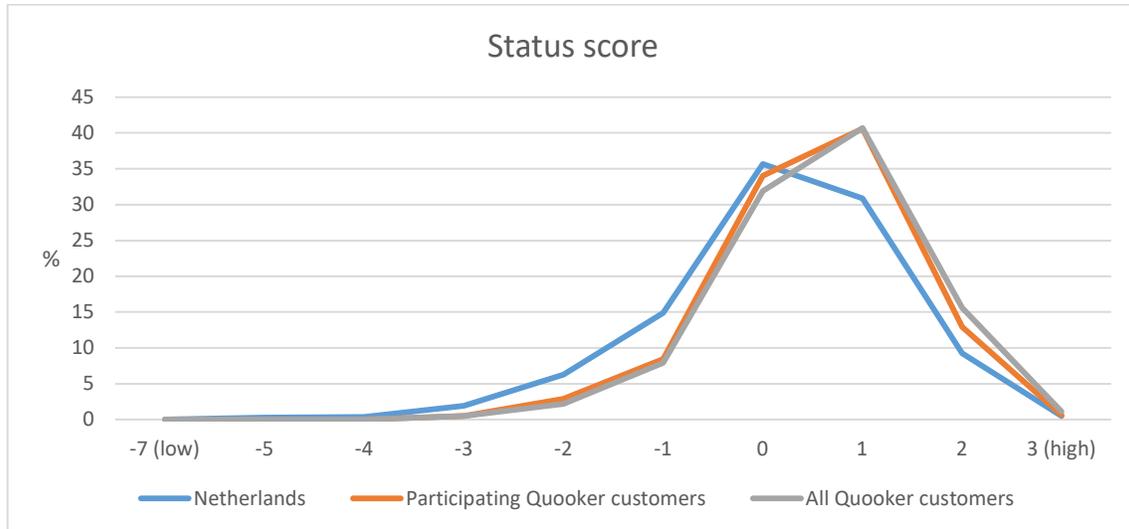


Fig. 25) Distribution of the status score in the postal code areas of the Quooker customers who filled in the questionnaire, all Quooker customers and of the Dutch population.

The status score (based on income, education and position in the labour market) of the neighbourhoods of boiling-water tap users is on average higher than the neighbourhoods of the average person in the Netherlands.

Summary of results and discussion

The average age of the respondents is 57 years. It cannot be ruled out that only the older boiling-water tap users answered the questionnaire, but it can be assumed that the average age of boiling-water tap users is around 57 years.

The average level of education of the respondents is high. Again, it cannot be ruled out that only boiling-water tap users with a high level of education filled in the questionnaire. Nevertheless, it can be assumed that the average level of education of boiling-water tap users is higher than the average Dutch population. This also appears from the postal code analysis that was done on the four-figure postal codes of a large number of Quooker customers. On average, Quooker customers live in neighbourhoods with higher incomes and a higher status score than average in the Netherlands.

On average, Quooker customers live in less or non-urbanised areas. Quooker customers also live more often in neighbourhoods with a lower-than-average percentage of non-Western migrants than the average in the Netherlands.

The boiling-water tap is mostly used to make tea. The boiling-water tap is used instead of a kettle for making tea. Very few boiling-water tap users still have a kettle. One important reason for purchasing a boiling-water tap is to save space on the work surface. Many boiling-water tap users, however, still use a teapot. The boiling-water tap only replaces teapots to a limited extent. Boiling-water tap users tend to make more tea than average.

The boiling-water tap is also frequently used when cooking. The time that pans are on the cooker can thus be shortened and the time that pans can be knocked over is shorter. However, there is more moving of boiling water.

The boiling-water tap is also regularly used to make soapy water for cleaning. While filling a bucket with hot soapy water is not a cause of many accidents among young children (van Zoonen, 2019), it can cause serious burns. The research shows that soapy water made with boiling water often replaces soapy water made with hot water.

Boiling-water tap users perceive the boiling-water tap as very safe (score: 8.5) and view the boiling-water tap as safer than a kettle. The most important reason given is that the tap has a safety ring mechanism and that the tap is attached to the work surface. The confidence in the safety of the tap also emerges from the fact that there are fewer safety precautions taken when using the boiling-water tap than when using the kettle.

On average, Quooker's boiling-water tap is used from age 11 years onwards. This is equivalent to the age of kettle users. 11 years is thus apparently viewed as an age at which children have an understanding of using boiling water safely. Children can unlock the Quooker boiling-water tap from about the age of 9.

34% of the accidents are caused by splashing water from the tap; 39% by holding the hand under the full jet of water; and 20% when filling an item such as a cup. Strikingly, the burn wounds in cases of 'the hand under the full jet' and 'filling an item' are less severe than the wounds caused 'by splashing water from the tap'.

In 78% of the cases the victim was informed through different means about using the tap. Only 3 victims indicated that more information is needed about usage or that a lack of knowledge was the cause of the accident.

In about half the burn incidents, the lack of concentration (because of distraction, stress, fatigue, not thinking, not paying attention) was the biggest cause.

The perception of a high degree of safety may make it more likely that people act subconsciously. However, boiling water always has a degree of risk. It could thus be that the experience of feeling safe actually increases the risk of burn injuries.

In the other half of the burn incidents, particular features of the tap were the most important causes. In these cases, splashing from the tap and the associated shock response was cited the most.

Many victims believe that there is a realistic chance that the burn incident could have happened to other people. This points to the fact that it could be a preventable accident mechanism rather than a coincidental accident.

Conclusion

The boiling-water tap replaces the kettle, which is a significant risk product for burn incidents among young children. Previous research looked at the number of serious burn incidents among young children in Dutch burns units. This research did not find any burn incidents from using boiling-water taps (van Zoonen, 2019). It thus seems that by replacing kettles with boiling-water taps, the risk of serious burn incidents among young children is reduced. However, analysis shows that the socio-economic and demographic characteristics of Quooker users are different from the risk group in the research. It is therefore not possible to definitively conclude that the risk of burn injuries among young children decreases with the use of a boiling-water tap. An estimate of the risk of burn injuries, whereby we examined the percentage of the parents with young children that have a boiling-water tap at home (Annex B), does suggest this though.

Literature

1. Alnababtah, K., Khan, S., Ashford, R. (2016) Socio-demographic factors and the prevalence of burns in children: an overview of the literature. *Paediatr Int Child Health*, 36(1), 45-51.
2. Dokter, J., Vloemans, A.F., Beerthuisen, G.I.J.M. (2014) Epidemiology and trends in severe burns in the Netherlands. *Burns*, 40(7), 1406-1414.
3. Edelman, L.S. (2007) Social and economic factors associated with the risk of burn injury. *Burns*, 33, 958-965.
4. Park, J.O., Shin, S.D., Kim, J., Song, K.J., Peck, M.D. (2008) Association between socioeconomic status and burn injury severity. *Burns*, 35, 482-490.
5. Stirbu, I., Kunst, A.E., Bos, V., van Beeck, E.F. (2006) Injury mortality among ethnic minority groups in the Netherlands. *J Epidemiol Community Health*, 60, 249–255. doi: 10.1136/jech.2005.037325.
6. Van der Veer, N., Boekee, S., Hoekstra, H. (2020, January) Nationale Social Media Onderzoek 2020. Newcom Research & Consultancy B.V, Enschede.
7. Vloemans, A.F., Dokter, J., van Baar, M.E., Nijhuis, I., Beerthuisen, G.I., et al. (2011) Epidemiology of children admitted to the Dutch burn centres. Changes in referral influence admittance rates in burn centres. *Burns*, 37: 1161-7.
8. Van Zoonen, E.E., Pijpe, A., van Baar, M.E., Nieuwenhuis, M.K. van Schie, C.H.M., de Vries, A. (2019, May) Risk factors for burn accidents in children of 0-4 years old. Poster presented during ECPB2019 congress, European Club for Pediatric Burns, Prague.

Annex A. Research summary 'Characteristics of burn incidents among children aged 0 to 4 years'

Characteristics of burn incidents among children aged 0 to 4 years

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Background

Children aged 0 to 4 are admitted to burns units in the Netherlands more often than other age groups. In response, the Dutch Burns Foundation developed prevention projects for this risk group targeted at parents. These prevention projects use the most recent knowledge about the mechanism and the risk factors of burn incidents. Several international studies have been published about this subject, but cultural differences mean that the factors of burn incidents are specific to each country. Dutch literature about the mechanism and risk factors for burn incidents among children aged 0 to 4, however, is almost 20 years old. Therefore, we did this study as we wanted to check if the known mechanisms and risk factors of burn accidents are still relevant and whether there are new factors that we need to consider. The outcomes of this study will help us determine where we can best target our prevention projects.

Methodology

The research is a prospective cohort study in the three burns units in the Netherlands. For one year, between May 2017 and August 2018, all children aged between 0 and 4 years who were treated for burns in the clinics or polyclinics were included.

Personal information, behaviour and spatial information at the time of the burn incident were gathered. These data were extracted by local research staff from electronic patient files. The parents/carers of the children were asked for any data that was missing.

The details of the accidents derived from the collected data were listed.

The risk factors for burn incidents were determined by examining trends in socio-demographic factors at the time of the accident and by seeing if these trends diverged from the average population of the Netherlands.

Results

In total, 510 children with burns were included in the study. The average age of children was 18 months and the majority were boys (52.5%). 41.9% of the burn incidents were caused by a cup of hot liquid, usually tea (27.8%) or coffee (8.2%). After incidents with a cup of hot liquid were accidents caused by touching heating units (8.4%). Accidents with a cup of hot tea were more frequent in the 2nd year of life, while accidents through touching a heater usually occurred in the 1st year of life. More children lived in neighbourhoods with an average lower socio-economic status, a higher percentage of non-Western migrants, and in more urbanised areas than average. Burn incidents did not generally occur more often in single parent households except for accidents with cookers or hot oil. The risk of burn incidents among the eldest child in the family was higher than for their younger siblings.

Children with two parents born abroad were 2.5 times more likely to incur burn incidents than children whose parents were born in the Netherlands. Children with parents born in countries with a recognised refugee status had an even higher risk. Burn incidents with hot tea were more common among children whose parents were born in countries with a tea culture (e.g. Morocco and Turkey).

Most (71.7%) accidents occurred in or around the home of the child, mostly in the kitchen (43.5%) or in the living room (34.9%).

In 84% of the cases the children themselves had caused the accident. Accidents with cups, pans or kettles usually occurred when children were standing and poured the contents of the cup, pan or kettle over themselves. Accidents with teapots mostly (47%) occurred when children were sitting down. 2.3% of the children were sitting in the lap of an adult at the time of the accident. Most accidents happened in the presence of a parent or carer. In 85.6% of the cases the parents or carers were in the same space as the children and 57.5% saw the accident happen. It was usually the mothers who were caring for the children at the time of the accident. Accidents rarely happened (1.3%) when professional carers or staff of educational institutions were responsible for the children. Grandmothers were looking after the children in 6.2% of the cases.

Most burn incidents occurred between 09:00 and 12:00 and around 18:00, whereby accidents with hot tea occurred more frequently in the morning.

Conclusion

While the most common accident mechanisms generally did not deviate from previously described accident mechanisms in the literature, there are small differences. One example is that the way coffee is made has changed over the years so that there were fewer accidents when making coffee. Further, fewer accidents with kettles were caused by pulling the cable, perhaps because of the introduction of cordless kettles. There are also small differences in the risk factors for burn incidents. It is known that children with a migrant background are at greater risk. This research shows that children with a refugee status are at even higher risk. The research also shows that accidents with hot tea occur more often among children of Turkish and Moroccan parentage. The Netherlands has a relatively high number of people of Turkish and Moroccan backgrounds than other European countries.

Most burn incidents among children aged 0 to 4 years were caused when, out of curiosity, children were standing and poured a cup of hot tea over themselves. This is striking as up to now the assumption was that many burn incidents occurred when parents with children on their laps accidentally dropped a cup of hot tea over the children. The accidents remarkably frequently occurred in the presence of parents or carers, an indication that it is difficult for parents and carers to anticipate the motor and cognitive development, and thus the skills, of children. Prevention programmes should thus be directed at the development phases of children and their relevant safety precautions.

We found significant risk factors to be: around 18 months of age; a migration background; and living in neighbourhoods with a low socio-economic status. Children with a migration background, and in particular children with a refugee background, are an important target group for prevention programmes. Prevention programmes should also target children from more disadvantaged neighbourhoods.

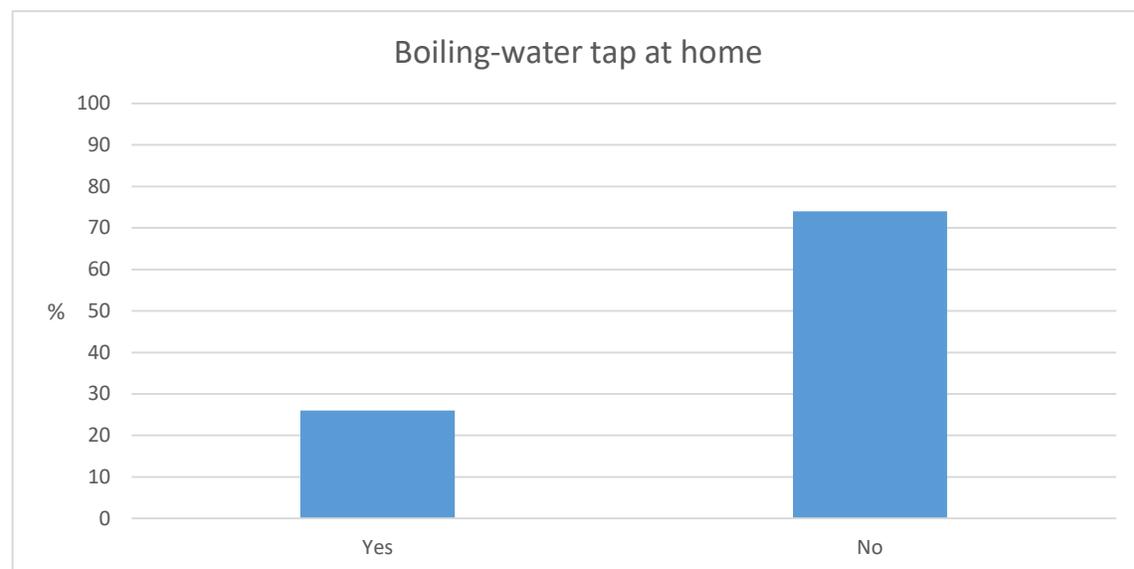
Annex B. Estimate of risk of burn injuries through boiling-water taps

If boiling-water tap users ran the same risk of burn incidents as kettle users, how many children would we expect would have serious burns from boiling-water taps in the above study into *'Kenmerken van verbrandingsongevallen bij kinderen van 0 t/m 4 jaar'* (characteristics of burn incidents among children aged 0 to 4 years, Van Zoonen, 2019)?

To calculate this risk of burn injuries, the number of parents with children aged 0 to 4 years who have a boiling-water tap at home was examined. To gather this information, a poll was run on the 'Facebook' social media platform.

82% of 20 to 39-year-olds in the Netherlands use Facebook and of these, 57% use Facebook every day (Van der Veer, 2020).

The poll was filled in by 2,312 parents of young children (0 to 4-years-old). The socio-economic traits of the parents in the poll were fairly comparable to the average of parents in the population of the Netherlands. The parents lived in slightly more urbanised areas than average and slightly fewer parents with above average incomes responded.



Of the parents, more than 25% say that they have a boiling-water tap at home. Of the parents with a boiling-water tap, almost 71% has a Quooker and 29% another brand of tap.

Looking at the details below, a calculation can then be made of the expected number of patients with serious burns from boiling-water taps in the above study into *'Kenmerken van verbrandingsongevallen bij kinderen van 0 t/m 4 jaar'* (Van Zoonen, 2019).

- 87% of the Dutch population has a kettle (as shown in the sample in chapter 2). This percentage is the same among parents of young children (assumption).
- 25% of the parents of young children in the Netherlands have a boiling-water tap at home (shown in the poll described above).
- A study in burns units in the Netherlands (Van Zoonen, 2019) shows that of the 510 young patients, 20 burn wounds were caused by kettles.

- There are 872,289 kids aged 0 to 4 years in the Netherlands.

Calculation

- 87% of the 872,289 = 758,891 children in the Netherlands has a kettle at home.
- 25% of the 872,289 = 218,072 children in the Netherlands has a boiling-water tap at home.
- 20 of the 758,891 children with a kettle at home had a burn incident with a kettle = 2.6 out of 100,000 children.
- If 2.6 out of 100,000 children with a boiling-water tap at home (218,072 children) would have a serious burn incident with a boiling-water tap, about 6 of the 510 patients in the study in the burns units would have sustained burns from the boiling-water tap.

If the risk of burn injuries would be comparable to that of the kettle, about 6 of the 510 patients in the burns units would have sustained burns from boiling-water taps. However, in the year in which the study was carried out, no burns through boiling-water taps were described in the study. This is an important indication that the risk of burn injuries with boiling-water taps appears to be lower than with kettles.