Patterns of Water

The water related practices of households in southern England, and their influence on water consumption and demand management

Final report of the ARCC-Water/ SPRG Patterns of Water projects

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Executive summary

- This report contains the findings of survey research on the patterns of water using practices in households across the South and South East of England.
- Following a 'practice based' approach to water demand, this research takes practices as the unit of analysis when exploring water use – rather than attitudes, behaviours or simply 'litres used' – and highlights how this changed unit of analysis allows for a deeper understanding of the routines and habits of everyday life that lead to domestic water consumption – washing and personal hygiene, doing the laundry, gardening, cooking etc. A practice approach highlights the diversity of dynamics shaping domestic water demand and can help bring new insights into how to construct interventions, and into the future trajectories of different practices and levels of water consumption.
- The research involved an 1800 respondent survey, conducted in the south and south east of England in the summer of 2011. This survey focused on the range of practices in which water is implicated in the home, in particular, personal hygiene and care, doing the laundry, gardening, cooking and washing up, cleaning the home and other water using activities such as car washing. The survey included questions to probe the 'materials, meanings and skills' of everyday practice associated with water, such as an audit of water consuming technologies in the home and garden, detailed questions on routines and performances of practice, and collected other data such as socio-demographics, presence of meter, and a suite of questions exploring other environmental habits.
- Analysis included both descriptive statistics and cluster analysis techniques to explore the diversity of water consuming practices and to reveal common variants of each practice, identifying similar and recurrent ways in which people in the population perform, in particular, personal cleaning, laundry, and garden watering. Qualitative, face to face semi-structured interviews were conducted with 22 of the survey participants, adding valuable details to our understanding of the patterns observed in the quantitative survey data and the complexities of and reasons behind them.
- The sections below in this executive summary draw out the main findings presented in the report. The main results of the research are presented for household water infrastructure and technologies, for each of the separate water using practices, and for how the practices overall interrelate with one another. The final section then discusses the key implications of the work for contributing to designing interventions and to techniques for forecasting future water demand, pointing the way to future research and applications.

Water infrastructure and household technologies

- Mains water is provided almost universally to the survey population (to 99.9%). 8% also have waterbutts or tanks, while 1% recycle grey and/or black water, usually informally.
- Water metering stands at 46% in the sample, being highest in the east (at 61%) and lowest in the London region (at 23%). Meters have usually been fitted voluntarily,

either by the current resident (38%) or a previous one (24%), or when the house was built (24%). Compulsory fitting is rare.

- Water heating is usually by gas or oil (85%) or/and electric immersion heating (17%). Only two people of the 1802 surveyed (0.1%) said they had solar heating.
- Households have a variety of water using technologies both in and outside the home. All households have at least one sink or basin, 88% have a shower, and 92% have a bath. In the kitchen, 94% have a washing machine, 47% have a separate tumble dryer, and 42% have a dishwasher. 61% have outdoor taps and 57% have a hosepipe.
- Other water using technologies are comparatively rare – presence of all the following stands at (usually substantially) less than 10% of households: hydrotherapy baths or spas, ice makers in the fridge, waste disposal units, humidifiers, air conditioning, Jacuzzis, swimming pools, other outdoor water features.
- Water- and energy-efficient water using technologies are also uncommon or rare, e.g. dual flush toilets (28%), aerated shower heads or taps (1%), water displacement devices (4%), water softeners (6%).

Personal hygiene practices

- 70% of the population have a full body wash at least daily, mostly by showering – over 50% never have a bath. Flannel or other forms of washing are only practiced by 29% of respondents, and is usually complementary, rather than an alternative to, a bath or shower.
- People typically wash to get clean, to freshen up or to smell nice, whilst having a bath is seen by some as a way to relax or ease aches and pains. Less than a quarter ever shower outside the home (mostly at the gym). Nearly half vary their shower length for different reasons, primarily for washing hair (especially among women) and shaving (especially among men).
- Shaving patterns and methods vary greatly between genders, as would be expected, with two thirds of women shaving legs and underarms and over 50% the bikini line, whilst only 15% of men shave anything other than the face (most commonly under arms).
- Over 90% of respondents brush their teeth at least twice a day. Notably, 29% still do so with the tap left running, despite water saving information campaigns encouraging people to turn off the tap.
- Six distinct variants of personal washing were identified in the data using cluster analysis. They vary in terms of the frequency of washing (the number of baths or showers per week), the technology used (the ratio of baths to showers), the diversity between washes (a measure of how many different factors people say influence the length of their showers or the height to which they fill the bath) and how many different places outside the home people shower or have baths – at the gym, at other peoples' homes, at work, or anywhere else.
- The variant of practice a person follows is only weakly predicted by their sociodemographic characteristics and environmental values, although there is a

substantial variation by age, with frequency of showering and bathing being higher on average among younger age groups.

- This poses an interesting question of whether the difference is due to individuals changing their washing practice over the lifecourse, or because younger generations are adopting, and carrying, new, more water and energy intensive washing practices.

Laundry practices

- Laundry practices appear quite homogenous across the population in some respects – 95% of the population have a washing machine and this is the dominant way of washing clothes. Three quarters never change its settings. Washing machines are most commonly run 2-3 times per week, and this increases slowly with the number of people in the household.
- Hand washing is rare, with two-thirds never hand washing and only 6% hand washing more than once a week. It is usually done to preserve delicate items or simply because the label says to do so.
- There is, however, substantial diversity in how often people use clothes and linen before putting them to wash, although outer garments are generally worn more times between washes than undergarments.
- Commonly cited reasons for putting clothes to wash are that they look dirty, smell or need freshening, but also often simply because they have been worn, suggesting influence from norms about appropriate washing frequency rather than an item's actual state of cleanliness.
- In terms of outsourced laundry services, 30% use dry cleaners and 9% use laundrettes, while laundry collection and nappy cleaning services are used by 1% or less of the population.
- Six clusters of laundry practice were identified, with the most common (performed by 36% of the population) being a relatively simple practice in which almost all washing is done in a washing machine that is always run full and the settings of which are never changed, and which involves no use of outsourced laundry services like dry cleaners. The other variants differ from this in terms of the level to which settings are changed, outsourced services are used and the frequency with which the machine is run part full.
- Which variant of washing practice a person performs is at most only very weakly predicted by sociodemographic characteristics such as age, gender, affluence, and family structure, and also only very weakly predicted by the reasons given for why people wash their clothes.
- This implies that tailoring and targeting interventions to particular ways of doing the laundry will be difficult, although at the same time many potential interventions may not need such targeting: everyone could be encouraged to wear clothes more before washing them, for example, to reduce the loads of laundry washed per week, while technologies such as dirt repelling clothes, washing machines with half load settings and more environmentally friendly laundry cleaning methods could also be universally introduced.

Gardening watering practices

- 9 out of 10 people have some kind of outdoor space, 87% having a back garden and 77% a front garden. However, 38% say they have nothing to water outside, perhaps having only artificial surfaces or trees not requiring watering.
- Outdoor space, for those who have it, is most commonly seen as a place for flowers and plants (59%) and/or an outdoor living area (34%).
- Couples, particularly the retired, are the people most likely to see it as a place to grow fruit and vegetables, whilst retired people are the most likely to see it as a place for birds and other wildlife.
- Even among those who do say they have things that require watering, over a quarter do not water them, instead waiting for the rain. This means that only 44% of households actually have outdoor space *and* water it.
- For those who do water their outdoor spaces, the decision about when to water is usually based on how dry things appear (e.g. plants look wilted, soil dry, it hasn't rained for a while), so that in a drying climate, levels of watering might increase.
- Those who actively water their garden tend to be older than average comparing to the rest of the population, usually more likely to be living with a partner, of higher than average affluence and living in a larger detached or semi-detached house which they own rather than rent. This suggests that active gardening can be dependent on having sufficient time, space and finances to support it.
- Low tech rules for watering – most people who water their garden and plants use small containers, buckets or watering cans. Only a third of those who water their outdoor space use hose pipes, or 19% of households including those who don't have any outdoor plants or lawn to water. Around a quarter say they use a water butt, although nearly half of those say theirs does not always have enough water in it for their watering needs. This all has implications for the effectiveness of hose pipe bans: encouraging increased use of water butts and of recycled water systems might be more effective interventions for reducing water use.
- Those with nothing to water meanwhile are more likely to be younger than average, with children, less affluent than average and living in smaller homes, flats or tenements, and more likely renting rather than owning their homes. Whilst about a quarter are likely to stay in this group, as they have no outdoor space, the rest do have some, so could become more active gardeners in future, with potential water use implications.
- As various interest groups are promoting changing gardening practices, from increasing planting of food plants and drought-resilient and native species, to increasing use of shared gardens in tenements and flats, then these social trends could potentially increase levels of active gardening in future, even giving rise to new variants of gardening.

Kitchen practices

- Three quarters of households prepare all, or nearly all, of their meals in the home. The retired and couples with children produce most at home, while younger people prepare the fewest meals at home.
- 94% of households wash vegetables and meat before preparing or eating them, most commonly under a running tap.
- Nearly half of households consume water in the home in addition to or instead of unprocessed tap water, most commonly bottled, but also filtered tap water. Younger people, and those living in the London region, are particularly more likely to drink such alternatives to tap water. 50% of households also run the kitchen tap before drawing water from it for use, for various reasons, most commonly to get it to the right temperature.
- Taps are also left running to rinse recyclates by roughly half of those who recycle. Just over half rinse dishes before washing them, mostly under a running tap, and regardless of whether they use a dishwasher or hand wash them. Only 29% rinse dishes after washing them, again mostly under a running tap. This is lower for dishwasher users.
- 44% of the sample reported having a dishwasher in the home, although it is notable that 22% of these rarely or never use it - it should not be assumed that because a technology is owned that it is used extensively or even at all!
- There was substantial variation in the timing and frequency of washing up, which varied too by dishwasher ownership.
- Our cluster analysis of kitchen practices revealed no variants that were distinctly different from others – all combinations of possible responses to the questions used to define clusters were provided by respondents. This could be because the links between food preparation and cleaning practices in the kitchen are quite complex and/or weak, or that the questions used were not refined enough to pick out the relationships between them.

Vehicle cleaning practices

- Three quarters of households own at least one car, with 40% owning two or more.
- Car washing frequency varies between at least once a month through to less than quarterly for most people.
- About half wash their car(s) at home, usually with just a bucket and sponge. 37% outsource car washing to a professional hand washing service, and 17% to automated services.
- Home mains water use for vehicle washing is therefore likely to be low for many households, although outsourced water use in many cases replaces what would otherwise be used at home to wash vehicles.
- Innovations in professional car washing services, such as those using recycled water or waterless cleaning systems, could therefore reduce water use associated with vehicle cleaning, as could wider policy related to vehicle taxes, public transport

provision, urban planning and road building which in turn influence car ownership and use.

The overall story of household water use

- Individual practices, or their constituent elements, might be expected to correlate, forming stable bundles or complexes under the influence, for example, of a shared norm relating to cleanliness, or common technological constraints. Equally, the diverse, distributed and differing factors which influence the performances of practices could also imply correlations between them will be weak or absent.
- Between variants in personal washing, laundry and gardening practices, we find correlations in particular between laundry and personal washing practices, perhaps shaped by common ideals relating to convenience and cleanliness, or common financial constraints.
- Individual elements of each practice also correlate in some instances.
- However, we find that in general the relationships between water using practices are quite weak or absent.
- Taking a different approach, we analyse the water using practices of a set of five single occupancy households all of whom have close to average overall per capita levels of water consumption. Again, we find substantial diversity between them in terms of the way in which they perform the separate practices.
- Combined with the often weak ability of standard sociodemographic variables and environmental values to predict which variant of a practice a person will follow, the results present a picture of complexity, in which diverse and different factors shape the different practices, in ways not strongly related to sociodemographics or values.
- This has implications for common approaches to understanding and forecasting water demand and to segmenting households into common "types" of water consumer, as both approaches assume households with similar sociodemographic characteristics or similar levels of per capita water consumption will behave and change over time in similar ways. These results demonstrate that behind these assumed-to-be average households lies substantial diversity in practices, which implies diversity too in their future water using trajectories.

Discussion and conclusion

- The research presented in this report has tested a mixed methods approach to "scaling up and out" a focus on practices to increase understanding of how household water use is enacted in everyday life.
- From the revealed diversity in how practices are performed, with a cluster analysis we were able to identify common variants of everyday routines that involve water use, notably those related to personal hygiene, doing the laundry and gardening.
- We find, consistent with earlier research and practices theory, that how a person performs a particular practice is at most only weakly related to their sociodemographic characteristics, environmental values, and the reasons why they

perform it. The data also suggest that how one water using practice is performed also only weakly relates to how other practices are performed.

- These results imply that current models used to predict and forecast overall household water demand based on sociodemographic characteristics and psychological and economic variables fail to account for the complex sociological reality of how water use is constituted, enacted and maintained in everyday life, including what services it provides such as cleanliness, comfort, convenience, and ideas of 'outdoor rooms' and other ideas of the good life in the garden. We outline an approach to supplement such forecasting techniques with descriptions of possible future trajectories in common practices.
- With respect to interventions, the influence of wider systems of provision, social norms, technologies and environmental conditions on individual routines suggests new points of possible entry for influencing more sustainable practices that could be explored in future research.
- Future work could also address some of the limitations of the current research, such as by considering in more detail how practices are shaped by other household members, and the effect of "outsourcing" water use beyond the home through the use of services such as restaurants and laundrettes.
- The approach could also be developed in further work by linking practices survey, qualitative, and other related data to microcomponent and smart meter data, allowing fine-grained analysis of how practices influence water (or other resources such as energy) use, and contributing to projects which attempt to tailor interventions to unique features of the performances of individuals and households, thus avoiding the need to categorise customers into "actionable groups" based on their demographic characteristics.
- In combination with the data above, a periodically repeated practices survey could be a valuable tool in monitoring how practices and common variants change in the population over time, aiding evaluations of the effectiveness of different interventions that aim to increase the sustainability of everyday practices.

1 Introduction

Key points from the introduction

- Current approaches to consumer behaviour construct an idea of an 'average consumer' and miss the diversity with which different water using practices are enacted in homes and other spaces.
- We highlight how demand shifts as different relations within the system come into play, how historical practices persist throughout time, how these different factors become significant in shaping water demand, and through these elements how new and different combinations of practice can form (the concept of distributed demand).
- We highlight how the conceptual approach to understanding 'practices' involves considering the elements of 'images', 'skills' and 'stuff' (or more formally: meanings, skills and materials) that are intertwined with habitual and inconspicuous routines that use water.
- Applying this approach to a study of water use involves shifting from 'individuals' to 'practices' as the units of analysis.

This report contains the findings of research conducted at the Lancaster Environment Centre, Lancaster University and the University of Essex exploring the patterns of water using practices in households across the South and South East of England. This report forms part of a broader three year programme of work conducted through the ARCC-Water and SPRG Patterns of Water projects. This programme of work included an 1800-respondent survey on which this report is based, qualitative interviews with participants of the survey, and six focus groups discussing cleanliness and everyday practice. The quantitative results were also presented at a stakeholder workshop in Lancaster on the 25th June 2012 entitled 'From Sticking Points to Tipping Points: Climate change and the problem of UK domestic water demand'. This research scales up research previously conducted at Lancaster University on the sociology of water use, and drought and demand (Medd & Chappells, 2008; Medd & Shove, 2006). The difference with this research, however, is that it has attempted to apply a different methodology to the study of 'everyday practice', relying less on qualitative research which has been common in previous research and studies, and instead engaging in a methodological 'experimentation' to see if practice based approaches can be scaled up in a quantitative way. This introduction overviews our approach to applying practice theory to the study of water consumption, based on a conceptual approach that we have developed called 'distributed demand'.

1.1 A practice based approach to distributed demand

Current approaches to water consumption calculate demand based on ownership (O), volume (V) and frequency of use (F) (OVF). The resultant data available to inform an understanding of future water demand are however limited, as these traditional approaches mask the diversity and variation of actual consumption patterns, as well as

the drivers of demand. Similarly, conventional approaches of estimating water demand based on simple socio-economic variables (eg, McDonald, Butler, & Ridgewell, 2011) miss great diversity in the performance of different water using practices – washing and personal hygiene, laundering, gardening, kitchen practices, washing the car, etc. Even households with similar overall water use, near the national average level, have been found to be using that water in very different ways across the various sites of water consumption in the home (Medd & Shove, 2006). This research is based on the assumption that there is a need to better understand the dynamics of water demand. Existing quantitative approaches have tended to focus on questions about attitudes and values, economics and the impact of metering on the water demand of household consumers. While these have been of value, they tend to focus attention at the level of the individual consumer, from which strategies of demand management follow. By contrast, the practice based approach draws attention to the routines and habits of everyday life through which water is consumed, sometimes highlighting how water is used habitually and routinely, often in spite of an individual's preferred values, attitudes towards water and the environment and economic imperatives to initiate change. This practice based approach attempts to address the attitude-behaviour gap that is acknowledged in studies that focus on behavioural and economic aspects of demand management (eg, Russell & Fielding, 2010).

Our argument is that demand is constituted through multiple relations, and by focusing on this multiplicity we can see how demand shifts as different relations within the system come into play, how historical practices persist throughout time, how these different factors become significant and how new and different combinations of practice can form (Shove, Pantzar, & Watson, 2012). A practice based survey, therefore, requires asking a different range of questions about habits and routines, and focusing analysis on the factors shaping everyday demand which are located beyond the individual. This is based on what we call a 'distributed' approach to demand, and involves a shift from focusing on 'individuals' to the elements of 'practice' as the unit of analysis (Browne, Medd, & Anderson, 2013; Browne, Medd, Pullinger, & Anderson, in press 2013).

In our interpretation of practice theory and distributed demand, 'practices' is not a word that can be substituted in place of the word 'behaviour'. Although practices can obviously be used as a descriptive term that refers to things that people do, the strongest use of the word within the literature implies theoretical and methodological approaches which explore everyday practice as situated in diverse and divergent social, cultural, infrastructural and technological histories and current contexts (eg, Pink, 2012; Schatzki, Knorr-Cetina, & von Savigny, 2001; Warde, 2005). It is an approach that is increasingly being used within the literatures on water (and energy) use and demand management, and other areas of household sustainability, and has a particularly strong history of use within the UK, Australia and Europe (eg, Allon & Sofoulis, 2006; Gram-Hanssen, 2007; Halkier, Katz-Gerro, & Marteens, 2011; Hand, Shove, & Southerton, 2005; Horne, Maller, & Lane, 2011; Kuijer & De Jong, 2012; Pink, 2012; Shove, 2003; Sofoulis, 2011b; Strengers, 2011; Strengers & Maller, 2012; Taylor & Trentmann, 2011). It is different, however, from dominant approaches, as rather than focusing on attitudes or economics, and how these things influence behaviour, practice based approaches put what people do, how they do it, and what they use when doing it first and foremost. These practice based approaches focus on the often inconspicuous and habituated enactments of everyday practice; the links between these enactments and available technologies and infrastructures (i.e. the material stuff of consumption); and aspects such as cleanliness, comfort, ideas of the 'good life', and other cultural and social images and conventions shaping practice in homes and gardens (Shove, 2003; Shove, et al.,

2012). These approaches connect the everyday to the more historical approaches that explore the development of systems of provisions (e.g. the development of water infrastructures), broader cultural and medical agendas (e.g. emerging agendas around consumer rights, health and hygiene), and other elements of consumption (Allon & Sofoulis, 2006; Sofoulis, 2005; Strang, 2004; Taylor & Trentmann, 2011; Warde & Southerton, 2012).

The significance of adopting a distributed approach to demand can be highlighted with the well-used example of the history of showering. Showering actually reflects an interesting paradox as it is currently promoted as a way to save water when compared to the practice of bathing (having baths), however new shower technologies such as the power shower and the waterfall shower have actually pushed water consumption for showering above that originally consumed through the practice of having (less frequent) baths (Critchley & Phipps, 2007). Water efficiency programmes and other demand management interventions that simply focus on the individual consumer, replacing inefficient technology or reducing how long consumers shower for are limited in their impacts on water usage (Browne, et al., in press 2013). Hand et al. (2005) highlight the influence of indoor plumbing, heating and power which firstly enabled a movement from bathing in communal bath houses to bathing within the household, and then the development of showering technology for use within home spaces. These infrastructural and technological changes coincided with the emergence of multiple representations of health, cleanliness and freshness – a combination of emerging health agendas, ideas about the rights of the consumer (including the right to a constant level of water pressure which enables the use of showering technology), and emerging commercial agendas linked to soap, cleanliness and freshness (Gram-Hanssen, 2007; Hand, et al., 2005; Shove, 2003). The interacting influences of these changes to infrastructure and technology and of changing ideas about the consumer, which have resulted in constant water supply and water pressure being classified as rights in recent history, along with changing cultural and commercial representations of bodies and cleanliness, have meant that showering has increasingly become a more popular way of washing. This has changed the temporal organisation and routines of everyday life in such a way that, as we will show later in the report, showering at least once a day has become the 'new normal'. However, just because at least daily showering is the dominant 'new normal' does not mean that we would expect that there would be no variation in practice. We would expect that due to the differential diffusion of technologies in homes (e.g. a lower level of access to showering facilities in social housing), issues of mobility, personal preferences for bathing for reasons other than getting clean (such as for relaxation), and other reasons, that there would be diversity in the way that people wash, such as whether they predominantly have baths, flannel washes or showers.

This research programme is based on the assumption that future water demand, at the level of the household, will depend upon a) the character of the existing and future household water infrastructure, b) the technologies and appliances connected to it, c) a range of performances of practice, i.e. everyday routines and habits that imply and require water consumption; all of which are connected to d) broader expectations relating to, and meanings of, those practices and e) the provision of supply shaped by the broader 'hardware' of the supply infrastructure and policy/regulatory frameworks. Therefore, as demand is constituted through multiple relations, we can see how demand shifts as different relations within the system come into play, how historical practices persist throughout time, and how these different elements become significant and through these elements how new and different combinations of practice can form (Shove, et al., 2012). A simpler way to describe this is to consider the 'images'

(meanings), 'skills' (performances) and 'stuff' (materials, technologies, regulatory frameworks, infrastructures) associated with different sites of practice (Shove, et al., 2012). This next section outlines how we translated this conceptual approach into methodologies not commonly used within theories of practice – namely through the use of a quantitative survey of water using practices.

1.2 An outline of the conceptual approach adopted for the questionnaire

The broad aim of the survey was to develop a quantitative approach to the study of practices that could highlight, rather than mask, the diversity of social practices associated with water use. That is, the main aim was a playful and methodological one, an experiment to see whether the practices approach presented here could be 'scaled up and out' through a quantitative survey as a way to explore the diversity of performances of, in this case, water related practices across a population. However, there was also a desire to try to build upon previous work on the changing natures of practices-as-entities. For example, could we compare our quantitative results with comprehensive historical accounts of the rise of the shower, and demonstrate the extent to which we have lost, as a population, the flannel wash and weekly bath, and the degree to which showering has come to dominate (Hand, et al., 2005; Shove, 2003; Trentmann & Taylor, 2006)? To this end we conducted a survey of water using practices across a representative sample of the population of the south and south east of England in 2011 in order to capture that diversity and complexity.

At the same time, for all the diversity in the way in which people perform these day to day things, there are also reasons why we might expect that a variety of shared and distributed influences on how people perform everyday practices would actually lead to a relatively limited set of variants of each practice that are performed commonly in the population – not identically from person to person, but similarly (Shove, et al., 2012). Examples of factors that may potentially constrain the diversity of performances of particular practices include that people are constrained by the skills and knowledge they have about how to do certain things, there are limited alternatives to common technologies available in the home (e.g. if you want to wash your clothes at home there are now only front loading washing machines, or hand washing in a sink or bucket as options), as well as dominant societal themes regarding acceptable levels of cleanliness and hygiene. As discussed in the previous section, wider systems of provision and regulation also constrain the options available for the way in which individuals perform their practices – a hosepipe ban, at least in theory, prevents high levels of garden watering, for example, but it does not stop people from taking water from inside the house outside to water their plants.

Although if viewed as a 'snapshot' each performance of a practice is unique, 'each instance of doing is informed by previous, related and associated practices. At the same time, each instance is to a large extent defined by the elements of which it is composed' (Shove, et al., 2012, p. 38). Therefore although we expect there to be greater diversity in practice than is currently represented in the 'averaged' understanding of water consumption embedded in the water industry (Sofoulis, 2011b) and psychological and economic approaches to water use, practice theory also acknowledges that there will be a common, and constantly evolving, set of 'variants' of each practice that can be found, defined by their similarity in the constituent 'elements' of the materials, meanings and skills associated with those practices.

In the context of this body of broader literatures, the ARCC-Water and SPRG questionnaire aimed to explore the 'performance' of various practices in which water was used in the home. The aim of the questionnaire was to contribute to addressing the very real challenge of understanding the activities that lead to water consumption, particularly the nature of current ordinary and everyday practices, to then provide insights into how these practices might evolve. The key innovation of the project was to understand demand through the identification of clusters of people that perform similar variants of practices. Although not a specific focus of this study, it is thought that this new model of demand will be useful in identifying future strategies for demand reduction initiatives and to inform other aspects of 'adaptation' to climate change and other uncertainties. The research was a proof-of-concept test of the value of scaling up and out the practices approach, in this instance to understand better the landscape of water using practices in the south and south east of England. This methodological experiment raised a number of methodological and conceptual questions, namely:

- Can we create survey questions that reflect 'theories of practice' across different sites of practice in the home?
- What do these survey responses reveal about the diversity and homogeneity of performances of water-related practices across a population?
- What are the implications of scaling up methodology for interpreting practices as drivers of demand, i.e. can a practice rather than an individual or household be used as the unit of analysis?
- Does a mixed methodological approach facilitate in the interpretation of practice based quantitative data?
- What does a scaled up approach to practice theory teach us about possible strategies for intervention?

2 Research questions, aims and objectives

Summary of the research questions, aims and objectives

- Our main research question was actually methodological – can the diversity of patterns of water use be captured through a quantitative survey methodology?
- Key research questions relate to: capturing the diversity, or similarity, in water infrastructures and technologies in people's homes; the diversity and commonalities between performances of practices; typologies of households
- Descriptive and cluster analyses are not seen as evidence of 'causal' relationships within and between practices, materials, meanings and skills, and the people that perform them based on a positivist perspective, but as 'descriptive tools' supporting post-positivist understandings of practices.

2.1 Research questions

In the first instance, the main 'research question' was a methodological one: that is, whether 'practice' can be successfully captured through a more quantitative methodological approach than has previously been used in the application of practice theories (both for water use, and for other sites of practice). The maintenance of theoretical integrity while applying quantitative methodology is not a simple one – there is plenty of literature espousing the superiority of qualitative, ethnographic and observational research in capturing practice (Pink, 2012), and cautioning against the uncritical application of methodologies (including triangulation) that have largely been associated with positivism in practice-based and other post-positivist research in the water industry (Blaikie, 1991; Sharp et al., 2011; Shove, 2010, 2011; Sofoulis, 2011a). Despite this caution there is an observable trend occurring in the sociological and geographical literature of quantitative methodologies being used to represent more descriptive rather than causal interpretations of data (Uprichard, Burrows, & Byrne, 2008), and amongst the methodological literature there has been an untangling of the assumption that quantitative methodology is by association always underpinned by positivist ontologies and epistemologies (Alvesson & Sköldberg, 2009; Onwuegbuzie & Leech, 2005; Poon, 2005).

Therefore, adopting a pragmatic, adventuresome and playful approach to pluralistic forms of research inquiry (Kelly, 2003; Onwuegbuzie & Leech, 2005) one of the main research questions was actually methodological – can the diversity of water use patterns be captured through a quantitative survey methodology? As part of the 'testing' of the quantitative approach, and its success in 'capturing' practice, one aspect of our research programme was to conduct qualitative interviews with participants who also took part in our survey. This approach to methodological triangulation was undertaken as we were aware that in a 25 minute questionnaire the nuanced aspects shaping everyday practice – work life, leisure life, home life and infrastructures and cultures across those spaces – would potentially be difficult to capture in their depth and entirety. We thought that giving the opportunity for people to talk about their practices

(Hitchings, 2012) in a more detailed way would reveal any limitations of the quantitative approach, and add depth and flavour to the quantitative analysis. Although this report is focused specifically on the quantitative analysis, and further papers will discuss in more detail the results of the qualitative data, we have integrated the qualitative data into the sections presenting results of the cluster analyses in the form of interview vignettes from people who, based on their survey responses, were found to follow those particular variants of the practices in question.

As part of this methodological experimentalism to test whether the diversity of practices could be captured in this way, we also identified the following research questions. The chapters of this report containing results relevant to each of the questions are also indicated below.

Water infrastructure and technologies (Chapter 4)

- How 'homogenous' or 'diverse' are home/garden water infrastructures?
- How 'homogenous' or 'diverse' are the water using technologies in households?

Capturing practices (Chapter 5)

- What are the diverse patterns of water using activities and practices that (currently) provide definition and structure to people's lives?
- How do the diversity of practices related to different technologies in people's homes and gardens, and cultural/social factors, shape practice?
- For each principle practice in which water use is implicated – personal hygiene, laundry, gardening, kitchen use, car washing – are there common variants of how they are performed that can be identified in the population based on the survey data, with potential implications for water use?
- What are the associated characteristics of these practices?
- Are there any socio-demographic variables which are correlated with the various clusters of practices?

The overall story of household water use (Chapter 6)

A key point from previous practices-based research is that existing approaches to understanding household water demand which look at average per capita water use or use behavioural psychological methods to produce typologies of "typical" households (e.g. segmentation analysis to classify households based on their stated environmental values) mask the large diversity in the underlying practices that are performed through which that water use is constituted. In short, this suggests that such averages or segmentation analyses miss important underlying diversity in practices, such that households that appear similar through such analytical lenses are actually very diverse when focusing on their practices. This leads to the following research questions:

- At the individual or household level:
    - What can be said about the relationships between how individuals perform different practices (washing, doing the laundry, gardening, etc.) – do common variants "bundle" together?
    - Drawing on that, is it still possible to create a meaningful typology of households, based not on litres of water used or environmental values, but on similarities between them looking across all their water using practices?
    - Looking beyond the average water using household (in terms of litres per day), what does the perspective taken here let one say about the diversity in practices hidden behind that average?

The report finishes in chapter 7 with a discussion and overall conclusions from the research, highlighting key points and outlining possibilities for future research and applications of the approach.

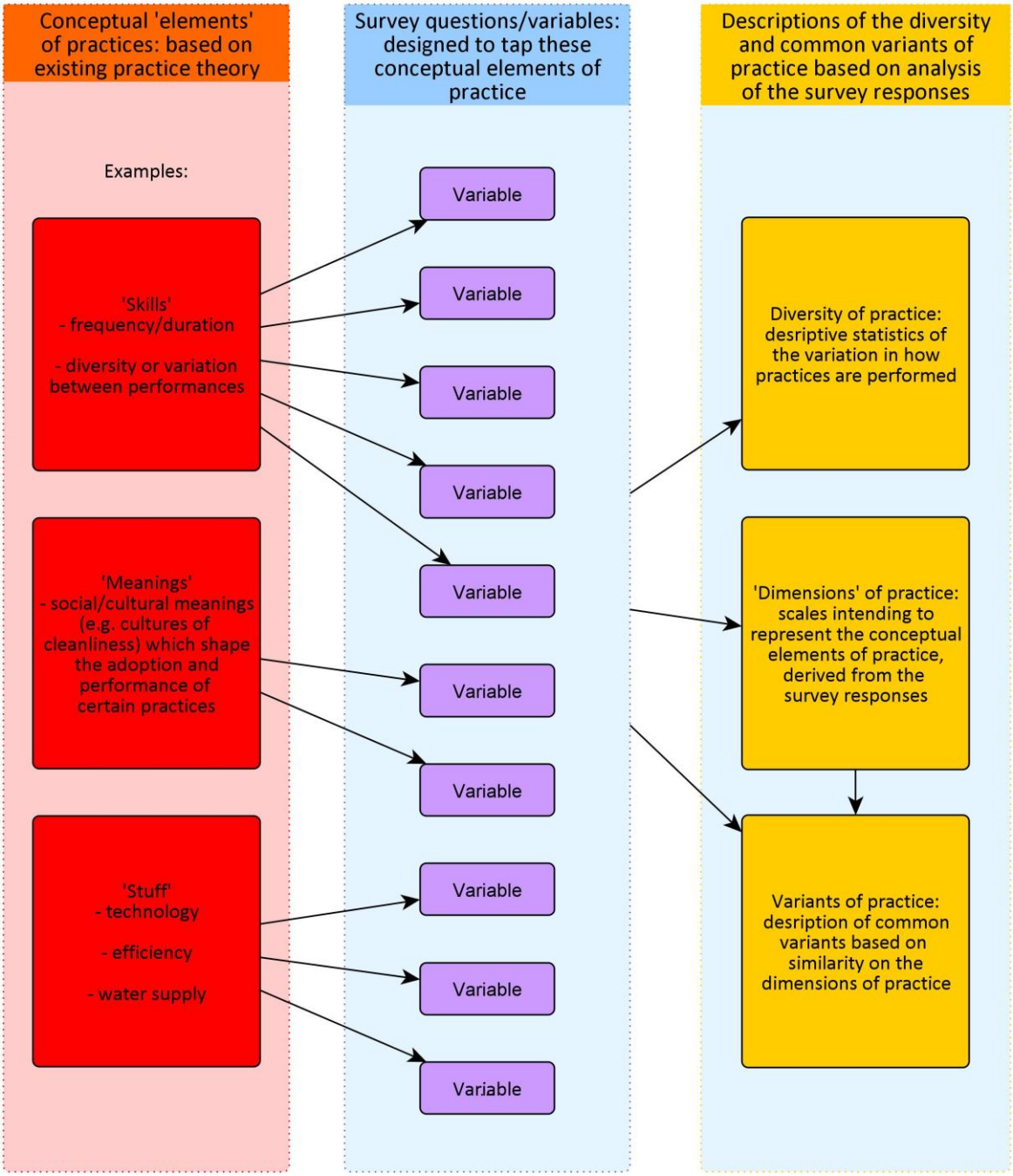
2.2 Variants of practice

The survey contains questions about various aspects of water using practices intended to reveal how these different practices are performed, and why they are performed as they are. Questions include how often the practice is performed (e.g. the number of showers or baths per week), the technology used, how much the practice varies between performances, in what ways, when in the day or week it is performed, for what reasons, and more. The full list of these questions will be accessible in due course from the ESDS data archive. The questions were constructed in such a way to try to represent, or tap into, different constitutive 'elements' (the images, skills and stuff) of each practice, which together shape and define how and why that practice is performed (Shove, et al., 2012). It is here that the difficulties of developing a post-positivist approach while constructing a quantitative survey emerge! Recent theoretical developments in one strand of practice theory (Shove, et al., 2012) highlight the interconnectivity between elements of practice – that is, elements of practice (the images, skills and stuff of practice) shape and are shaped by other elements. To go back to the shower example, the historical development of showering as an entity is not necessarily linearly or causally related to the performance of showering by particular individuals. The simple provision of showering technology does not then mean that showering just 'takes off' – this is linked with emerging meanings about showering (its role in cleanliness, and the negotiation of time for it to become a part of essential everyday routines) as well as the skills to shower (e.g. a range of skills and competences somewhat different to those involved in bathing or flannel washing).

There needs to be an obvious connection between the elements of practice (the images, skills and stuff) that we have used to create categories of questions and that are important defining elements of those practices, and the actual dimensions along which quantitative analysis such as descriptive and cluster analysis are conducted. Regardless of ontological or epistemological stance, when adopting a quantitative approach, 'dimensions' or 'variables' are needed on which to base further analyses. The risk here is that these relationships between the different 'variables' and 'dimensions' of the descriptive and cluster analyses are seen as linked in an overly simplified deterministic, linear way at the level of the individual – in the way that a theory of planned behaviour diagram or another more psychological analysis of behavioural and attitudinal data would be presented. In these versions the relationships between the variables and the behaviour that you are 'observing' are linear and mediated, and the results of statistical analysis may (mistakenly) be taken to support positivist theoretical notions of causality between these variables. Elements of practice are rather more softly designed than this, having been developed through descriptive post-positivist concepts that shun the presumptions both of linearity embedded in much quantitative analysis and the interpretation of dimensions or variables, and of causality that is often presumed in positivist quantitative methods. However, both in the tradition of post-positivist research, and through an emerging focus in the use of quantitative research as a descriptive tool rather than one designed to provide evidence of causal linkages between variables (Uprichard, et al., 2008), the construction of each of the dimensions to be analysed in this current study are fairly subjective and descriptive. This sits with the

subjective determination of dimensions of interest both within the post-positivist approach, and that also adopted in cluster analysis (eg, Medd & Shove, 2006). Figure 1 represents the development of the research from these conceptual elements of practice as described in theory and developed from our interpretation of practice theory with a specific interest in the materials/technologies, meanings and skills involved in the performances of various aspects of practice within the home, to the questions or variables developed for the survey, through to the analysis and development of descriptions of the diversity of practices, and their common variants derived from dimensions which attempt to translate the conceptual elements into empirical measures.

Figure 1 Research development from conceptual 'elements' of practice, to survey variables, to the resultant descriptions of practice in terms of their diversity, 'dimensions' and common variants



2.3 Household water use

A final stage of the analysis moves from looking at the commonalities of performances of the individual practices between households (i.e. the clusters of practice in kitchens, bathrooms, outdoor spaces) to exploring whether there is any relationship between what in some cases appear to be unrelated practices – that is, exploring the 'bundles' of practice. That is, if we were to integrate the analysis on all the different sites of practice within a household, would there be coherent patterns in how each practice and its variants interrelate with one another? Are there connections and interconnections between the seemingly separate practices enacted in homes, beyond the mere physical co-location of these practices being enacted in households? This is a more speculative stage of the research – one in which we explore whether the ways individuals perform one water using practice (like showering) bears any relationship to the performance of other practices (like gardening). Current social practice theory hypothesises that there are ways that seemingly unrelated practices may bundle together:

> 'Practices that are routinely enacted in similar places, for instance in kitchens, bathrooms or offices, are not necessarily connected by virtue of co-location alone. However, there are various ways in which spatial arrangements constitute and underpin potentially important patterns of association. Some have to do with the physical location of material elements. For example, practices requiring good supplies of running water converge around taps and drains. In effect plumbing infrastructures bring practices together in ways that allow, but do not ensure, their mutual influence (Muthesius, 1982). Shared elements of meaning can work in the same way' (Shove, et al., 2012, p. 84).

Effectively, this set of analyses explores whether there are bundles or complexes of potentially seemingly unconnected practices that combine together. For example, is heavy showering likely to be associated with heavy laundry practices? Qualitatively, one could speculate that they might be interconnected given shared meanings relating to 'cleanliness' that could potentially be ascribed to each practice. But equally, someone that showers often might not feel so compelled to change their clothes regularly because it is the shower that makes them 'feel clean', or vice versa! While there are some examples where we could presume there would be little or no relationship between the performances of different practices (e.g. dishwashing habits and car washing), there are other areas of practice that might be more likely to be interrelated due to more common elements shaping that practice (e.g. practices dealing with dirt and the cleanliness of homes, bodies and clothes, or the reuse of kitchen water from washing up to water the garden). This stage of investigation is performed in part to identify whether any of these elements of practices bundle together in any apparently coherent way, so that individuals, as carriers of these practices, would fall into a relatively small set of 'types', each with a distinct bundle or complex of variants of the different water using practices that they enact within their homes.

This analysis is also performed in part to test the validity of existing approaches to modelling overall household water use within the industry. Current approaches to household segmentation for example categorise 'households of water users' based on socio-demographic or other household characteristics. These approaches assume that these household level variables can 'predict' the water using behaviour of particular types of households, as well as other environmental behaviours (e.g., Collier et al., 2010; DEFRA, 2008a; Ipsos Mori, 2007; Waterwise, 2011). We suggest that this analysis will tentatively be able to show whether there is any consistency between the various sites

of practice that consume water within and across households. If we were to show that there is little correspondence between how households do the dishes, do the laundry, wash or garden, and that these practices vary substantially even between households with similar socio-demographic and household profiles or overall water use, then this is further analytical evidence for the added value of establishing approaches to understanding water demand, water forecasting and water interventions that use 'practices' as the unit of analysis.

3 Methods

Summary of the methods

- A representative sample of 1802 households from the South and South East of England participated in a practices survey between June and October 2011.
- The survey included questions on the participants' habits and practices relating to personal hygiene and care, clothes laundering, gardening, vehicle washing, cooking, cleaning and washing up, as well as water using equipment in the home, general sociodemographic characteristics, the presence of water meters, estimates of their most recent bill if metered, and a range of 'environmental' habits, such as turning off lights in rooms not in use.
- 22 interviews were also conducted with participants in the survey in order to obtain richer qualitative data on the nature of water using practices in the region, as well to provide a way to validate results from the quantitative survey.
- The quantitative data were analysed descriptively to explore the diversity of water using practices and their constituent elements of practice (materials, skills, meanings), whilst cluster analysis was used to identify if, among this diversity, common variants of the main water using practices could be identified. The statistical relationships of these variants across practices and to the sociodemographic characteristics of those who perform them were also investigated.

This section details the methodological approach adopted in the ARCC-Water and SPRG projects to developing and analysing the quantitative survey that was initiated across the South and South East of England in the summer of 2011. A UK market research company, BMG Research, was engaged via an open tendering process to assist in the development of the final questionnaire and of the design of the sample selection, to be responsible for the fieldwork and data collection of the survey interviews, and for the data preparation of the final dataset. This section details the processes and procedures for the fieldwork and data management that they undertook for us in 2011 (BMG Research, 2011).

3.1 Quantitative data collection

3.1.1 Sample design

From the outset a twin-track but co-ordinated approach to sampling was adopted that would produce an overall sample of some 1800 respondents, comprising two specific sub-samples. The first sample was to be a randomly selected sample of households in the Government Office Regions of the South, East and South East of England, to provide a *random sample representative* of those three regions with a regional sample size proportional to the population size in each. The second was to be an identical survey administered to randomly selected households within specific *case study areas* of those

Government Office Regions where our collaborating water companies were able to provide area-based metering penetration and water consumption data through their own network monitoring systems.

In the case of the first (main) sample the Lower Layer Super Output Areas (LSOAs) in each region (South, East and South East) were stratified according to their contemporary Index of Deprivation scores. A '1 in n' selection process was then used to select a set of Census Output Areas (COAs) within each stratification layer and finally a random draw of addresses from within the selected COAs was made from the Royal Mail's Postcode Address File (PAF) using a '1 in n' selection process from a random start point. For this sample 30 such addresses were drawn per COA, on the assumption of achieving 10-15 successful interviews. This approach was taken to deliver a degree of fieldwork efficiency, whilst minimising the amount of clustering in the sample. For the case study areas, the COAs were selected by the project team as being those with the highest proportion of addresses known to be within the water company monitoring areas for each of Essex and Suffolk Water, Thames Water and South East Water. Once the COAs had been selected the same address allocation method was used but with an increased initial allocation of 40 addresses within the water company boundary areas. In both cases if the target number of interviews was not achieved in each of the sampled COAs, more addresses were issued (rather than more COAs being sampled). The number of COAs selected for each of the four areas and the number of addresses selected from within these COAs are given in Table 1 below. Overall then the survey produced a main sample of 997 responses with an additional 805 case study responses. BMG produced non-response weights to correct for non-response bias in both the main and case study samples (see section 3.1.6 on weights, below) and they are analysed together as one sample using these weights in the analyses in this report.

Table 1 Spread of respondents across main sample and case study areas

	Number of COAs in issue	Number of addresses in issue	Number of interviews completed
Main sample area	96	3,435	997
Case Study 1 – London	14	560	216
Case Study 2 – Essex and Suffolk	20	800	302
Case Study 3 – South East	20	800	289
TOTAL	150	5,595	1,802

3.1.2 Address, household and respondent selection

On their initial visits to the selected addresses, interviewers were required to identify cases in which a single address describes more than one dwelling unit (addresses where there is more than one dwelling, or more than one household in each dwelling). In such cases, interviewers typically used a Kish grid as a means to identify randomly the particular dwelling to be targeted for a visit. Once a household had been identified, the interviewer sought to interview someone from within the household aged 16 and over who was able to speak with knowledge about how that household uses water, i.e. someone who knows about how the household does its washing, cooking, gardening, etc. To minimise non-response and ensure diversity, the sampling process was designed to ensure that all households in the target survey areas had an approximately equal chance of being invited to take part in the survey.

Further steps were taken to ensure that no group was marginalised from participation by the way in which the survey was delivered. BMG worked with the

project team to ensure that the introduction to the survey and accompanying documentation were appealing, highlighting the benefits of participation.

3.1.3 Fieldwork pilot and data collection fieldwork pilot

Once the questionnaire had gone through several iterations of drafting and we were satisfied that it was close to final draft, a fieldwork pilot took place. This pilot took place between 28th May – 6th June 2011 in Oxfordshire. 30 pilot interviews were completed. No major issues were found during the pilot exercise and the team agreed the survey could proceed to the main fieldwork phase. The fieldwork during which the 1,802 interviews were completed was conducted from 13th June to 8th September 2011.

3.1.4 Survey questions

Data were collected on the participants' habits and practices relating to personal hygiene and care, clothes laundering, gardening, vehicle washing, cooking, cleaning and washing up. Further data were collected on the water using equipment in the home, general sociodemographic characteristics, the presence of water meters, estimates of their most recent bill if metered, and a range of 'environmental' habits, such as turning off lights in rooms not in use, wearing more clothes rather than turning up the heating when cold, and using public transport over private car travel. Finally, permission was requested to link their survey responses to their daily water use data based on their water bills, including daily expenditure, as well as litres of water used where the households were metered, obtained from the participants' respective water companies.

3.1.5 Sensitive data and data linkage

The survey was undertaken using computer assisted personal interviewing (CAPI), as normally used by BMG in face to face interviewing. Some sections of the questionnaire that referred to personal hygiene practices were considered to be of a sensitive nature, and respondents were offered the fieldwork tablet in order that they could self-administer these questions (CASI – computer assisted self-interviewing). At the end of the interview respondents were asked if they would give written consent for their water consumption data to be attached to their survey responses. If they gave consent for this to happen, they were asked to provide their water company account reference number on a signed consent form, or at a minimum their postcode and address were recorded. We anticipated at the start of the project that the level of consent would be low. At the end of fieldwork, a total of 282 respondents had provided written consent from a total sample of 1,802 (a rate of 15.6%). As Table 2 shows, consent was also much less likely in London and more likely in the South East.

Table 2 Overall and data linkage response rates by sample category

		Number of respondents	Agreement to linkage of water meter data to survey responses	
			Number of cases	Percentage of cases
Main sample	**East of England**	380	75	19.7%
	London	304	17	5.6%
	South East	313	69	22.0%
	Total	*997*	*161*	*16.2%*
Case study sample	**Essex & Suffolk**	302	50	16.6%
	London	216	13	6.0%
	South East	287	58	20.2%
	Total	*805*	*121*	*15.0%*
Overall total		**1802**	**282**	**15.7%**

3.1.6 Weights

In order to attempt to correct for non-response bias and sample design bias (in the case of the case studies) BMG calculated four respondent level weights:

- A household level non-response weight for the main sample
- A personal non-response weight for the main sample
- A household level non-response weight for the whole sample (including case studies)
- A personal non-response weight for the whole sample (including case studies)

In the case of the household weights, the calculations were made based on a comparison of the household attributes (such as the number of persons, family type, water metering, presence of water using appliances) with regional data sources such as the ONS' Living Costs and Food Survey or the Labour Force Survey. This comparison suggested that 'water metering' was the only non-response bias dimension that needed to be corrected for.

In the case of the personal level weight a similar exercise was carried out for age, gender, ethnicity and labour market status and as a result a weight was calculated based on gender (the sample contained more women than expected), age (there were more older people than expected) and work status.

3.1.7 Response rates

Overall response rates for the survey were relatively good, with a main sample unadjusted rate of 29% and an adjusted rate (excluding empty addresses, those that were businesses or where no contact was made) of 35.7% (see Table 3), slightly lower than the comparable British Social Attitudes 2010 Survey figure of 46% (Park, Clery, Curtice, Phillips, & Utting, 2012).

Table 3 Overall response rates by response category

	TOTAL		South East case study		London case study		Essex and Suffolk case study		Main sample	
Unadjusted response rate	1802	32.2%	287	35.9%	216	38.6%	302	37.8%	997	29.0%
Adjusted response rate	1802	38.0%	287	42.4%	216	39.8%	302	41.2%	996	35.7%
Ref	875	15.6%	113	14.1%	65	11.6%	110	13.8%	473	13.8%
No reply call 1	694	12.4%	153	19.1%	63	11.3%	65	8.1%	528	15.4%
No reply call 2	507	9.1%	55	6.9%	55	9.8%	81	10.1%	316	9.2%
No reply call 3	328	5.9%	29	3.6%	65	11.6%	45	5.6%	189	5.5%
No reply call 4	206	3.7%	2	0.2%	36	6.4%	72	0.9%	96	2.8%
No reply call 5	151	2.7%	4	0.5%	0	0.0%	37	4.6%	110	3.2%
Call back	170	3.0%	34	4.2%	39	7.0%	21	2.6%	76	2.2%
Empty	49	0.9%	6	0.8%	8	1.4%	9	1.1%	26	0.8%
Can't find	13	0.2%	5	0.6%	1	0.2%	4	0.5%	3	0.1%
Business	23	0.4%	0	0.0%	3	0.5%	0	0.0%	20	0.6%
Language	8	0.1%	0	0.0%	3	0.5%	0	0.0%	5	0.1%
No Contact	769	13.7%	112	14.0%	6	1.1%	54	6.8%	597	17.4%
Total	5595		800		560		800		3435	

3.2 Qualitative interviews

As part of the SPRG project workplan, 22 qualitative interviews were subsequently conducted by one of the project members (Dr Alison Browne) with a selection of participants from the survey who had already completed the questionnaire, in order to obtain some richer qualitative data on the nature of water using practices in the region, as well as to provide a way to validate results from the quantitative survey. As part of the questionnaire, respondents were asked if they would like to participate in future research conducted by Lancaster University, and participants for the qualitative interviews were selected from among those who responded yes. It was decided that fieldwork would take place in London (and Greater London) and urban and rural Essex as these were two regions where we were likely to be able to link with people's actual consumption data (due to agreements with water companies in those regions) and because it gave a good spread of both urban, peri-urban and more rural households. As only 20 interviews were needed in total, half of the people in each of the London and Essex areas (approximately 100 in both) who had indicated their willingness to participate in future research were sent a letter to contact Lancaster University if they wished to participate in a further interview. They were offered £20 Sainsbury's vouchers as incentives for their participation. The semi-structured qualitative interviews were completed in two fieldwork periods in March 2012. Retrospectively, we identified which cluster each of the respondents belonged to for the different sites of practice for which we found clusters in the quantitative data (personal hygiene, laundry and gardening). We got a reasonable spread of interview participants loading on the different clusters in the cluster analyses, confirming that we had got a sufficiently diverse group of practitioners in the qualitative interviews. Although the results of the interviews are not discussed fully in this report, results from them have been used to supplement the cluster analysis results (as seen in sections 5.1 to 5.3, and in the

separately downloadable learning pack of posters, the URL for which can be found at the beginning of this report (Browne, Pullinger, Anderson, & Medd, 2013), with each of the participants' survey and interview responses being pulled out of the larger dataset for comparison. All names used to identify people in the qualitative interview excerpts in this report are anonymised to maintain confidentiality.

3.3 Data analysis

The sections below describe the methods used for the analyses in this report. After undertaking a range of descriptive analyses, a set of cluster analyses were performed on the data. The first section below describes the cluster analysis method used to identify common variants of each practice, including an overview of cluster analysis as an approach to classification, the broad dimensions (or elements) of practice used to define clusters in this report, and a more detailed description of the method used. The final section describes the analyses performed at the household level: the search for common 'types' of water using household, and demonstrating the diversity of household practices.

3.3.1 Cluster analysis

Overview

Cluster analysis is a method to aid in the identification of a set of distinct groupings in a sample (categorisation), and the assignment of the cases in the sample into those groups (classification). Much of the early development of cluster analysis occurred to formalise the process of taxonomy in biology (Tan, Steinbach, & Kumar, 2006). The idea of cluster analysis, as a particular approach to the classification process, is that, as science is supposedly objective, classifications of similar cases such as elements, species or social groups, should be done objectively too (Aldenderfer & Blashfield, 1984p. 17-18). It is also capable of identifying groups in the data that are complex enough that they could not be feasibly discerned simply by observation of the data, as when there are non-linear relationships between multiple variables. Cluster analysis then aims to group cases (survey respondents, in this research) into clusters such that cases within each cluster are more similar to each other than they are to those in other clusters.

Boundaries are usually fuzzy, so that a classification system is rarely as clear cut as the human observer would perhaps like to believe. Depending on your perspective, some cases may belong to more than one classification (categories may overlap rather than being exclusive), while some may not fit easily in any category (or put in another way, be categories with just one member) (Tan, et al., 2006). Recognition of this is not necessarily to say that classifying has no value or should not be attempted. The categories are often highly useful ways to reduce the complexity of the observed world and identify patterns which are relevant to the research questions, or more broadly which allow one to understand the world and act effectively within it. Following on from this point, classifications only have meaning or relevance within a given context. A population can be classified into entirely unrelated groups depending on which variables are selected upon which to define categories (e.g. gender, age, nationality, height, income group, hair colour, etc). A clear theoretical understanding of along which variables (or dimensions) it is relevant to look for groupings which represent distinct categories is thus needed before engaging in any classification exercise, including cluster

analysis. In short, it is not enough to simply include all variables which have been measured into a cluster analysis and expect to obtain cluster groupings that are of relevance to the research questions (Leonard & Droege, 2008).

Variables upon which to define groups/clusters therefore need to be selected based on an underlying, explicit, rationale or theory. It should be the case that the clustering variables/dimensions selected are likely to be relevant to the topic being studied, so that the resulting clusters are meaningful to the research. For the current example, for a water use study that draws on theories of practice, we would want to cluster based on dimensions which represent recognisable elements of the performance of water using practices, and which capture variations in each practice along the lines of those constituent elements. The clustering dimensions selected are described in the next section.

For the cluster analysis, these dimensions are then taken to be a measure of a respondent's position in an imaginary space with k dimensions, such that each dimension represents one element of that practice, measured by a single variable. The cluster analysis method then helps to identify cases which are clustered in closer groupings in this k-dimensional ''Euclidean'' space. A final stage of analysis is to test the validity of the final clustering solution. In large part this is based on the value of the resulting classification system for the research questions to hand – there is an element of researcher construction of the final results that mean the final classification system cannot objectively be said to be "correct" or "incorrect".

The process of performing a cluster analysis can therefore be divided into four stages (adapted from Aldenderfer & Blashfield, 1984, p. 12):

1. Sample selection;
2. Selection of dimensions, relevant to the research topic, along which clusters are to be identified, and operationalisation (preparation) of variables representing those dimensions;
3. Selection and application of a clustering method, involving calculating the degree of similarity between cases along the clustering dimensions, deciding upon an appropriate number of clusters in the clustering solution, and then grouping most similar cases into that number of clusters;
4. Validation of the resulting cluster solution.

The sections below describe steps 2 to 4. For step 1, the sample used in the analyses in this research is the full set of survey respondents for which there are valid responses to all the questions required to perform a cluster analysis. The next section describes the dimensions selected for use in the cluster analysis, and this is followed by a description of the precise cluster analysis method used and the approach to validating the results.

The clustering dimensions

As just discussed, an important step is to decide which dimensions are important for defining clusters. As we are interested in water using practices, different elements of the performance of practices are important. Five dimensions, described in Table 4 below, were selected[1]. These are clearly just a subset of the different elements of a practice

[1] Note that the names given to these dimensions are intended to be purely descriptive, and are not intended to convey any normative value judgement regarding which ways of performing a practice are "better'' or ''worse". In particular, the term efficiency is used purely to indicate whether the amount of water used in the performance of a practice could be higher or lower than it is, if other dimensions are controlled for. Different efficiency levels may not even be functionally equivalent in all cases – in the case

which might be considered important in fully describing how it is performed. Several reasons lie behind the selection of these five dimensions and omission of others. By selecting standard dimensions that are then used to look for clusters in each of the water using practices surveyed, the intention is that the approach is in some sense standardised as well, albeit that the dimensions are operationalized for different practices in differing ways. Secondly, although it was not the intention of this research to measure how variation in these practices translates into the amount of water that the individual or household uses, these dimensions still cover elements of the practices which intuitively would have implications for final water use and consumption.

Other elements of each practice, such as the times of day or week at which they are performed, and the meaning the performance has for the individual, were also asked about in the survey, but are not included as dimensions in the cluster analyses. As such, variations in these elements of the practices do not influence the variants of the practices identified by the cluster analyses and described in the results in this report. Instead, how these elements correlate with the clusters is presented in the results. There were two principle reasons for omitting these elements of practice from the cluster analyses. Firstly, a limit of the cluster method is that the dimensions used should be on some form of scale, with one end representing low frequency, or diversity, or technology, etc., the other representing high. It is difficult to translate 'meanings' associated with showering (everything from getting clean, to relaxing, to easing aches and pains, to being an aid to get to sleep), for example, into a scale representing low to high 'meaning'. Although such a scale of meaning could be forced from the data (e.g. by ranking the reasons why people have showers in order of likelihood such as most likely to least likely), such a scale could be quite redundant with each 'shower' having an important albeit different meaning every time someone jumps in it. It would be difficult to quantify variants of 'dirty' and how much they are satisfied each time a shower, bath or wash is enacted. A second issue is that the more dimensions that are used to describe each practice, the more variation is identified between respondents, and the more clusters there are likely to be in the data. Deciding how many groups to split the respondents into is a partly subjective decision, as the next section describes more, driven in part by the need for parsimony in the results presented, but with many dimensions there generally need to be increasing numbers of clusters for the members of each to be similar enough to each other that they look like a coherent group. Adding more dimensions (represent more elements of each practice) to the analyses was found to produce overly large numbers of clusters, which reduced their value in simplifying and interpreting the social reality.

The need to simplify the cluster analysis to produce parsimonious results in this way provides further evidence of the value of 'triangulating' qualitative and quantitative data as was done in this research: many of the fine details of the dimensions present in the cluster analyses, and the relationships between the elements of practice that are both included and excluded from the cluster analyses, can be revealed in an interview, for example, but get lost in the need to standardise and summarise statistically.

of kitchen practices for example, efficiency refers to whether the respondent leaves the tap running before drawing water, for rinsing plates, or for other purposes – whilst not running the tap is allocated a higher efficiency score, in some instances (such as if the respondent has lead pipes), doing this can be seen as serving an important function (ensuring the water to be drunk contains as little lead as possible).

Table 4 The five dimensions of water using practice used in cluster analyses

Dimension	Description
Frequency	How often is the practice performed? This is a continuous variable, but nevertheless it is likely that it could be influenced by shared ideas of what the norm is that are passed between particular groups and demographics.
Diversity	How much does the performance of the practice vary for a given respondent between performances?
Technology	How much or which technologies are used in the performance of the practice? As there are a common and limited set of technologies available for given practices, individuals are likely to cluster around which technology they use, with implications for water use. Technologies are rated on an ordinal scale by the authors based on their approximate level of sophistication and water use involved.
Outsourcing	Is the practice performed outside of the home some or all of the time? Or, is the purpose for which the practice is performed sometimes achieved outside the home, such as by using outsourced services? Again, there are in many cases a limited set of options available that have water use implications, so that households are likely to cluster on this dimension.
Efficiency	For each performance of the practice, given the technology and other dimensions above, is the use of mains water as efficient as it could be?

Cluster analysis method

The precise clustering method used to analyse the data follows that of Medd and Shove (2006), with a few modifications, and is a commonly used method for identifying the optimal number of clusters and subsequent groupings of cases into them (Burns & Burns, 2008). There is a range of clustering methods available, and they, along with classification systems in general, are commonly distinguished by whether they are hierarchical or partitional (Tan, et al., 2006). Partitional systems divide cases into a simple set of mutually exclusive groupings (such as gender). Taxonomy, meanwhile, is a good example of a hierarchical system: individual animals (for example), can be allocated to a particular species, which in turn is one of a set belonging to a genus; genuses belong to families, which form orders; and so on.

The approach used in this research has two stages, the first of which is an initial hierarchical clustering stage, which is performed to identify the optimum number of clusters into which to split the sample, and the initial starting points that are used to define the centre of each of these clusters in the k-dimensional space. The second stage uses these as inputs into a k-means cluster analysis, which produces the final, partitional, classification that is presented in the results section of this report[2]. The stages of analysis are as follows:

1. Perform a hierarchical cluster analysis, using Ward's method, which in turn requires squared Euclidean distance to be used as the measure of similarity between cases (Medd & Shove, 2006).
2. Identify the number of clusters in the hierarchical cluster analysis at which there is a sudden drop in the rate of change in the fusion coefficient (a measure of the change in the similarity between clusters between n and n+1 clusters). This point indicates that further breaking down the cases into more clusters "adds very

[2] These analyses were performed using SPSS versions 19 and 20 for Windows.

much less to distinguishing between cases" (Burns & Burns, 2008, p. 560-1), whereas fewer clusters would mask more substantial differences within each cluster. This thus represents a semi-objective indicator of the optimum number of clusters to select, balancing the similarity between cases within each cluster with the need for parsimony in the number of clusters selected for them to be of value to meeting the research aims.

3. Identify initial cluster centres for the k-means clustering based on the hierarchical cluster solution for the chosen number of clusters. The initial cluster centres are points in the k-dimensional Euclidean space, one per cluster, representing the mean value of all the cases within that cluster on each dimension, i.e. the cluster's centre point within the Euclidean space of the analysis. The hierarchical clustering results for the optimal number of clusters are used to identify these initial cluster centres, which are used as inputs (or "seeds") for the k-means clustering. This approach, of using a hierarchical cluster analysis to identify an optimal number of clusters and their initial seeds, and then refining these using a partitional cluster analysis such as k-means, is commonly performed, with the aim of increasing the likelihood that the clusters which ultimately result are globally optimal, i.e. that the similarity within clusters and relative dissimilarity between clusters are both the maximum possible for the chosen number of clusters (Eshghi, Haughton, Legrand, Skaletsky, & Woolford, 2011).
4. Run a k-means cluster analysis specifying the number of clusters to identify and their initial cluster centres, drawing both from the previous two steps.
5. Explore and validate the final clusters that result (see next section for more detail).

The different clusters identified by the cluster analysis represent different variants of the water using practices being studied. They are given descriptive names by the researchers to describe and differentiate them. Again, as with the names of the individual clustering dimensions, no value judgement is intended by the names given, and they are used simply to provide descriptive and non-arbitrary labels by which to identify them.

Validation

The process of creating and validating the final cluster solution is an iterative one, in large part because what defines a 'good' clustering solution is largely down to its usefulness for the research aims. The method *will* define clusters, as many as you tell it to in the case of the k-means analysis, and as such it can be hard to identify if the clusters thus found are in any sense 'real', or just artefacts of the method (Aldenderfer & Blashfield, 1984). The cluster groupings, in short, may be found to be quite distinct sets of cases, relatively homogenous within each cluster but separated by large distances between clusters. Equally though, there might be little difference in the spread of cases within and between clusters, and then it is hard to say if it is meaningful to discuss their having 'reality'. One initial stage of validation is therefore to visually inspect the distribution of the values on the different dimensions for each cluster, to identify if the clusters, taken together, represent essentially all possible combinations of values on the different dimensions (and are thus artefacts), or whether there are genuine gaps, combinations of values which are not present in the sample (indicating by implication that the groups identified are separated by larger gaps and thus have some 'reality', and

also that there are therefore theoretically possible ways of performing the practice that are not found, or found only rarely, in the sample).

A further test of the cluster results is to see whether they have value in terms of serving the purposes for which the classification was attempted, i.e. for addressing the research questions. Do members of any given cluster seem to be similar enough to one another for them to be reasonably considered as performing that practice in a recognisably similar way? Additionally, can correlations be found between cluster membership and other variables that are theoretically expected to be related (such as other variables tapping into other elements of the practice, or sociodemographic variables)? Whilst finding expected correlations provides an indication that the clusters do provide a valuable way to group cases, the absence of such correlations does not necessarily demonstrate the opposite, as the expected relationships between the variables may not occur in practice.

Aspects of the approach taken to producing the clusters can then be adjusted iteratively to develop a classification that functions better on these empirical, rather than theoretical, terms. The precise way in which dimensions are defined, for example, can be modified, or their relative weightings altered. This iterative approach to cluster analysis highlights that, whilst it can appear to be a scientifically objective method by which to identify real clusters in the data, it is more accurately viewed as a method by which groupings can be identified from complex data that could not be done otherwise, which nonetheless are likely to only be meaningful and valuable within the context of the research questions.

3.3.2 Household water use and bundles and complexes of practice

As described earlier, differences in one practice may influence how other practices are performed, such that certain variants (or clusters) of the different practices more commonly occur together, forming 'bundles' or 'complexes' (Shove, et al., 2012). The example that is given by Shove et al. is of water using practices in the home which are similarly configured due to common infrastructures of provision (piped water, electricity, etc.). Previous research (and common sense!) also tells us that elements of some practices might be more likely to 'bundle' where there are shared infrastructures and other elements such as the meanings associated with cleanliness and convenience for clothes and bodies (which could affect the frequency of both personal washing and clothes washing). There are other practices that use water in homes where there may be fewer interconnecting 'elements' (e.g. dishwashing and washing the car), although this does not necessitate that the interconnections do not still exist outside of our narrow definitions of water using practices (e.g. dishwashing or cooking can occur simultaneously with child minding or leisure activities such as watching the TV, so that how on is performed is influenced by the others).

Approaches to customer segmentation that focus on attitudes, values, and socio-geo-demographic variables link the resultant segmentations to the whole of household water use, and presume that these typologies link these variables in some consistent way with overall water use. Current research however has shown that these approaches are fairly poor predictors of actual usage (Waterwise, 2011). This fits with our conceptual perspective, based on previous research that has demonstrated that the levels of water used at different sites within the home (e.g. kitchen sink, shower, toilet, outdoor tap) vary greatly even between households with similar overall pcc, demographic and other characteristics – there is in fact no 'average water user' (Medd &

Shove, 2006). We would also extend this to say that as well as there not being an 'average user', there is not necessarily any empirical evidence 'for' or 'against' the idea that practices within household spaces are necessarily interlinked simply because they use water; indeed, where they do mutually shape one another, this may be because there are shared elements beyond just the association with water used in their enactment.

We initiated this stage of analysis to see whether the practices that constitute household water use do mutually shape one another. Only if they do intersect in this way would one expect to find a simple typology of households themselves, enabling them to be categorised into a small set of groups, each with similar water using practices across the whole set of practices, akin to 'segmenting' households based on similar attitudes and behaviours in behavioural research. Therefore in this stage of the analysis we move from practices as the unit of analysis to the respondent or household, to explore whether these bundles or complexes of practices can be identified. Two approaches are taken.

Firstly, we look for correlations between variants of each practice as identified using the cluster analyses in the previous section of work. Such correlations, where found, indicate that a variant of one practice tends to occur more commonly with a variant of another practice, from which further work can then start to investigate why this is the case. Secondly, we investigate if there are similarities across practices in the individual dimensions/elements of each practice: does a high frequency of washing oneself (by taking baths or showers) correlate with high frequencies of clothes washing and car washing, for example, or does a respondent or household that uses higher or more modern technology in one practice tend to use 'high tech' across all practices? This stage then looks at the constituent elements of practices, rather than the practices themselves, to look for correlations between them. Again, further work could then investigate why these correlations occur – does affluence and level of interest in technology, or desire for labour saving technology, shape the level of technology used across multiple practices, for example?

Both of these stages can potentially reveal hidden and perhaps unexpected linkages between practices and how they are performed, or equally serve to demonstrate the diversity in how people use water by highlighting the absence of such correlations between practices. A final stage of work presented in this report focuses on that diversity again. This stage follows a similar exercise to that presented in the work of Medd and Shove (2006), taking from the survey respondents a sample of ''average'' water users, in that they have per capita consumption (pcc) of water of close to the current national average of 150 litres per day (DEFRA, 2008b). The analysis then explores the underlying diversity in their water using practices, thus demonstrating that behind any household level averages lies substantial diversity in how and why that water is being used, in turn demonstrating the added value of investigating practices for understanding household water use.

4 Water infrastructure and household technologies

Summary of water infrastructure and household technologies

- Mains water is provided almost universally to the survey population (to 99.9%). 8% also have waterbutts or tanks, while 1% recycle grey and/or black water, usually informally.
- Water metering stands at 46% in the sample, being highest in the east (at 61%) and lowest in the London region (at 23%). Meters have usually been fitted voluntarily, either by the current resident (38%) or a previous one (24%), or when the house was built (24%). Compulsory fitting is rare.
- Water heating is usually by gas or oil (85%) or/and electric immersion heating (17%). Only two people of the 1802 surveyed (0.1%) said they had solar heating.
- Households have a variety of water using technologies both in and outside the home. All households have at least one sink or basin, 88% have a shower, and 92% have a bath. In the kitchen, 94% have a washing machine, 47% have a separate tumble dryer, and 42% have a dishwasher. 61% have outdoor taps and 57% have a hosepipe.
- Other water using technologies are comparatively rare – presence of all the following stands at (usually substantially) less than 10% of households: hydrotherapy baths or spas, ice makers in the fridge, waste disposal units, humidifiers, air conditioning, Jacuzzis, swimming pools, other outdoor water features.
- Water- and energy-efficient water using technologies are also uncommon or rare, e.g. dual flush toilets (28%), aerated shower heads or taps (1%), water displacement devices (4%), water softeners (6%).

Mains water provision is very close to universal in the survey population, at 99.9% of households. Only two of the 1802 cases said they did not have a mains supply. Other forms of water provision are fairly uncommon – although 8.3% have water butts and/or tanks, only 0.2% have a properly fitted grey or black recycled water system in place, 0.9% recycle grey water informally by collecting it, and just 0.1% (1 case) has access to a borehole or spring.

Table 5 Prevalence of sources of water provided to the home
n = 1802, weighted by household

Mains water	Waterbutts and/or tanks	Recycled water (grey and/or black water) in the home using a properly fitted system	Recycled water (grey water) in the home informally by collecting bathwater, cooking water etc. and re-using it	Borehole or spring
99.9%	8.3%	0.2%	0.9%	0.1%

46% of households in the sample area have a water meter in the home meanwhile.[3] This percentage varies substantially by region (significant at 0.1% level). Whilst the prevalence stands at 23% in the London region, it is 38% in the south east, and 61% in the east. The timing of and reasons for having meters installed also varies substantially by region (significant at 0.1% level), as presented in Table 6. Whilst meters have most commonly been fitted voluntarily at the current resident's request (38% of those who know when it was fitted), 30% were fitted when the home was built, and 24% voluntarily by a previous resident. Compulsory fitting is comparatively rare, at 8%, although this is higher (12-13%) in the London region. The meter having been fitted when the home was built is most common in the south east, based on the main sample data; those in London are also substantially less likely to know when theirs was installed.

Few who do not currently have a water meter have plans to get one. 6% plan to have one installed in the next 12 months, 1.6% plan to sometime within 1 to 5 years, and a further 3.4% have an intention but without a definite idea of when. A further 9% don't know, leaving 80% of those who don't have a meter who do not plan to have one installed.

[3] We oversampled in the Essex and Suffolk, Thames and South East water company regions in an attempt to secure a higher level of linkage between our survey results and actual household consumption (from metered bills). The 2011 Water White Paper in the UK indicated that 37% of households have a water meter and pay proportionally to what they use, although under current water company plans half of all UK homes will be metered by 2015 (DEFRA, 2011).

Table 6 Timing and reasons for water meter installation
n = 750 (those with a water meter); weighted by household
Number of cases and column percentages (excluding don't know responses)

	Main sample			Case study			Total
	East of England	London	South East	Essex & Suffolk	London	South East	
Fitted when your home was built	63	11	42	34	14	39	203
	32.1%	21.6%	45.7%	26.0%	17.7%	31.2%	30.1%
Fitted voluntarily by a previous resident	45	16	14	41	22	25	163
	23.0%	31.4%	15.2%	31.3%	27.8%	20.0%	24.2%
Fitted voluntarily at your request	80	18	29	46	33	50	256
	40.8%	35.3%	31.5%	35.1%	41.8%	40.0%	38.0%
Required to be fitted (compulsory, at some point after the home was built)	8	6	7	10	10	11	52
	4.1%	11.8%	7.6%	7.6%	12.7%	8.8%	7.7%
Total (excluding don't knows)	196	51	92	131	79	125	674
	100%	100%	100%	100%	100%	100%	100%
Don't know (as a percentage of all in that sample region)	*15*	*12*	*14*	*12*	*14*	*9*	*76*
	7.1%	*19.0%*	*13.2%*	*8.4%*	*15.1%*	*6.7%*	*10.1%*

Of the 94% who knew how their water was heated and did not decline to answer (5.4% did not know, 0.6% refused), almost two thirds have a combi gas or oil boiler; 21% have gas or oil indirect heating to the hot water tank; and 17% have an electric immersion heater. Just two people (0.1%) said they had solar heating, and 1.0% had some other form of heating, as presented in Table 7.

Table 7 How water is heated in the home
Multiple response question. n = 1695, weighted by household

Electric immersion heater	Gas or oil direct heating (combi)	Gas or oil indirect heating (to hot water tank)	Solar heating	Other
17.1%	64.5%	21.1%	0.1%	1.0%

The survey also asked respondents about the water using technology they have in their homes. Results are presented below, separated into three groups: sinks and bathroom, other indoor technologies, and outdoor technologies. Everyone has at least one sink or basin in their home, 100% with at least one sink, and 99% with at least one basin (Table 8). The spread likely reflects the size of the property. Power showers are still far less common than non-power showers. 88% of households have at least one shower of some kind though. Nearly every household has a bath too, and there were only 5 cases (0.3%) reporting that they had neither a shower nor a bath, which could easily be an error in the responses, or potentially tenants in some HMO (houses in multiple occupation) situation where they don't have private access to bathroom facilities. Single flush toilets are a lot more common than dual flush ones. 3% of respondents responded that they had neither, but this is presumably again a mistake or misunderstanding. Water displacement devices like hippos are rarely used, with only 4% having them. Of the

other sink and bathroom technologies, few have them – bidet and hydrotherapy baths or spas, nor aerated flow showerheads or taps.

Table 8 Sinks and bathroom water using technologies in the home: percentages having
n = 1802, weighted by household

Number of units	Basins (bathroom, en suite and next to toilets)	Sinks (kitchen and utility room)	Shower (excluding power shower)	Power shower	Bath	Single flush toil	Dual flush toilet (two buttons to deliver a big or small flush)	Water displacement device (eg. hippo) in toilet	Bidet	Hydrotherapy bath or spa	Aerated or other flow restricting showerheads	Aerated or other flow restricting taps
0	0.6%		29.1%	71.1%	8.4%	20.8%	72.4%	95.5%	97.5%	97.8%	98.8%	99.5%
1	53.2%	79.2%	61.7%	25.6%	86.9%	52.9%	16.4%	3.3%	2.3%	2.2%	1.2%	0.3%
2	32.2%	15.8%	8.2%	2.8%	4.1%	20.8%	8.6%	0.9%	0.1%			0.2%
3	10.9%	3.4%	0.8%	0.4%	0.6%	4.8%	2.0%	0.2%			0.1%	
4	2.3%	1.1%	0.1%		0.1%	0.7%	0.6%					
5	0.7%	0.5%		0.1%			0.1%					
6	0.1%											
7												
8	0.1%											0.1%
Percentage who have any	99.4%	100%	70.8%	28.9%	91.6%	79.2%	27.6%	4.4%	2.4%	2.2%	1.2%	0.5%
Percentage of those with any who have more than one	46%	21%	13%	11%	5%	33%	41%	25%	2%	0%	4%	45%

Of the other indoor water using technologies (presented in Table 9), having a washing machine is the norm, with 94% of households having one. Half that many (47%) have a separate tumble dryer, and 42% have a dishwasher. The percentages are quite low for the other indoor water using items.

Table 9 Indoor water using technologies in the home: percentages having
n = 1802, weighted by household

Number of units	Washing machine	Tumble dryer	Dish-washer	Ice-maker in fridge	Waste disposal unit	Water softener	Humid-ifier	Air condi-tioning
0	5.5%	53.4%	57.8%	91.5%	98.1%	94.0%	98.4%	98.2%
1	94.4%	46.5%	42.2%	8.3%	1.9%	6.0%	1.6%	1.7%
2	0.2%	0.1%	0.1%	0.1%			0.1%	0.2%
Percentage who have any	94.5%	46.6%	42.2%	8.4%	1.9%	6.0%	1.6%	1.8%
Percentage of those with any who have more than one	0.2%	0.2%	0.1%	1.3%	0.0%	0.0%	3.6%	9.2%

In terms of outdoor water using technologies (presented in Table 10), 61% of households have outdoor taps, and nearly as many (57%) have a hosepipe – either an ordinary one, or less commonly high pressure one, or both. 15% have some water in the garden for birds and wildlife. After that, the percentages having the rest of the options are all low – swimming pools, Jacuzzis, ponds, children's water toys, or automatic reticulation systems. Children's water toy ownership is higher among those with children, at 9% for single households with children, and 17% for couple households with children, but 2% at most for other households without children (the difference being statistically significant at 0.1% level).

Table 10 Outdoor water using technologies in the home: percentages having
n = 1802, weighted by household

Number of units	Outdoor tap	Hosepipe	High pressure hose or jet hose	Swimming pool (permanent)	Swimming pool (temporary)	Jacuzzi or spa (including Jacuzzi baths and hot tubs)	Garden pond	Garden water feature (e.g. fountain etc.)	Children's outdoor water toys (e.g. paddling pools, water slides, water guns etc.)	Water in your garden for birds or other animals	Automatic reticulation (garden irrigation) or garden sprinkler
0	38.7%	43.9%	90.7%	99.7%	99.1%	99.3%	92.3%	95.1%	94.6%	84.9%	98.2%
1	57.5%	55.2%	9.2%	0.3%	0.9%	0.7%	7.5%	4.7%	5.0%	14.2%	1.8%
2	3.7%	0.8%	0.1%				0.2%	0.1%	0.3%	0.6%	
3	0.1%	0.1%					0.1%	0.2%	0.1%	0.2%	
4										0.1%	
5										0.1%	
Percentage who have any	61.3%	56.1%	9.3%	0.3%	0.9%	0.7%	7.7%	4.9%	5.4%	15.1%	1.8%
Percentage of those with any who have more than one	6.2%	1.5%	0.6%	0.0%	0.0%	0.0%	3.5%	5.6%	7.2%	5.9%	0.0%

5 Water using practices in South East England

- Summary boxes of descriptive and cluster analysis results and analysis for each of the main sites of water using practice are presented in the sections below.
  - A poster pack of the results is available for teaching and policy presentations as a separate download (Browne, Pullinger, et al., 2013). See page i of this report for the URL.

Sections 5.1 to 5.3 below describe bathing, laundry and gardening practices in the south east of England based on the survey data, including details of the six common variants of each practice identified by cluster analysis. Sections 5.4 and 5.5 describe kitchen and car washing practices. No natural clusters were found in the data for either of these, and these sections therefore focus on descriptive statistics of the two sites of practice.

The separately downloadable poster pack contains resource material for teaching or policy makers interested in presenting these results to different groups (Browne, Pullinger, et al., 2013). This resource pack contains posters for the main descriptive results for each of washing, gardening and laundry, and also posters detailing the cluster results for each of these sites of practice, including the detailed descriptions of the clusters and representative quotes from the qualitative interviews. The URL for downloading the pack is given on page i of this report.

5.1 Personal hygiene: Showers, baths and other washing

Summary of personal hygiene practices

- 70% of the population have a full body wash at least daily, mostly by showering – over 50% never have a bath. Flannel or other forms of washing are only practiced by 29% of respondents, and is usually complementary, rather than an alternative to, a bath or shower.
- People typically wash to get clean, to freshen up or to smell nice, whilst having a bath is seen by some as a way to relax or ease aches and pains. Less than a quarter ever shower outside the home (mostly at the gym). Nearly half vary their shower length for different reasons, primarily for washing hair (especially among women) and shaving (especially among men).
- Shaving patterns and methods vary greatly between genders, as would be expected, with two thirds of women shaving legs and underarms and over 50% the bikini line, whilst only 15% of men shave anything other than the face (most commonly under arms).
- Over 90% of respondents brush their teeth at least twice a day. Notably, 29% still do so with the tap left running, despite water saving information campaigns encouraging people to turn off the tap.

- Six distinct variants of personal washing were identified in the data using cluster analysis. They vary in terms of the frequency of washing (the number of baths or showers per week), the technology used (the ratio of baths to showers), the diversity between washes (a measure of how many different factors people say influence the length of their showers or the height to which they fill the bath) and how many different places outside the home people shower or have baths – at the gym, at other peoples' homes, at work, or anywhere else.
- The variant of practice a person follows is only weakly predicted by their sociodemographic characteristics and environmental values, although there is a substantial variation by age, with frequency of showering and bathing being higher on average among younger age groups.
- This poses an interesting question of whether the difference is due to individuals changing their washing practice over the lifecourse, or because younger generations are adopting, and carrying, new, more water and energy intensive washing practices.

5.1.1 An overview of practices

It is already known that washing is a practice which has changed substantially for many people in the last few decades, with a switch from having baths to showers, and a switch from an often just weekly wash to daily, or even more than daily (Geels, 2005; Gram-Hanssen, 2007; Hand, et al., 2005; Quitzau & Ropke, 2009; Walker, 2009b). The data from our questionnaire reflect the new patterns well, and add interestingly to the picture. Overall in the population, nearly three quarters have a bath or shower at least daily. Figure 2 combines showering and bathing frequencies, showing that the large majority have a full body wash by one of these methods at least seven times a week. From Figure 3 we can see that showering is the preferred way of having a full body wash – 50% of respondents never have a bath, compared to just 17% who never have a shower. For most of those who do have baths, it is combined with showering, and is an occasional event. Among those who only have baths, and no showers, the majority have one about daily.

Figure 2 Frequency of having a bath and/or shower
n = 1750, weighted by respondent

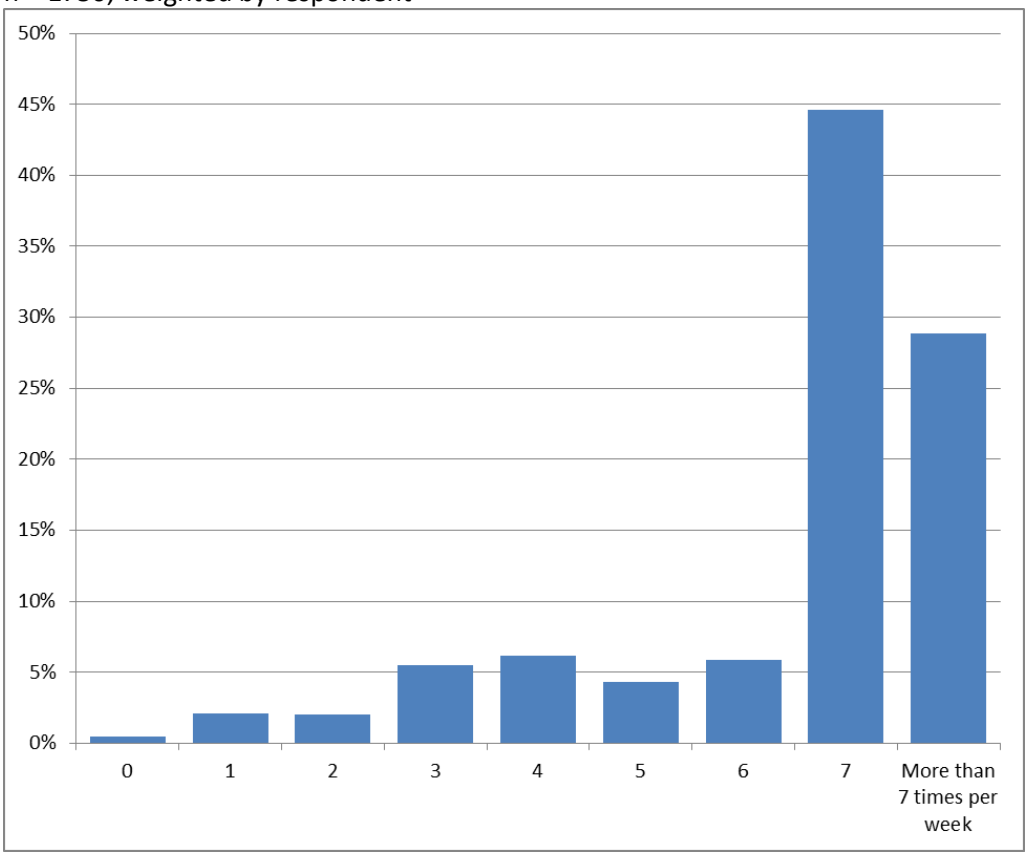
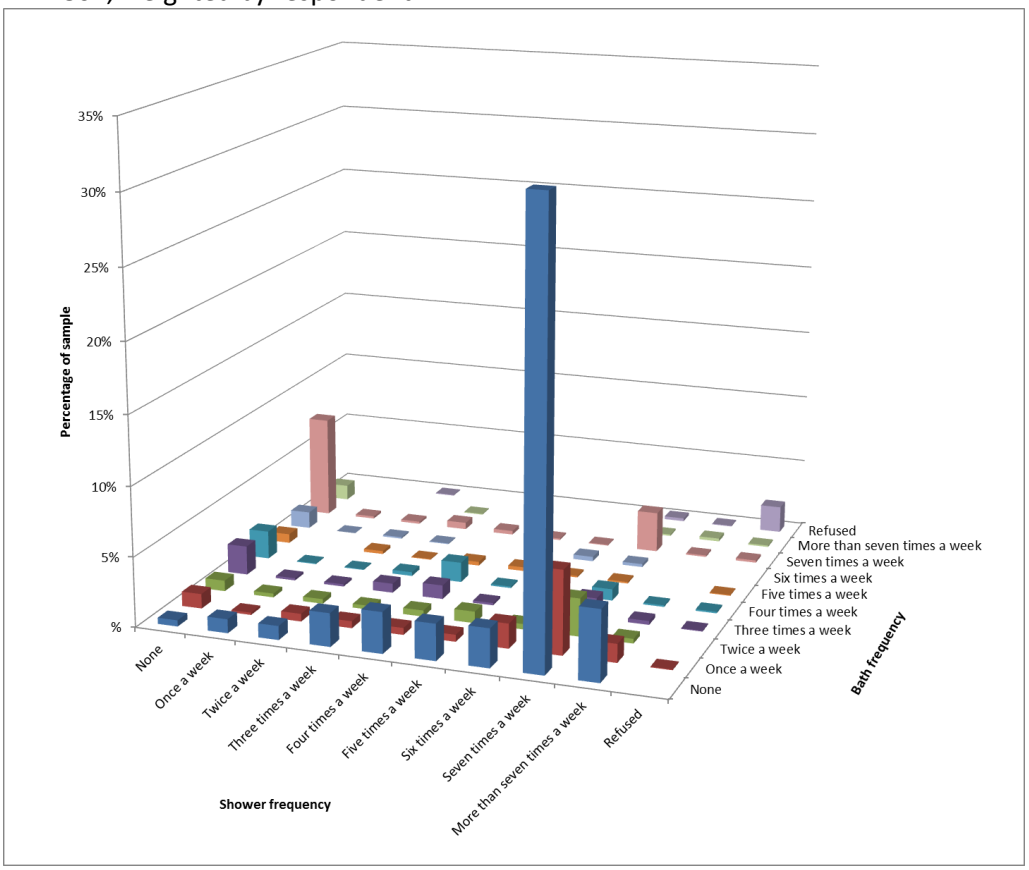


Figure 3 Percentages of respondents reporting different showering and bathing frequencies
n = 1802, weighted by respondent



The survey also asked about other forms of washing, such as flannel washing. Only 29% of people have a flannel or similar wash at all, although among those who do, two thirds do so at least seven times a week. Figure 4 compares flannel washing against the combined weekly frequency of baths and showers. 75% of those who flannel wash at least seven times a week also take a bath or a shower at least seven times a week – they are clearly currently complementary practices for most people, rather than alternative forms of washing as is being encouraged within the design literature (eg, Kuijer & De Jong, 2011; Kuijer, McHardy, & Scott, 2010; Scott, Bakker, & Quist, 2012).

Figure 4 Percentages of respondents by showering and bathing and other washing frequencies
n = 1751, weighted by respondent

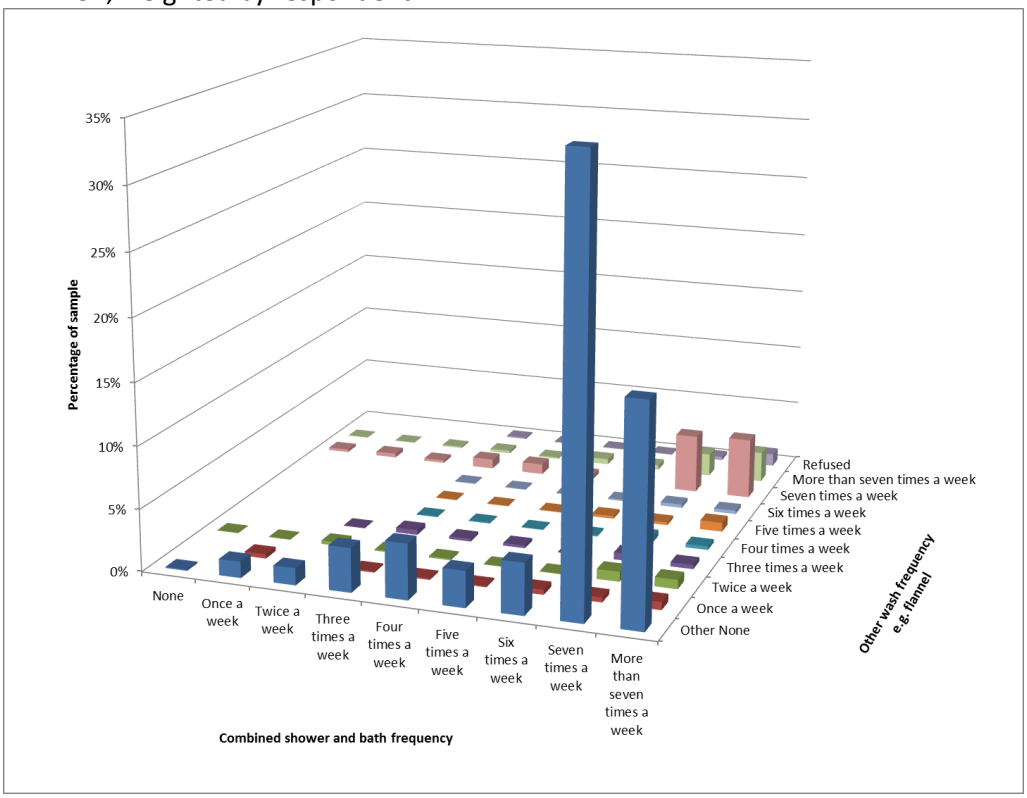
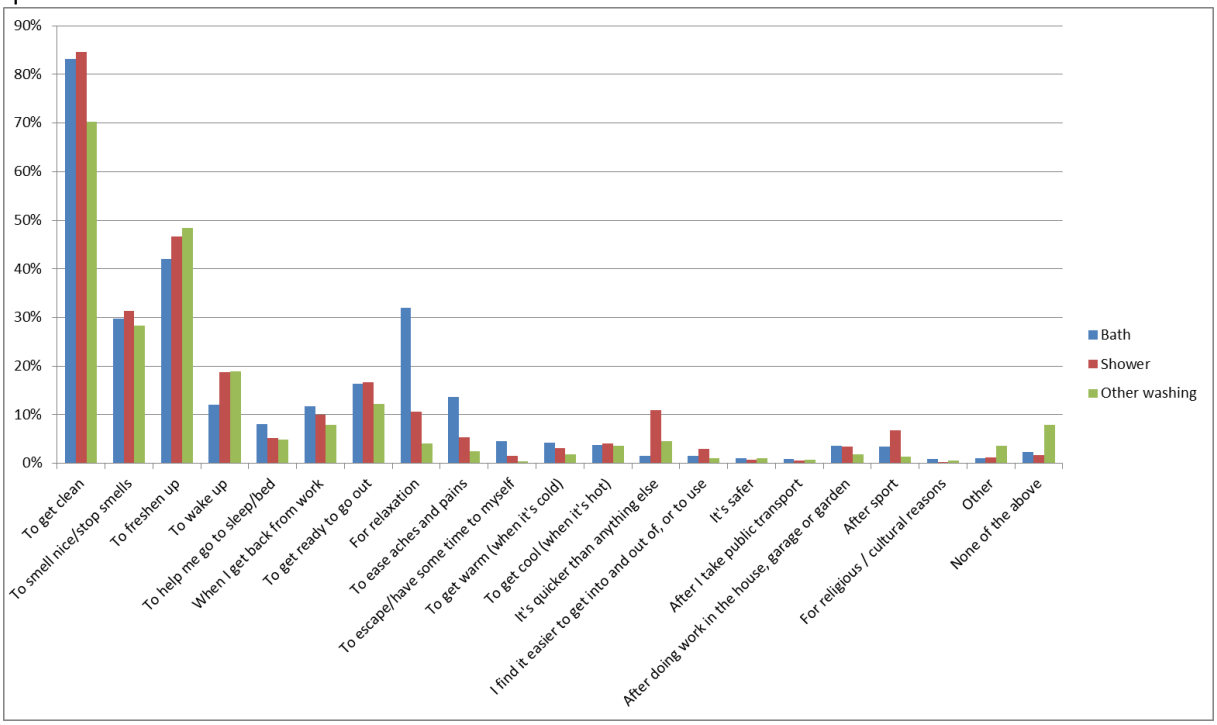


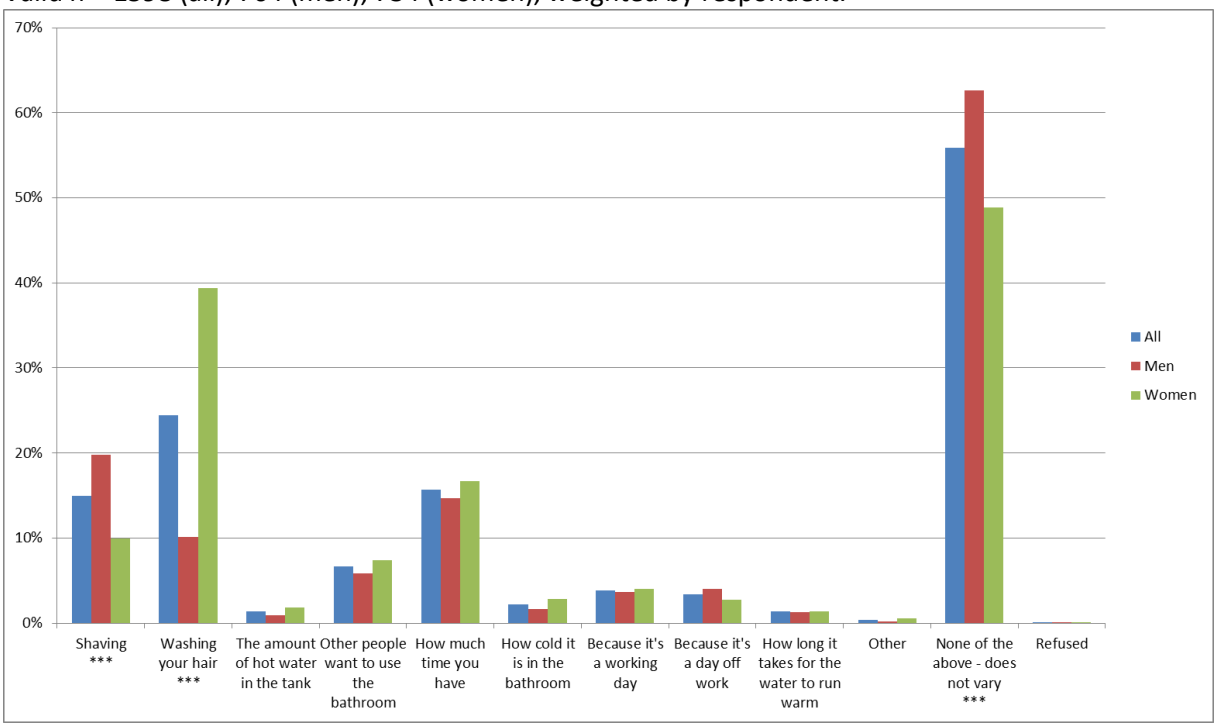
Figure 5 below shows the different reasons people answered yes to for having a bath, a shower or another type of wash. To get clean is by far the most common reason for all three categories, although less so for 'other washing' (such as a flannel wash). To freshen up is also a common reason, with between 42% and 48% saying yes to that. Next at 28-31% yeses comes to smell nice/to stop smells. Response rates are generally similar across the three types of washing for the different options, although it can be seen that bathing is popular for relaxation and to a lesser extent also for easing aches and pains, whilst showering is seen by more people as being the quickest option. What people *don't* wash for is also revealing, i.e. the options that few people selected, of which there are many, presented in the figure.

Figure 5 Reasons for having a bath, showering and other washing – percentage of 'yes' responses Valid n = 900 (bath), 1498 (shower), 578 (other), weighted by respondent. Multiple response question



In terms of people having a bath or shower outside the home, 77% report that they never do so. Among those that do, at the gym is the most common place (15% do), followed by the home of friends, family or partner (9%), and 4% at work. There is also diversity in how long people spend in the shower from day to day, with 44% of respondents who shower conscious of varying it based on different considerations. The most common reason is for washing hair (to which 24% said yes), followed by the amount of time they have (16%) and shaving (15%). 7% also mentioned others wanting to use the bathroom, while the other options were all rarely picked. There were statistically significant differences in certain responses by gender, with women nearly four times as likely as men to respond that they vary shower length for washing their hair, men a third more likely to say so for shaving, and men also more likely than women to say that they do not vary shower length for any of the reasons asked about.

Figure 6 Reasons for varying the time spent in the shower from day to day
Valid n = 1598 (all), 764 (men), 734 (women), weighted by respondent.

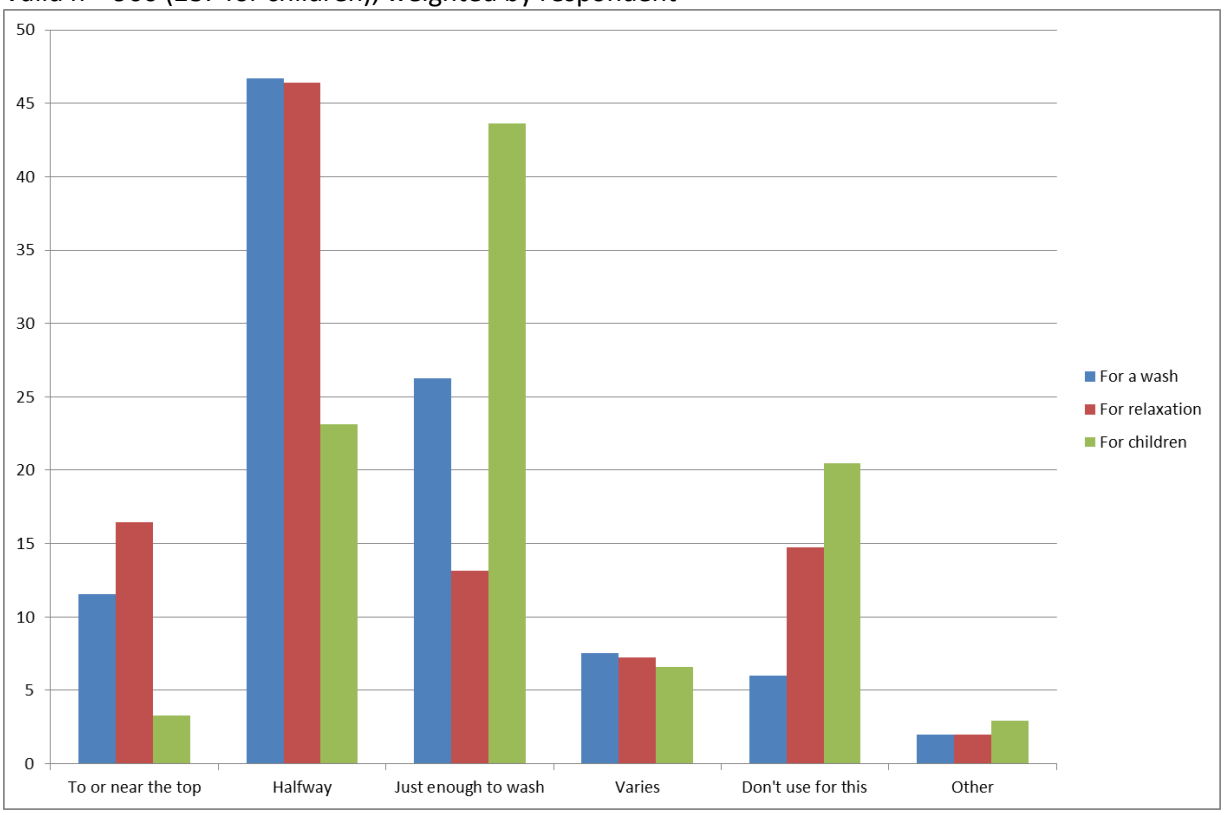


*** Significant differences between genders, at 0.1% level.

There is also some variation in bath practices in terms of how much water is used. Among those who responded yes to having a bath at least once a week, Figure 7 shows how far they fill it for a wash, for relaxation, or for children[4]. About halfway is the most common depth to fill it for washing and relaxation, for nearly 50% of people, although when filling it for children, the typical level is lower, most commonly just enough water, as one might expect for safety reasons. 15% never use a bath for relaxation, and 21% never give their children a bath (although note that this includes all dependent children up to age 17, so for many the respondent is unlikely to decide on this).

[4] Results for children include only those households with resident dependent children.

Figure 7 How full do you fill your bath? Percentages.
Valid n = 900 (287 for children), weighted by respondent



Shaving practices were also asked about in the survey. Results are given below broken down by gender, given the clear gender differences in practices relating to shaving. Figure 8 presents results for women. Around 65% of women shave their legs and underarms, and the methods used for both are very similarly distributed. Of those who do shave their legs and underarms, most wet shave (72% and 75% respectively) or use a depilatory cream (17-21%). Only 6-7% dry shave, and 2% responded that they use 'another' technique. Of the 51% who shave their bikini line, the distribution of methods is similar, although somewhat more use a depilatory cream (24%). A few shave their face (11%), head (5%) or other parts of the body (12%). Of those who do shave their face, wet shaving is most popular again, with 61% using this method, while 17% dry shave and 17% use a non-specified method.

For men, the results are quite different, as can be seen in Figure 9. The face is the only part of the body shaved by the majority (by 94%). 55% of those who do shave their face wet shave without the water running, 29% dry shave, almost 16% wet shave with the water running, and 1% responded 'other'. 8% responded that they shave their head, and similar numbers their legs and 'other parts of the body'. Dry shaving was popular for the head (37% of those who shave it), and the various shaving options were quite spread out for legs and other parts. 4% said they shave their bikini line, 62% of which use 'another' method. Over 15% shave under their arms, nearly two thirds of which do so by wet shaving, and most of the rest use 'another' method.

Rates of refusal to answer these questions are also interesting, and are presented in Table 11 below: firstly, refusal rates were three to six times higher among women than men. This is consistent with the fact that men are much less likely to shave the parts of the body asked about that are typically considered more private. The relative

refusal rates between the options are quite similar comparing the two genders, with rates highest for the bikini line and 'other parts of the body', and lowest for the face.

In summary, shaving practices vary substantially between the genders, as expected. Also as we expected (which is why we got people to answer these questions privately on the handheld computer device), shaving is clearly a very private practice, especially for women, based on the refusal rates. Dry shaving (by electric shaver or epilator) seems generally unpopular for women compared to other methods, suggesting that norms or the attractiveness of this technology may need to change before uptake would increase. Dry shaving is relatively more common for men's shaving, which might also have to do with the material culture of dry shavers and them being historically associated with men's shaving (Retallack, 1999).

Figure 8 How do you shave your…? Women's responses
n = 695-775, weighted by respondent

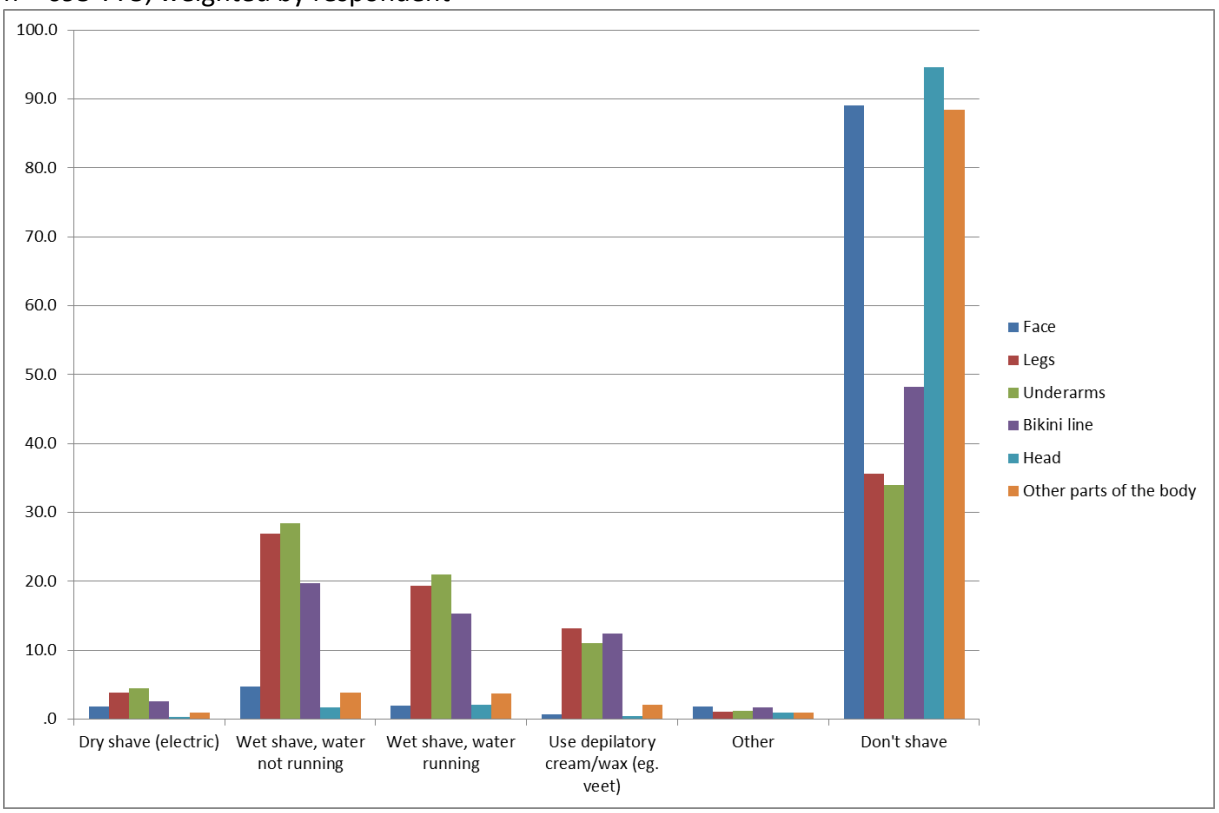


Figure 9 How do you shave your…? Men's responses
n = 827-867, weighted by respondent

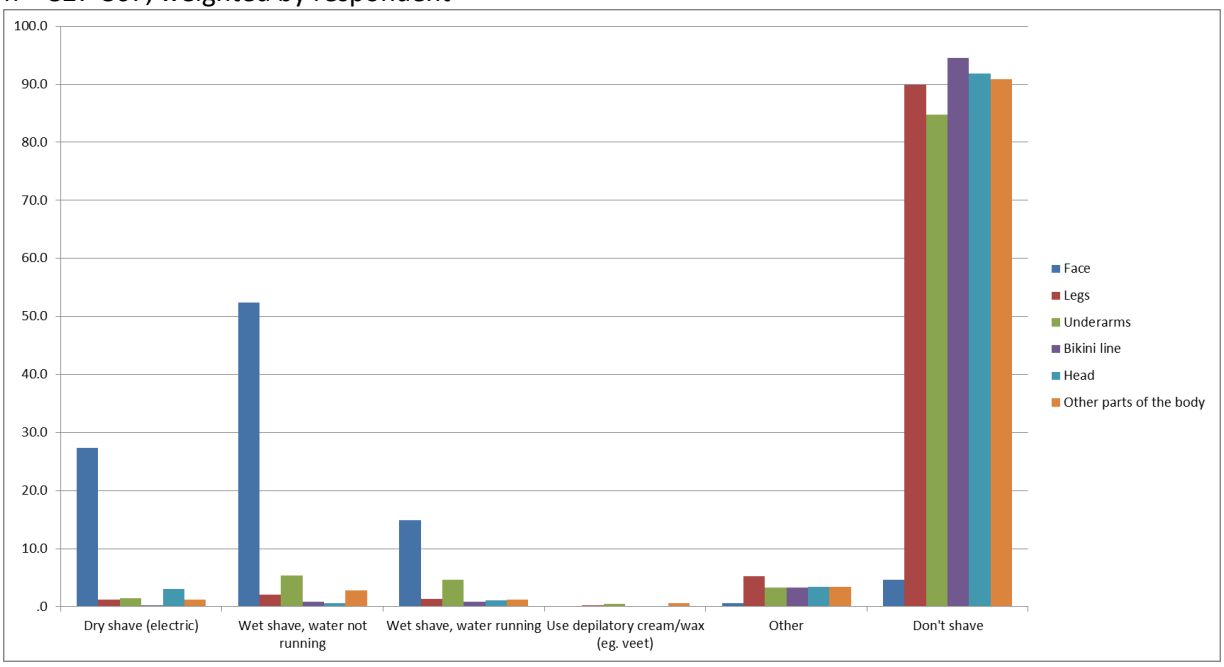


Table 11 How do you shave your…? Percentage refusals ('Don't want to answer'), by gender
n = 888 (men), 914 (women), weighted by respondent

	Face	Legs	Underarms	Bikini line	Head	Other parts of the body
Women	15.2	19.9	20.8	23.9	20.0	22.0
Men	2.3	4.7	5.7	5.7	4.8	7.4

A final area of personal care questioned about in the survey relates to teeth brushing practices. Both when people brush their teeth, and where, were asked about. The timing of tooth brushing is presented in Table 12. 88% of respondents who answered (only 0.9% refused) brush their teeth morning and night, with 4.2% of those doing so after some meals as well. Another 1.8% brush their teeth more than once a day, but not at fixed times. 8.2% brush their teeth just once a day, mostly in the morning rather than at night or at no fixed time. There are some slight trends with age, statistically significant at the 0.1% level: there are more respondents who only have dentures in the 65 and above categories (up to 6%), while the percentage brushing morning and night drops from around 85% to 70% in the oldest category (75+), and the percentage brushing teeth just in the morning increases from around 4-8% to 13.5% in the same age band. By gender, there is a slight variation, significant at the 0.1% level, with men a little less likely to brush their teeth twice a day (81% for men, 86% for women) and a bit more likely to brush them just in the morning or just at night (11.3% vs. 4.7%).

In terms of where people brush their teeth, 98% do so at the sink (Table 13), two thirds without the tap running, and 6% using a cup of water. Strikingly, 29% of the population brush their teeth with the tap running at the sink. The remainder brush their teeth in the shower or bath, or elsewhere. There were no statistically significant patterns by gender, but by age there are differences significant at the 0.1% level (see Table 14). Numbers brushing their teeth at the sink stay similar, but the youngest (16-24) and oldest (75+) age bands are more likely to leave the tap running, while cup use is substantially higher among older age bands.

Table 12 Timing of tooth brushing
n = 1802, weighted by respondent

Timing	Per cent
Just in the morning	6.5
Just at night	1.5
Morning and night	84.1
After meals	1.2
After some meals, plus morning and night	4.2
Once a day, but not at a fixed time	0.2
More than once a day, but not at fixed times	1.2
Only have dentures	1.0
Other	0.3

Table 13 Where teeth are usually brushed
n = 1785, weighted by respondent

Location	Per cent
In the bath	1.3
In the shower	0.9
At the sink with a tap running	29.0
At a sink without a tap running	62.5
At a sink with a cup of water	6.1
Other	0.3

Table 14 Where teeth are usually brushed, by age band
n = 1785, weighted by respondent. Numbers of cases and column percentages

Age band, years:	16-24	25-34	35-44	45-54	55-64	65-74	75+	Total
In the bath	10	2	5	1	2	1	1	22
	3.7%	.6%	1.5%	.3%	.8%	.6%	.7%	1.2%
In the shower	2	5	2	2	3	1	1	16
	.7%	1.6%	.6%	.7%	1.3%	.6%	.7%	.9%
At the sink with a tap running	90	93	89	73	69	41	47	502
	33.2%	29.8%	27.0%	25.1%	29.2%	24.4%	30.7%	28.5%
At a sink without a tap running	157	198	221	194	143	105	73	1091
	57.9%	63.5%	67.0%	66.7%	60.6%	62.5%	47.7%	62.0%
At a sink with a cup of water	8	10	10	20	14	18	27	107
	3.0%	3.2%	3.0%	6.9%	5.9%	10.7%	17.6%	6.1%
Other	2	1	0	0	1	1	0	5
	.7%	.3%	0.0%	0.0%	.4%	.6%	0.0%	.3%
Don't want to answer	2	3	3	1	4	1	4	18
	.7%	1.0%	.9%	.3%	1.7%	.6%	2.6%	1.0%
Totals	271	312	330	291	236	168	153	1761
	100%	100%	100%	100%	100%	100%	100%	100%

5.1.2 Six variants of washing practices

A cluster analysis led to the selection of six distinct groups of washing practices. Washing cluster membership was defined along four dimensions characterising different aspects of washing, described in Table 15 below. Washing frequency

represents the number of baths or showers per week, technology represents the ratio of baths to showers, diversity is a measure of how many different factors people say influence the length of their showers or the height to which they fill the bath, while outsourcing is a measure of how many different places outside the home people shower or have baths – at the gym, at other peoples' homes, at work, or anywhere else.

Table 15 Dimensions used to identify variants (clusters) of washing practice

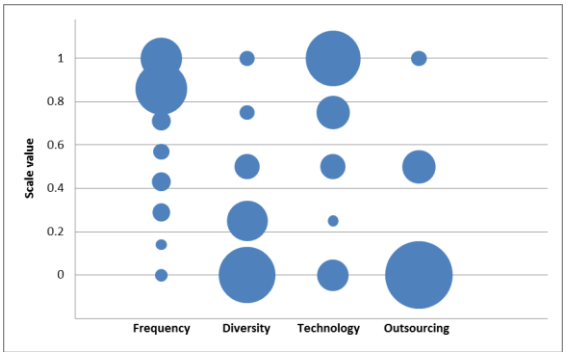
Dimension	Definition	Scale values
Frequency	Number of baths and showers per week.	0 indicates 1 or fewer; 1 indicates 8 or more
Diversity	Number of factors which affect shower duration or level of filling the bath.	0 indicates none (never varies); 1 indicates 4 or more factors.
Technology	Shower to bath ratio.	0 indicates always baths; 0.5 indicates about equal; 1 indicates always showers
Outsourcing	Number of places outside the home at which respondent also showers/bathes.	0 indicates none; 0.5 indicates 1; 1 indicates 2 or 3.

Figure 10 below presents balloon plots of the differing characteristics of the six clusters. The first figure shows the distribution of all the respondents on the four dimensions by which clusters are defined. The remaining figures show the distribution of members of each of the six clusters in turn on these same dimensions, so that their relative differences from each other and from the population overall can be seen.

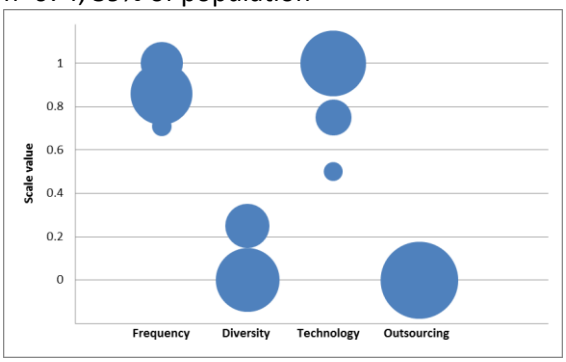
As well as differing along these dimensions, members of the different clusters also have distinct differences in other aspects of their personal care regime which were asked about in the survey and presented in the previous section, such as how they brush their teeth, and whether and how they shave different parts of their body. Sociodemographic characteristics also in some cases predict to which cluster an individual is more likely to belong, although the strength of correlation is usually weak, so that people with a given set of sociodemographic characteristics can still be found in most or all of the different clusters. The following paragraphs briefly summarise the main characteristics of each variant of personal hygiene practice, then compare the groups, and the following section presents detailed results for each cluster.

Figure 10 Personal hygiene (washing), 6 cluster solution: balloon plots
Bubble sizes represent weighted percentage of respondents having that value on that dimension

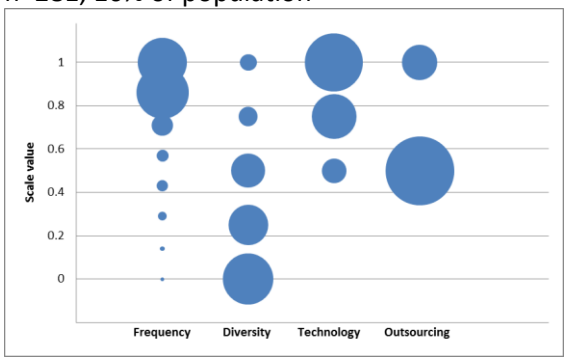
Population as a whole
n= 1750-1802



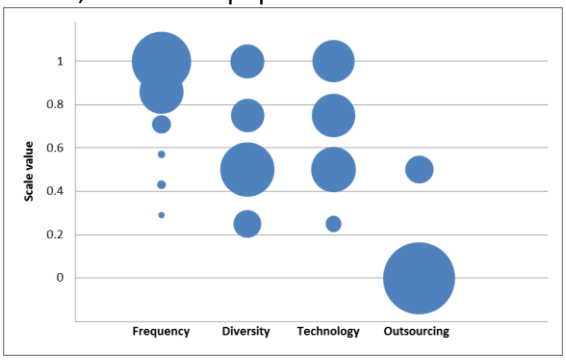
Simple Daily Showering
n=674, 39% of population



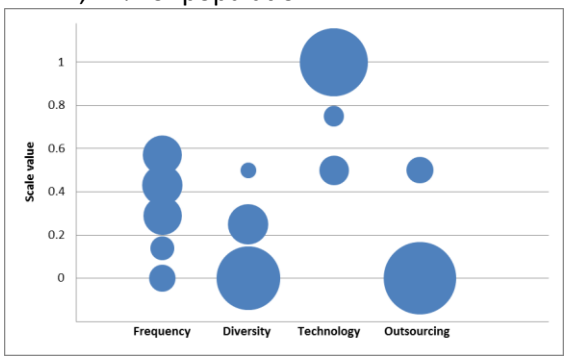
Out and About Washing
n=281, 16% of population



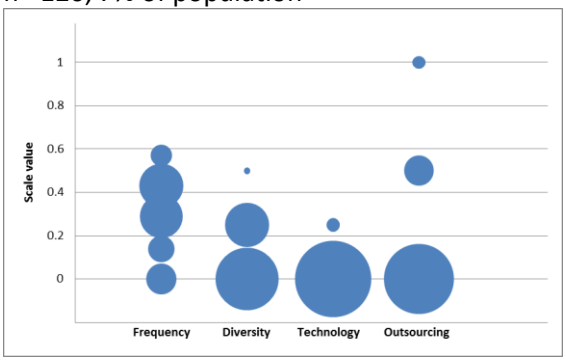
Attentive Cleaning
n=261, 15% of the population



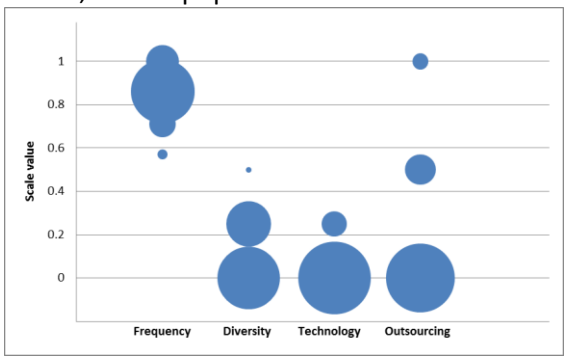
Low Frequency Showering
n=211, 12% of population



Low Frequency Bathing
n= 120, 7% of population



High Frequency Bathing
n=200, 11% of population



By far the largest group arising from the cluster analysis is that of 'Simple Daily Showering', with almost 40% of the population partaking in this routine. The performance of this practice is simple, with practitioners washing usually every day, sometimes more often (and occasionally just six times per week), and usually only having showers. People involved in this type of practice usually don't change their shower length or bath water level for any particular reason, and never shower outside the home. It appears to be a practice where the daily shower is just 'the done thing', performed out of habit as the accepted, and most convenient, way to stay clean and fresh. Brushing teeth twice a day is also the norm for those following this washing pattern, slightly more so than for the rest of the population (89% vs 80% do so).

The next two groups in size, both followed by about 15% of the population each, are 'Out and About Washing' and 'Attentive Cleaning'. Out and About Washing differs from Simple Daily Showering primarily in that showers or baths are taken outside of the home as well, particularly at the gym, where two thirds of people in this group shower (compared to just 5% of the rest of the population), and at a friend's, family or partner's place (38% compared to 4%). People in this group are also more likely to wash more than daily, and women are more likely to shave under their arms and their legs. Followers of this practice are substantially younger on average than the rest of the population, more likely to be in full time work, and more likely male.

The people who are committed to Attentive Cleaning meanwhile rarely wash outside the home, but are even more likely to have eight or more showers or baths per week. They vary in the proportions of baths and showers, but most have quite a fair share of baths, and they also vary how long they spend washing for a wide range of reasons, suggesting they take a lot of care in their washing and grooming. Both men and women are substantially more likely to shave their body, particularly under arms and legs for men (41% and 22% do, respectively, compared to 17% and 13% in the rest of the population). People following this practice are also more than average likely to have children. In short though, both Out and About Washing and Attentive Cleaning tend to be practiced by people who are young and socially and/or physically active, with these water intensive washing practices perhaps representing rising new variants of personal care.

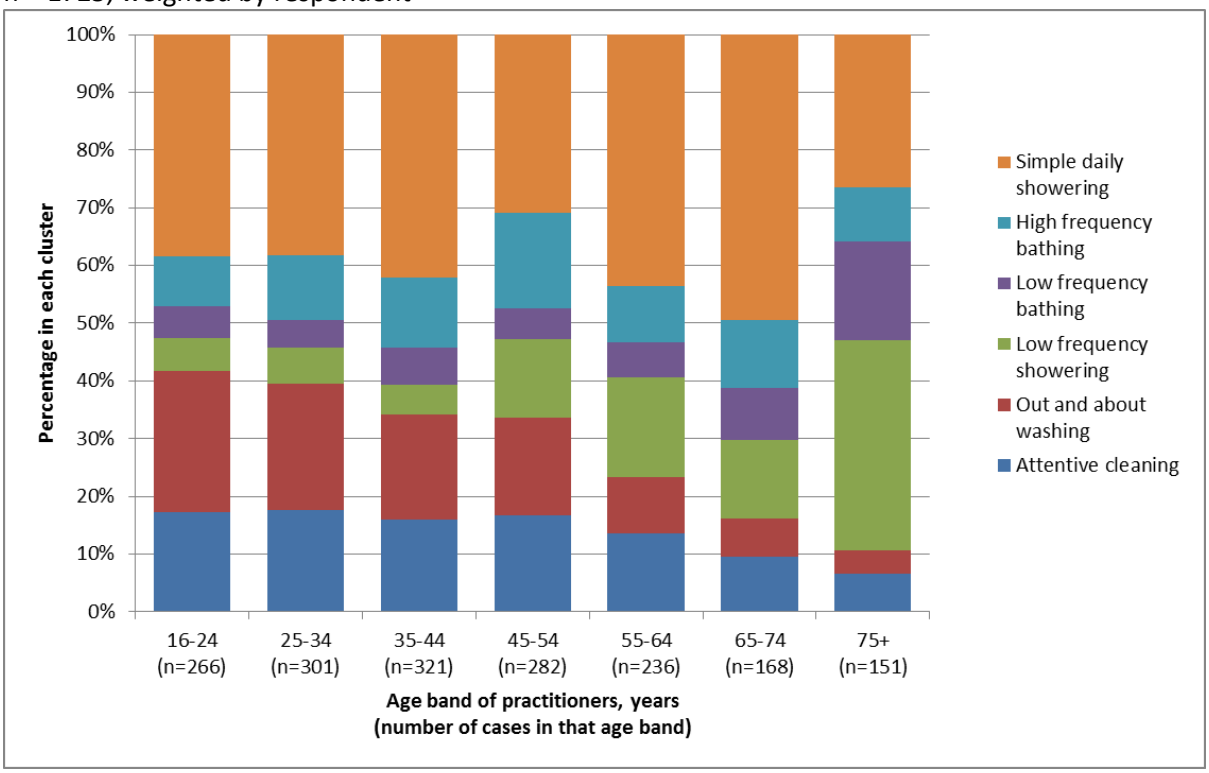
Smaller proportions of the population follow 'Low Frequency Showering' and 'Low Frequency Bathing', at 12% and 7% of the population respectively. In both variants, people average about four baths or showers per week, but often fewer, with the first variant usually only involving showers, the other almost always involving just baths. People who partake in these practices tend to be markedly older than average and more likely to be retired. They could represent variants of washing that have been carried by the members of this group for years, although many seem to have made the switch from baths to showers.

The final variant of washing, 'High Frequency Bathing', is notable for involving a usually daily bath, but almost never a shower. There is a suggestion in the data that for many people following this variant, having a bath rather than a shower is simply because they don't have a shower in the home, and perhaps do not have the possibility to get one – they are more likely to be less affluent than average, unemployed, and to be renting, all potential barriers to installing this technology in the home.

So overall there is an interesting picture in southern English washing practices. How people wash varies strongly with age: Figure 11 shows the variation in the proportions of each age band which can be found in each cluster, posing potentially very interesting questions about whether the change in practice associated with age is due to changes over the lifecourse (that is, whether people move between these different

variants of practice at different periods of their lives), or whether it represents generational change, with new variants of washing emerging (e.g. Simple Daily Showering, Out and About Washing, and Attentive Cleaning) and other variants now simply being traces of disappearing practice (e.g. Low Frequency Showering and Bathing).

Figure 11 Variation in percentages of cluster membership by age
n = 1725, weighted by respondent



5.1.3 Detailed cluster results, and proxies of practice

The six clusters are described in more detail below, drawing on the data from Figure 10 above and more detailed analyses available in the Technical Appendix. The descriptions cover the aspects of washing practice which define the clusters (i.e. the respondents' scores on the four cluster dimensions – frequency, diversity, technology and outsourcing), other aspects of washing and personal care practice not included in the cluster definition (such as shaving and tooth brushing practices), and sociodemographic characteristics of the members of the different clusters. We have included some quotes from the interviews to illustrate in more detail possible formations of how personal hygiene practices appear in each cluster.

Simple Daily Showering

Practiced by: 39% of population (of SE England) (n = 674, of 1747, weighted)

A summary of the cluster:
By far the largest group, this form of washing is somewhat more homogenous than those of the other washing clusters. This variant involves washing frequently, nearly always at least daily, and mostly without any variation in shower duration or how full the bath is

based on the reasons for which people are having it[5]. People who participate in this variant of practice tend to have only showers, although some have baths for as many as half of their weekly washes. They never shower or have a bath outside the home. They are less likely to ever flannel wash than others (76% never do vs 63% of the rest of the population), and less likely to report showering for many of the less common reasons asked about in the survey (mostly to do with relaxation and comfort) – that is, the reasons for showering seem to be the ones more commonly reported, fitting well the fact that this is the mainstream variant of washing practice. Both men and women who practice this form of washing are more likely than others to not shave under their arms, and men are also more likely to not shave the head and 'other' parts of the body, although the differences with the rest of the population are quite small. Brushing teeth morning and night is the norm, even more so than for the rest of the population.

Although the group following this variant of washing practice represents nearly 40% of the population, one can still see that it differs in some sociodemographic characteristics from the average – members of this group are a bit more likely to be in full time work, and less likely to be unemployed; likely to be more affluent than average, and more likely to own their house outright, whilst being less likely to rent. They are also more likely to be a couple and to be free from long term health problems or disabilities in the household.

A qualitative example of practitioners of 'Simple Daily Showering' is Matthew and Cheryl, a married couple of 55-64. Cheryl is retired and her husband works part time. They live in a beautiful, pristine 10 room detached house that they own outright with a large front and back garden in a small town in rural Essex. They shower every day. This is what they say about their washing practices, including reflections on how their washing practices have changed over time:

Cheryl: We tend to shower.

Matthew: We shower all the time, we do have a bath, we've got a bath but it always takes so long to fill it and it always seems to be such a waste of water, to be honest, if you fill all the bath up and you spend too long in it you go all wrinkly and then you get....

Cheryl: you find yourself more exhausted I think when you've had a bath. You feel more refreshed when you've had a shower. We very rarely do a bath, do we, we always shower every day.

Matthew: we had baths 15-20 years ago but since we had one put in that's when it all changed over to showering all the time.

Interviewer: I find it interesting what you say about baths making you more tired, do you think.... can you explain that?

Cheryl: because I like the water fairly hot, yeah, and I can't sit in a bath that's tepid so I like it fairly hot, and of course it does sap your energy. I find that when you get out you're really – phooar!

Matthew: Because Cheryl she doesn't like the cold anyway so the door was always closed, the window was always closed and when it [the water] started to get cooler she turns the hot tap on again so it was like a steam room. I used to be the same I suppose really. You get out and you're sort of pink and that's the idea really. And you could fall asleep really.

Interviewer: It's like deep relaxation. Do you ever take a bath here secretly? [laughs]

[5] At least, this variable indicates that they do not consciously vary shower length or bath height for any of the reasons asked about, but this does not necessarily mean they do not still vary from day to day.

Cheryl: sometimes - if you get a bad back or you don't feel well then I think a bath is nice.

Matthew: but it's very rare, not often.

Interviewer: so is it a shower a day sort of routine?

Cheryl: yes, every day.

Interviewer: so do you have a shower in the morning or..?

Cheryl: erm, usually at night, in the evening I usually have a shower before we go to bed. Don't we. I mean, if I don't get one that night for some reason that night, going out, then I'll have one the next morning.

In summary, this represents the population's standard variant of washing practices – a daily shower, not varying in duration for any specific reasons, with some baths, and always at home – seemingly a simple practice of a daily wash to keep clean and fresh. The fact that this has emerged as the dominant variant in the cluster analysis fits with the literature exploring the transition in bathing and showering due to changing expectations of comfort and cleanliness, and available technology (Geels, 2005; Quitzau & Ropke, 2009; Shove, 2003). It seems that the simple daily shower, for most people, has indeed become the new normal. A question then becomes whether this daily showering is likely to remain the normal variant of washing in the future. In some ways, if we are to consider that 'getting wet' at least once a day through a shower is now the baseline, a potential future trajectory of this cluster is an increase in showers to more than once a day, plus additional baths for things such as relaxation or illness as was identified in the qualitative data. In terms of interventions, as followers of this variant are slightly more likely than average to own power showers, overall water reduction might be substantial if the water-efficiency of power showers could be improved, or shorter shower durations could be effectively encouraged – something that is already addressed in conventional water efficiency programmes. However, perhaps a more substantial impact on members of this new cluster would be to consider the underlying meanings behind the 'daily shower', and considering interventions that challenge this 'normalised' idea of what it means to be clean and how this is achieved.

Out and About Washing

Practiced by: 16% of population (of SE England) (n = 281, of 1747, weighted)

A summary of the cluster:

This cluster is defined by a usually at least daily shower or bath, and a tendency towards more showers than baths (and often only ever showers). The reason that it is called 'Out and About Washing' is that people in this group perform the practice of washing and bathing outside the home more than any other group, particularly at the gym, but also at the home of other people and at work. They vary their shower duration and bath height for different reasons slightly more than the average, but there is a range of such 'diversity' in the group, and the only specific reasons for varying shower length that are given statistically significantly more that by others is for shaving, the amount of time available, and because it's a day off work. Followers of this variant of washing practice are also more likely to have extra flannel or other washes too, and are more likely to have showers for most of the range of reasons asked about, whilst having a bath is more likely to be about relaxation or getting cool when it's hot than for other people. They are more likely to own both ordinary and power showers, and to combine showers and

baths, i.e. having a shower before or after a bath. In terms of shaving practices, for men differences with the rest of the population are small, but women in the cluster are markedly more likely than others to shave their legs and underarms, but not using wax. The practice of brushing teeth at the sink with a cup of water is less common in this group.

This cluster's members are likely to be: substantially younger than average, with relatively few over 55; in full time work and not retired; and more likely than average to be male. They are more likely to want to do more for the environment than they currently do, and more likely to have a mortgage, and less likely to have health problems. They are more likely to be living with at least one other person, usually in a house of three or more. They are less likely than others to have had a water meter fitted themselves if they have one.

Consider the qualitative interview data of Lewis, who is a 16-24 year old single male who lives in his parents' semi-detached nine room house (male 55-64, female 45-54) in seaside Essex. He showers seven times a week and 'other' washes, such as with a flannel, seven times a week, doing both of these to 'get clean'. He also showers in the gym and fitness centre when he goes there.

Interviewer: so showering and stuff like that, you don't push that a couple of days?

Lewis: no, only if I'm feeling really lazy.

Interviewer: not even at uni?

Lewis: no not even at university to be honest just, no I'm just not up for that.

Interviewer: so you have a shower every day, and wash your hair?

Lewis: yeah yeah wash my hair.

Interviewer: so do you have memories of doing things differently when you go on holiday to different countries or other places?

Lewis: I've been to places like Italy on school trips and you know you might have left it a few days sort of thing because it is a school trip and you can't be arsed, but apart from that it is routine, apart from camping and places like festivals and things then it is just wipes.

Interviewer: yeah, I was thinking about that. So how does that feel? So does that bother you when you are there?

Lewis: no, 'cause everyone is in the same boat and you have wipes and that so I don't think that it is that much of a big deal. I don't think it is anyway.

Interviewer: could you imagine taking that habit out of its context and doing that here?

Lewis: no, it would be different because you would obviously smell compared to everyone else, well I would [laughter].

Interviewer: when you were at university you were saying there were people [that smelt because they didn't wash] ....

Lewis: yeah, but I couldn't really, nah it's not the done thing ergh to smell, it's not for me, nah.

Interviewer: so what about cleaning your room is there a critical threshold of dirt?

Lewis: oh well my room - I'm always clean, but my room was pretty bad to be honest actually!

Overall, this variant of washing does not differ markedly from Simple Daily Showering, except that it includes showering or having a bath more outside the home and more variation on the other dimensions. Without longitudinal data (both quantitative and qualitative) it is difficult to say whether this cluster is a new variant of everyday showering, or whether it is one that is associated with a particular demographic group or stage of the lifecourse. One way to interpret the group which follows this variant is that it is comprised more commonly of younger, active, sporty, and urban people and those with other similar socio-demographics. Potentially they then shift into a 'Simple Daily Showering' pattern as their lives become oriented towards work and home and other activities that prevent them from being 'out and about' quite as much (such as starting families, increasing work commitments, mortgages, etc.). Similarly, this could represent a new variant of showering and cleanliness regime, with the daily shower at home still a fairly central practice, but one which is supplemented with additional showers and cleanliness regimes occurring outside of the home. Lewis' account and survey responses demonstrate such a practice well, indicating that he showers seven days a week, flannel washes seven days a week, and showers outside the home at the gym or leisure centre!

Current approaches to water demand focus mostly on the impact of people's water use in the home; however, as this cluster shows there is a small group of people who shower not only in the home but in other, often public, spaces as well. That is, it reveals that peoples 'water footprints' due to washing extend outside of the home. The focus of conventional water efficiency programs on water use in the home then misses opportunities in terms of intervening in technology and water efficient devices in public spaces such as work places, gyms and leisure centres. This could involve both the provision of more water efficient technologies in these spaces, as well as their becoming potential sites for other interventions (e.g. encouraging shorter showers or substituted cleaning practices such as flannel or splash washes rather than showers). As with followers of Simple Daily Showering, people practicing this variant of washing are clearly being recruited into the practice of daily (or more frequent) showering and therefore playful interventions and experimentation relating to ideas and routines of cleanliness that confront this increasing participation in cleanliness practices inside and outside of the home could be quite impactful. These more drastic interventions might be particularly pertinent if there is an increase in active, sporty and 'out and about' social lifestyles in the future.

Attentive Cleaning

Practiced by: 15% of population (of SE England) (n = 15, of 1747, weighted)

A summary of the cluster:

'Attentive Cleaning' involves have a shower or a bath at least daily, often more, with showers rather than baths usually accounting for between half and all the total. Shower length or bath water level is generally more varied between washes than in other clusters, with at least one and usually two or more considerations affecting these things. Indeed, across the range of reasons surveyed for why people vary shower length, they are consistently between five and 15 times more likely to respond yes to them if they follow this variant. They are less likely than the rest of the population to shower outside the home (in at most one other place, but usually none), significantly less at the gym and at work.

The picture of members of this group is one in which practitioners put a high priority on personal grooming, which is backed up by the other aspects of their personal care practices. They are more likely to have a shower unit in the home, and to have a power shower, and to have two or more baths in their home, than the rest of the population. They are also more likely to cite most of the range of reasons surveyed for having a bath or shower, from freshening up to waking up to relaxation (although not, interestingly, any more likely to say yes to showering or having a bath for getting clean). Shaving practices vary substantially from the rest of the population too. Men are substantially more likely to shave their body, particularly under arms and legs: the 'metro-sexual' male seems therefore to be clearly in this group. This is reflective of the increased depilation of male body hair that has been acknowledged in the literature on both heterosexual and homosexual masculinities (Boroughs, Cafri, & Thompson, 2005; Pompper, 2010; Shugart, 2008). Men in this group are also less likely to dry shave, but more likely to wet shave, and 28% do so with the water running, compared to 13 % in the rest of the population. Women meanwhile are substantially more likely to shave all parts of their body, including being slightly more likely to shave their faces and heads. There seems to be an overall greater than average preference for wet shaving too, particularly among women, and often specifically with the water left running. Members of this group are overall likely to be younger than average, and to be female, more likely to have children, especially two or more, and less likely to be retired or with health problems in the household. They are less likely to have a water meter, and for those that do, it is more likely to have been fitted compulsorily than for the rest of the population.

Consider the qualitative information of Christian and Anna, who are a retired elderly couple (75+); hardly the image of the young 'metro' lifestyle described above, but their washing practices nevertheless fit with the characteristics of 'Attentive Cleaning', based on their survey responses. The interesting thing about their interview is that this 'attentiveness' to cleanliness is linked to weather and lifestyle, and seems to be associated with particular stages of their life. They recalled in their interview a time when they lived overseas during which they would often shower multiple times a day. Although their practices may have changed on their return to England and in retirement, their current practices still hold remnants of this attentiveness – their cleanliness practices shifting with feelings of needing a shower, bath or other wash rather than on any time-based schedule.

Interviewer: do you have a shower in the house?

Christian: yes.

Anna: over the bath.

Interviewer: do you use it or do you prefer a bath?

Christian: yes. I prefer a bath because it helps you when your knees hurt or something and it is quite relaxing, a bath. We use both mmmm...

Anna: we manage to get in and out.

Interviewer: so do you [to Anna] have showers and baths?

Anna: mostly baths.

Interviewer: and would you have one every day?

Anna: more or less every other day.

Christian: occasionally in between, depends what it is you would shower maybe on odd

days.

Anna: If it's hot we have the odd shower more or less ... Do you want to know this detail?

Interviewer: the thing is, everyone does things so differently so part of the reason that we are talking to people is to understand the diversity of what people do because for some people having a shower every morning they couldn't consider having....

Christian: if the weather is really hot, you do. When we were [living] in South America and South Africa sometimes we used to have a shower in the morning and in the evening, mind you we didn't have to if we had a pool to have a swim instead, but you would still have a shower.

Anna: we had a pool in the block of flats and when we were in Rio as well.

Interviewer: so did you find you had a shower in the morning and evening depending on when you went for a swim, but did you have a shower after you had got out of the pool?

Christian: yes, because of the chlorine, so basically after being in the pool you shouldn't need a shower, but you still do.

The overall picture of people who perform 'Attentive Cleaning' is of a group who place great importance on personal grooming, and it is suggestive of younger people following modern, urban lifestyles, and for men the image of a 'metrosexual' who is explicitly focused on grooming. Although involving a high washing frequency, this practice differs from Simple Everyday Showering and Out and About Washing in the attentiveness to cleanliness involved and the range of other reasons for washing, bathing and showering, as well as the significant proportion of washes that involve baths rather than showers. As well as the issues of frequency of use of baths and showers, followers of this practice also have a tendency to wet shave with water running. The combination of all these factors suggests there would be high water consumption associated with this variant of practice. Again, the issue of 'lifecourse' versus 'new variant of practice' arises here – people who wash like this are likely to be younger, but also more likely to have children. It is likely that this is a new variant of practice – that this attentiveness to cleaning is capturing the younger generations of new practitioners. Similarly, as this group is more likely to be younger and with children, it could also reflect transitions in lifecourse. For example, perhaps one possible explanation from a lifecourse perspective is that there might be a transition from Out and About Washing to Attentive [home based] Cleaning as younger people's lives become less oriented to the 'outside world' and oriented more towards their homes, and care of children. Of course, given the nature of our data this is largely speculative, but this does seem likely, although so does the idea that this increasingly common high intensity personal care represents a new, more intensive, variant of everyday cleanliness.

Low Frequency Showering

Practiced by: 12% of population (of SE England) (n = 211, of 1747, weighted)

A summary of the cluster:

This variant of washing practice differs from the most commonly followed one (Simple Daily Showering) primarily in involving a lower washing frequency, about four times per week on average, and no more than five, usually or always being showers rather than baths. Indeed, fewer of the relatively small group who practice this variant actually have

a bath in the home than the rest of the population – 82% vs 94% do. None or one (or rarely two) factors affect shower duration or bath water level, less than the average for other variants. Showering outside the home is less likely (in at most one other place, but usually none), particularly less likely at other people's homes or the gym/swimming pool. Followers of this variant as less likely to use showers for cleanliness, relaxation or comfort purposes, and are also likely to perform other self-care practices less often than average, such as brushing teeth less often, with women also being less likely to shave.

Followers of this variant of washing are substantially older than average, three quarters being 45 or over, and over a quarter being 75 or over, four times the proportion in the rest of the population. They are more than twice as likely to be retired (38% are) and less likely to be in full time work. Related to their being older, they are less likely to have dependent children living with them, and more likely to be living alone or with one other, in a home they own outright. They are also more likely to have long term health problems or disabilities in the household (29% do compared to 11% of the rest of the population), and are less likely to wish to do more to help the environment.

Consider the following example of someone who practices low frequency showering: Eliza is a 45-54 housewife who lives in an outright owned semi-detached house in northern London with her husband (45-54), which they share occasionally with their two university aged daughters. In the survey she said that she showered twice a week, and flannel washed seven times a week. While she uses the shower to get clean, because it's quick, after sport, and to cool down, the flannel wash is simply to 'get clean'. Eliza also reflects upon how the patterns of her washing habits changed with altered work and commuting patterns, and as a result of more leisure time as her children got older and left home. It is also interesting to reflect that it was only through the qualitative information that it was revealed that Eliza also has a weekly bath – her results to the survey did not reflect this for whatever reason, even though the frequency of having a bath was asked about.

Eliza: I'd say for me personally, I probably have more baths now because my children are grown up so I have more leisure time [laughs] and I consider a bath as a leisure activity whereas having a shower is what you do to get clean.

Interviewer: so how often would you have a leisurely bath?

Eliza: probably about once a week.

Interviewer: and is that embedded into a routine of say a Friday night or …?

Eliza: it's usually a Sunday night treat yeah.

Interviewer: and do you soak in there for hours?

Eliza: I do yeah! [laughs].

Interviewer: candles and music, all that kind of thing? [laughs].

Eliza: yeah, I do, all that kind of thing yeah!

Interviewer: oh lovely. So do you have a shower every day?

Eliza: no, not necessarily. Every couple of days or whatever; it depends what I've been doing kind of thing.

Interviewer: so if you haven't been outside in the garden, or it is not hot, would it be every couple of days? What's the thing that changes?

Eliza: the thing that changes, ah.... well obviously the heat makes a massive amount of difference, because you get really sweaty and things don't you. And to be honest when it is cold you don't particularly feel like having a shower in this house because it is quite a cold house. That puts you off a bit! It's not particularly warm! Ummm and also obviously what you have been doing. We do loads of gardening and you get absolutely filthy when you come out of the garden and stuff like that, or if you've been exercising.

Low Frequency Showering probably leads to a relatively low level of water use for washing, but encouraging others to adopt this variant of washing practice would perhaps be quite difficult! It would be interesting to see from repeat surveys whether this variant is being carried by the same cohorts over time, or whether it is a way of washing which people adopt as they get older, potentially due to decreased social pressure to 'look presentable' in work and social situations, and potentially due to decreased mobility and increased disability. To hypothesise, the most likely is that this is a practice that is essentially a trace of the past, when there was less frequency in washing across the majority of society; with this now representing a variant of practice that has been replaced by more high frequency, high intensity personal washing and grooming practices such as those of the previous clusters. However, as can be seen from the qualitative information on Eliza, it could equally represent a change in life stage with decreased social pressure, and the influences on the 'decision' to wash changing from a need to look 'presentable' to being more responsive to actual activities (gardening, exercise) and, with increasing time available, baths being considered (even if infrequently) as a leisure activity.

Low Frequency Bathing

Practiced by: 7% of population (of SE England) (n = 120, of 1747, weighted)

A summary of the cluster:

Followers of this variant of practice almost always have only baths (97% never have showers, with the rest having them only occasionally). Variation between performances of the practice is low, and bathing outside the home is on average less common than for the other clusters, although the full range of outsourcing scores is present. The difference to the other bathing cluster (see below – High Frequency Bathing) is the comparatively low frequency of full body washes compared to the population as a whole – no more than five baths/showers per week, averaging three or four (although always at least one). Followers of this variant of washing are also parsimonious with water use, tending to fill the bath substantially less than average whether it be for washing, relaxation or for children, and being more likely than average to turn the tap off when brushing teeth. People in this group are slightly more likely to bathe to get clean, and less likely for other reasons such as to wake up, to get to sleep, to get ready to go out or to relax, although they are more likely to have a flannel wash to relax. Men are somewhat less likely to shave their face, underarms and other parts of the body, while women are substantially less likely to shave their legs, underarms and bikini line compared to the rest of the population. Men are generally slightly more likely to wet shave these parts of the body with the water running, women more likely to wet shave *without* the water running. They are more likely to brush their teeth just once a day, and less likely twice. They are substantially less likely to have either a shower or a power shower.

In terms of their sociodemographic characteristics, the followers of this variant are markedly older than average, over a third being 65+ (compared to 18% of the rest of the population), and 22% being 75+ (compared to just 8%). Various other characteristics follow from that: they are less likely to be in full time work, more likely unemployed or in a retired household; more likely single and living alone, or living with at most one other, rather than in a larger household; and more likely to have long term health problems in the household. They are also less likely to want to do more to help the environment, more likely to be renting and less likely to own their home with a mortgage, more likely to be in a slightly smaller than average terraced house or flat rather than detached or semi-detached house, and likely to be less affluent than average.

Lionel, a 45-54 year old single man who lives on his own in a rented five room flat in a suburb of Essex, is an example of someone who practices low frequency bathing. His property is metered. After a period of unemployment, Lionel recently got a full time job working in an office. He dry shaves (electric), and fills his baths near or full to the top for getting clean and for relaxation. He never showers nor does any other type of washing (e.g. with a flannel). In his qualitative interview he described his washing practices as follows:

Interviewer: let's talk about bathing, did you say you have a bath every couple of days.

Lionel: yes, it's usually Sunday, Tuesday and Thursday, on the basis that I like to be pleasant to the workforce! [chuckles] But that's about it you know. As I'm living on my own, you know you don't have to shower that often...

Interviewer: have you always had baths?

Lionel: yes, I do like the soak. [start talking about a visit to California and if anything in his practices changed].

Interviewer: in a place like California did you still have baths?

Lionel: yes, yes. No I don't stand that. I was staying with friends over there. No, unless I am forced into it I prefer lying down and thinking about life, the universe and everything, rather than standing there going [washing movement]. Nah, it's not on. And as the research has proven it is not going to use that much water [baths] and anyway there it is not mine [at a hotel]!

As with Low Frequency Showering, Low Frequency Bathing seems likely to be a trace of washing practices from when daily full immersion was uncommon, but followers of this variant have stuck with baths rather than showers. This group has low levels of shower ownership, which could be the result of the high levels of renting and lower than average affluence acting as barriers to shower installation, or could equally be that this group prefers baths to showers, being accustomed to them and not seeing the necessity of installing showering technology. Despite the discourse in water efficiency programmes being that showers are more water efficient than baths, one would imagine that this variant of washing practices is actually likely to be a relatively low water using one. This group have a bath at most five times a week, and on average three or four times. They are also more likely to fill the bath partway, perhaps a function of it commonly being used only as a way to get clean rather than it being seen as a tool for relaxation or leisure (although the qualitative description above differs in that respect). Given the changing norms around levels of cleanliness it is likely that this is a variant of washing practice that is in decline. Although micro-component or consumption data would ideally be linked with detailed information on actual practices to see the impact

of this variant of practice on water use, we can derive from other studies that the occasional bath is actually a less water intensive variation of washing than once daily showering, particularly if that showering is with 'power-shower' technology (Critchley & Phipps, 2007). So an interesting question then becomes – is this actually an example of a fairly 'sustainable' variant of washing practice that is now dying out (as with the Low Frequency Showering)? If this is the case, could this set of habits and routines (and Low Frequency Showering) represent practices to encourage across the population? As radical as this might seem to water companies considering communicating with customers about water efficiency, interestingly it does intersect with developments in the design field where facilities encouraging 'splashing', as you can do in a small bath, are being designed into bathrooms (Kuijer & De Jong, 2011; Kuijer, et al., 2010), as it fits with dermatological research that shows that increased bathing does not necessarily have an impact in terms of decreasing microbiological flora on skin (Hartmann, 1979; Larson, 2001).

High Frequency Bathing

Practiced by: 11% of population (of SE England) (n = 200, of 1747, weighted)

A summary of the cluster:

Along with Low Frequency Bathing, this practice is characterised by almost always involving baths (although about 10% of practitioners have occasional showers too). People in this group nearly all bathe at least six times a week, usually seven times, with just a very few bathing five times a week. Few factors affect bath height or shower duration (where they have showers), and there is variation in how many places outside the home practitioners wash, similar to the rest of the population (although people are less likely to wash at work). Having a bath for people in this group is more motivated by cleanliness than for the rest of the population – followers of this variant of washing are significantly more likely to cite getting clean as the reason for a bath, and less likely to report the reasons of easing aches and pains or for relaxation. They also report getting clean or getting ready to go out more often as reasons for a flannel or other wash, although they do not on average wash this way any more often than other people. They are many times more likely to report having baths *instead* of showers rather than in addition to or in combination with them (67% report this vs 19% of the rest of the population), and are substantially less likely to have a shower or power shower in the home. In terms of shaving, men are slightly less likely to shave their face, while women are slightly more likely to shave their bikini line. Both sexes are more likely to wet shave without the tap running than others in the population. Conversely, they are more likely to brush their teeth with the tap running than the rest of the population, and less likely to without it running. In terms of sociodemographic characteristics, this group's members are more likely than average to be female, unemployed, less affluent than average, more likely to rent their home, and less likely to own it with a mortgage or outright. They are also less likely to have a water meter.

This washing cluster was the only one from which we did not have a representative from among the qualitative interviews. However, we created the following vignette of a 'High Frequency Bather' from a range of the qualitative interviews with people whose washing characteristics seemed to match that of High Frequency Bathing on specific aspects. An example of this was Lewis' (whose quote we presented above in the section on Out and About Washing) father who was present

during Lewis's interview and had a number of things to say about the baths he had every day!

Andy is a 45 year old man who shares a council rented flat in an outer Essex suburb with his wife and grown up son (Lewis – the Out and Abouter). Andy works as a part time labourer. Most mornings he usually just splashes his face and then waits until he gets home to have a long soak in the bath (to get clean from the physical work that he does, and sometimes also to ease aches and pains that his physical labouring work causes). The house has a shower attachment to the taps in his and his wife's bathroom but no stand up shower, so he fills it up just enough to wash, or to the top only sometimes, when he is having a soak to ease aches and pains.

Followers of this variant of washing clearly value being clean, and it seems that in many cases having a bath rather than a shower could have a technology-driven reason (not having a shower in the home), particularly for those who rent and are on a low income, and so perhaps face barriers or restrictions on installing one. Similarly it might just be the way they feel 'the most clean'. This group corresponds with the target group for water efficiency interventions that are currently being considered that are centred around simple 'technology solutions', particularly for those in social housing (Walker, 2009a). These interventions involve, for example, targeting rented accommodation with subsidised (non-power) shower installations. This change to the internal infrastructures in homes could represent a possible route and action for an intervention to reduce the water intensity of washing practices in this group.

5.1.4 Reflections on washing, showering and bathing

The cluster analysis has demonstrated that patterns of washing can be separated into distinct variants in the sample population. Baths do appear to be on the 'way out', people having them often only when limited to do so (e.g. not having the technology in the home). However, there are still some that value baths, for example people committed to an idea of Attentive Cleaning, whom when asked the reasons for which they have baths (as opposed to showers), often cite reasons of comfort – to relax, to ease aches and pains, or for getting ready to go out – so the bath has a more luxurious role for them. New variants of washing practice seem to have come in with new generations, particularly in terms of washing frequency, and also with the attention paid to personal care in general. But the socially and physically active, exercising, urban lifestyle associated with high washing could well be age related too – perhaps becoming less common as people age. The cluster analysis revealed interesting issues about generations and practices, both in terms of the potential for people to cycle in and out of different variants of practice over the life course, and for certain patterns of practice to potentially be disappearing as practitioners age and newer generations adopt different variants of washing.

5.2 Laundry

Summary of laundry practices

- Laundry practices appear quite homogenous across the population in some respects – 95% of the population have a washing machine and this is the dominant way of washing clothes. Three quarters never change its settings. Washing machines are most commonly run 2-3 times per week, and this increases slowly with the number of people in the household.
- Hand washing is rare, with two-thirds never hand washing and only 6% hand washing more than once a week. It is usually done to preserve delicate items or simply because the label says to do so.
- There is, however, substantial diversity in how often people use clothes and linen before putting them to wash, although outer garments are generally worn more times between washes than undergarments.
- Commonly cited reasons for putting clothes to wash are that they look dirty, smell or need freshening, but also often simply because they have been worn, suggesting influence from norms about appropriate washing frequency rather than an item's actual state of cleanliness.
- In terms of outsourced laundry services, 30% use dry cleaners and 9% use laundrettes, while laundry collection and nappy cleaning services are used by 1% or less of the population.
- Six clusters of laundry practice were identified, with the most common (performed by 36% of the population) being a relatively simple practice in which almost all washing is done in a washing machine that is always run full and the settings of which are never changed, and which involves no use of outsourced laundry services like dry cleaners. The other variants differ from this in terms of the level to which settings are changed, outsourced services are used and the frequency with which the machine is run part full.
- Which variant of washing practice a person performs is at most only very weakly predicted by sociodemographic characteristics such as age, gender, affluence, and family structure, and also only very weakly predicted by the reasons given for why people wash their clothes.
- This implies that tailoring and targeting interventions to particular ways of doing the laundry will be difficult, although at the same time many potential interventions may not need such targeting: everyone could be encouraged to wear clothes more before washing them, for example, to reduce the loads of laundry washed per week, while technologies such as dirt repelling clothes, washing machines with half load settings and more environmentally friendly laundry cleaning methods could also be universally introduced.

5.2.1 An overview of laundry practices

Based on our survey, we can say that laundry practices are quite homogenous across the population in some respects. 95% of the population have a washing machine in the home, and this is the main way of washing clothes. 46% also have a tumble dryer. For the large majority, hand washing is a rare practice - only 6% hand wash more than once a week, and for most, this is to preserve clothes from damage, or when the label says to. At the same time, people for the most part have a simple approach to washing machine use: three quarters of the population never change any of the settings on their machine, presumably picking their favourites and leaving the machine on those for everything they wash. There are, however, still points of difference in laundry practices which have some implications for water use.

Most notably, there is diversity in how often people wear clothes and for how long they use bed sheets, towels and so on, before putting them to wash – this frequency of washing will have clear water use implications. For clothing, the figures in Table 16 show that most people will wear underpants, knickers, bras, stockings, tights, and socks only once before washing. The same is true for t-shirts, shirts and blouses, although there are more people who would wear these items twice. Trousers and jeans tend to be worn two or three times (although with quite a spread, so once and four or five times are not uncommon either), skirts slightly less than this. Of those that have them, dresses and uniforms tend to be worn once or twice, or up to three times, before a wash, sports clothes just once. Jumpers, cardigans and jackets are most commonly worn more than five times between washes, although there is more variation in this for jumpers and cardigans than for jackets. Finally, there is quite an even spread in options for nightclothes. In short though, the further the piece of clothing is from the skin, particularly from more personal parts of the body, the more often it tends to be worn before being washed, but the greater the range in washing frequency across the population becomes too. In addition, the more a piece of clothing is designated for special occasions or specific activities (dresses, sports clothes and uniforms) the fewer times it is worn before being washed. And there is no consensus for the washing of pyjamas!

In terms of other laundry items, Table 17 shows that weekly washing of all these items is the most common (median) option. There is some variation still in the spread between the responses for the different items, both in terms of the proportions who do differently to the weekly schedule, and also in terms of the mean, i.e. the proportions who wash more often or less often than this. Fortnightly or less frequently is nearly as common as weekly washing for duvet and quilt covers, notably different to the case for bed sheets, where weekly washing is by far the most common option. The average length of time between washes for bath towels is rather less than for bath mats, as might be expected. Tea towels generally get washed every 2-3 days but nearly as many wash them weekly. About half of respondents do not use aprons, and a similar proportion do not use table cloths. Of those that do use these items, the frequency of washing is quite spread out between 2-3 days through to fortnightly or more, with the weekly option again being most common.

Table 16 How many times clothes are worn before being put in to be washed
Highest percentage is highlighted in bold italic for each clothes item
n=1802 (914 for women only answers), including don't haves/use, and don't know/don't want to answer

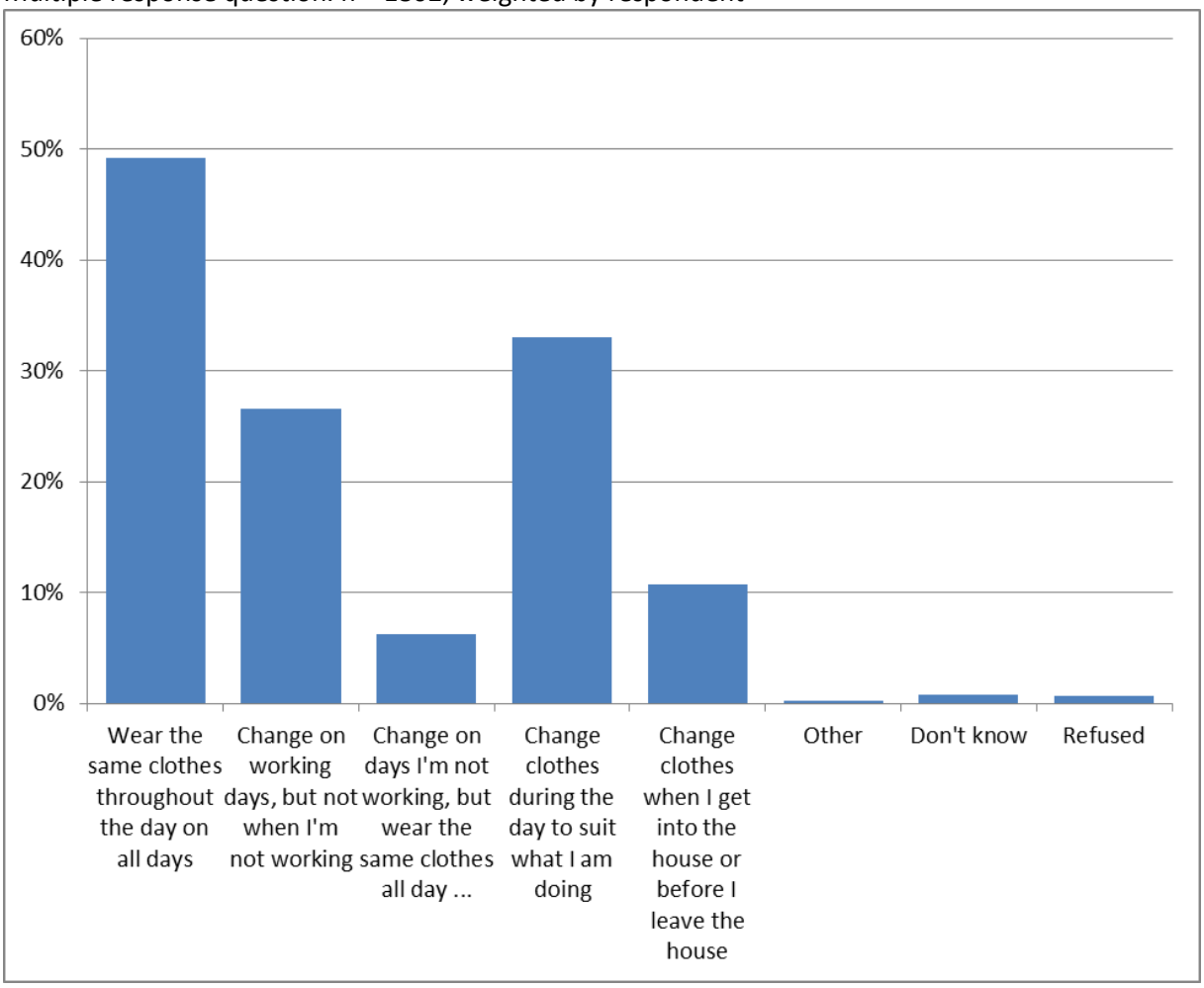
	Underpants/ knickers	Bras (women only)	Socks/tights/ stockings	Vests/ undershirts	T-shirts	Shirts/ blouses	Trousers	Jeans	Skirts (women only)	Dresses (women only)	Jackets	Jumpers and cardigans	Night clothes	Sports clothes	Uniforms
% of those who have/use, and answered															
Every time its worn/ used	***89.9***	***66.2***	***81.2***	***69.2***	***49.7***	***51.4***	21.6	16.9	26.8	**35.9**	9.1	11.2	21.6	***64.6***	***36.4***
Twice	7.2	17.2	12.1	21.1	35.3	31.9	26.8	21.9	27.5	26.9	7.3	14.7	***24.5***	16.8	26.4
Three times	2.0	11.2	4.4	6.4	11.1	12.3	***28.1***	***29.5***	***27.6***	20.3	9.6	18.4	24.1	8.5	19.0
Four or five times	.5	2.8	1.5	1.9	2.2	2.6	14.0	17.9	12.0	10.0	17.0	20.5	13.9	3.8	7.2
More than five times	.5	2.7	.8	1.3	1.6	1.9	9.5	13.8	6.2	6.9	***57.0***	***35.3***	15.9	6.3	11.1
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
% of full sample who…															
Have/use, and answered	91.2	90.1	89.1	76.2	91.7	88.8	90.9	85.0	80.0	77.0	82.9	88.4	82.6	55.4	39.4
Don't have /don't use	1.0	.9	4.1	16.2	3.0	5.3	3.6	9.4	13.1	15.2	9.7	5.5	10.6	36.1	49.7
Don't know/ don't want to answer	7.8	9.1	6.8	7.5	5.3	5.9	5.6	5.6	6.9	7.8	7.4	6.1	6.8	8.5	10.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 17 How long other laundry items are used or worn before being put in to be washed
Highest percentage is highlighted in bold italic for each clothes item
n=1802, including don't haves/use, and don't know/don't want to answer

	Bed sheets	Duvet and quilt covers	Bath towels	Bath mats	Tea towels	Kitchen aprons	Table-cloths
% of those who have/use, and answered							
Every time it's worn/used	1.1	0.6	4.2	1.2	3.9	2.1	4.6
Daily	.7	.3	5.0	2.1	10.9	4.8	5.2
Every 2-3 days	5.9	5.1	26.1	11.3	34.5	17.4	12.9
Weekly	62.3	51.7	51.7	49.7	39.3	42.5	46.2
Fortnightly or more	30.0	42.2	13.0	35.7	11.4	33.2	31.1
Total	100	100	100	100	100	100	100
% of full sample who…							
Have/use, and answered	96.1	93.4	96.0	86.3	90.7	40.5	41.1
Don't have /don't use	0.0	1.1	0.2	8.3	4.5	51.3	50.6
Don't know/ don't want to answer	3.9	5.6	3.8	5.4	4.8	8.2	8.3
Total	100	100	100	100	100	100	100

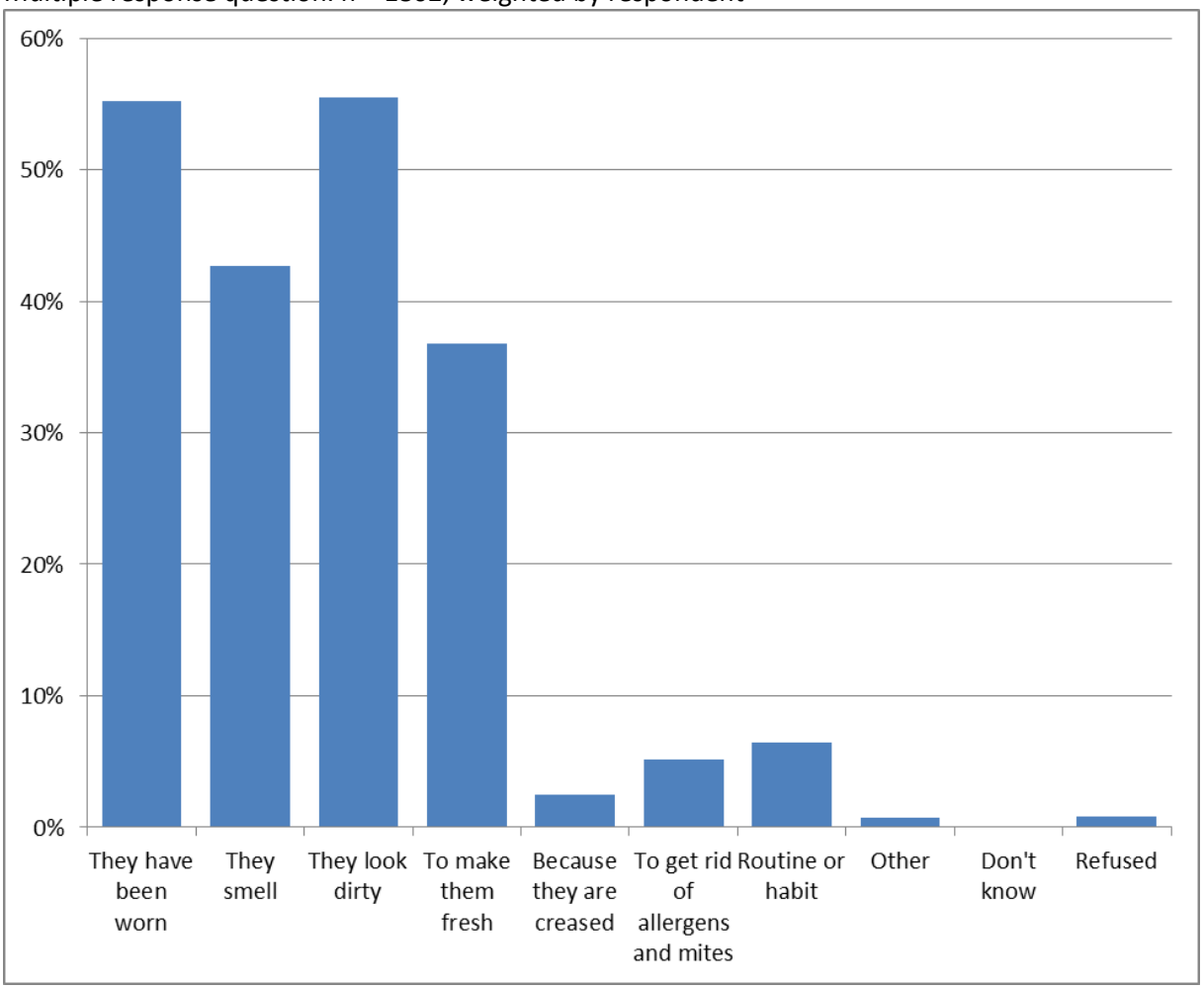
There is variation too in when and why people change their clothes (see Figure 12). Nearly half of respondents wear the same clothes throughout the day, while 33% change 'to suit what I am doing'. 27% change only on working days, and a smaller number change only on non-working days, or when arriving in or leaving the home. The percentages of participants responding that they wear the same clothes all day vary significantly (at the 0.1% level) by age, being 38% for the 16-24 group, in the region of the mid 40s for other working age adults, and rising after retirement age to 63% (for the 65-74 group) and 70% (for the 75+). This could be due to changes in the relative effort involved in changing, but also likely because the variation in activities over the day diminishes at this age – people are generally not going to work, and perhaps do fewer activities that require a change of clothes. Cohort effects obviously might be in play too, affecting attitudes towards changing clothes, or the range of clothes owned to get changed into. Differences with age in the other responses were not significant (if you exclude those over retirement age from the questions which relate to work clothes). The exception is the question on changing when arriving in or leaving the house, which varies significantly (at the 1% level), but here the pattern is not clear, going up and down by age.

Figure 12 When do you change your clothes?
Multiple response question. n = 1802, weighted by respondent



In terms of why people put clothes to wash, Figure 13 shows the distribution of responses. Whilst 'because they look dirty' is the joint most common response, an equal proportion said simply because they have been worn. Close behind is because they smell, then to make them fresh, whilst the other options were rarely selected. 6% explicitly say they wash their clothes out of routine or habit. The reasons can be divided into two types. The first is essentially a frequency response ('because they have been worn'), where washing is performed regardless of the condition of the item; the rest are based more directly on the item's state – smelly, dirty, not fresh. The former may be more influenced by factors other than just the item's state therefore, such as by expectations and norms about appropriate washing frequency.

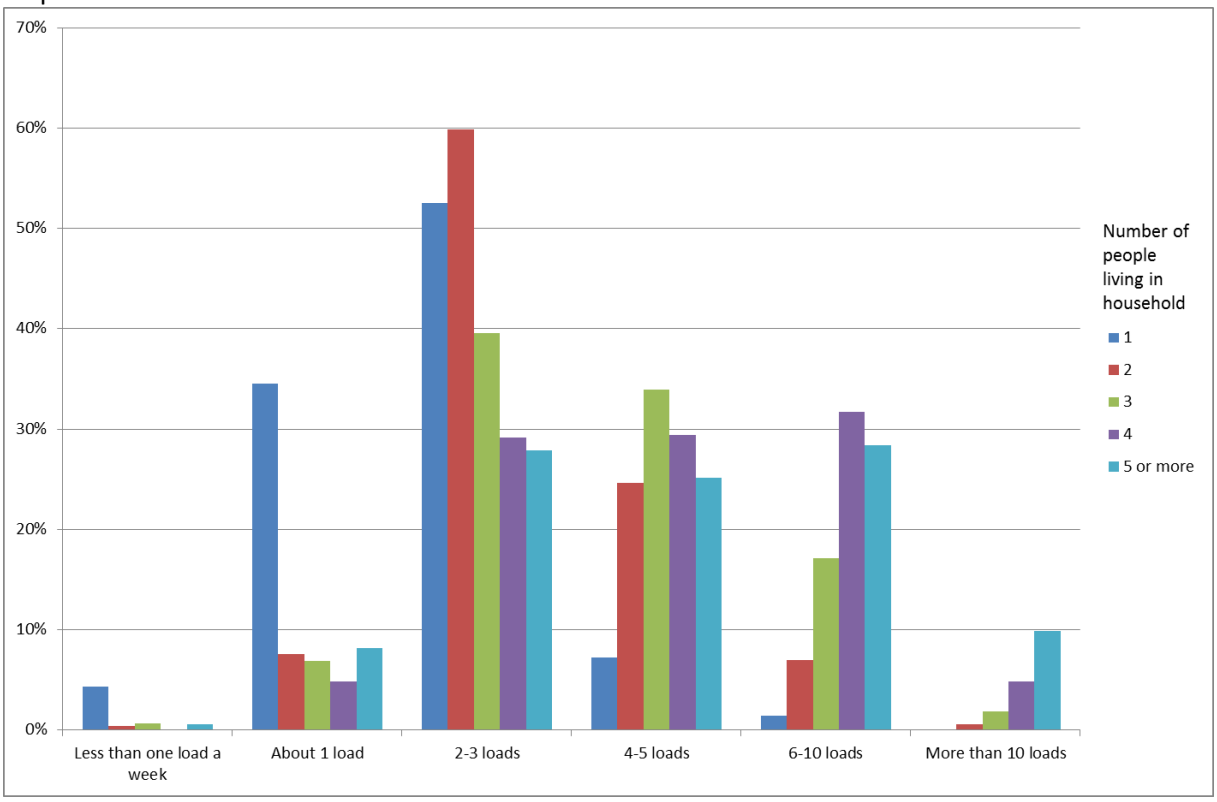
Figure 13 General reasons for putting clothes into the wash
Multiple response question. n = 1802, weighted by respondent



Washing machines meanwhile are most commonly used 2-3 times per week (by 45% of the population), a figure which increases with the number of people living in the household, although not in direct proportion – doubling household size less than doubles the number of weekly uses of the washing machine, and 2-3 loads remains the *median* number across household sizes (see Figure 14). Among households with more than one occupant, 88% report combining washing rather than doing it individually, and machines are usually run always full (by 72% of respondents) or at least mostly run full (21%).

In terms of washing machine settings, 77% don't use any of the pre-wash, extra rinse or pre-soak features. 11% do use a pre-wash, 4% use an extra rinse, and 2% use a pre-soak, while 9% don't know. 78% also always or nearly always use the same wash cycle on their machine, 16% do use different cycles and 6% don't know. In short, the multitude of options on washing machines are, for most, never used, although they allow people to pick their preferred wash cycle to stick with, balancing convenience (speed), cleanliness and any other considerations with their preferences.

Figure 14 Number of loads of clothes washed per week, by household size
n = 1648: 278 1 person; 516 2 person; 321 3 person; 350 4 person; 183 5 or more; weighted by respondent



How often clothes are worn or linen is used before being put to wash may be expected to be a predictor of how often the washing machine is used. A measure of the respondent's typical relative frequency of washing clothes, based on their responses to the clothes and linen use questions above, predicts about 8% of the variance (adjusted R^2) in the frequency of washing machine use in single person households[6]. However, if the whole sample is analysed, not just single person households, then the same clothes washing frequency variable, multiplied by the number of people in the household, predicts 21% of variance in washing machine use. The large degree of unaccounted variance could be explained by inaccuracies in the respondents' estimates of frequency of putting clothes to wash and of use of the washing machine, variation in machine size and levels of fullness, and the approximate nature of the clothes washing frequency variable derived here. Another possibility is the relationship between clothes ownership which Shove (2003) refers to as 'stocks of stuff' (which due to time constraints in the survey we didn't ask about), frequency of use of clothes, and frequency of use of the washing machine. For example, people who wear and put to wash clothes with greater frequency might for example own more clothes so can wait to do the washing until they have a relatively full load compared to people that wear clothes for longer but own fewer clothes so may not wait for a full load but just do it when they run out! Conversely, people might wear many

[6] Using a simple linear regression model with weekly washing machine use as the dependent variable, and clothes washing frequency as the independent variable. The clothes washing frequency variable is described more in the next section. Adding the other cluster dimensions described in the next section into the model also slightly increased model fit, with the level of outsourcing and of hand washing (technology dimension) both statistically significant predictors of washing machine use. Interestingly, higher use of outsourcing predicts increased use of the washing machine for the full sample, but decreased use for single occupancy households.

clothes for shorter periods each and then wait for a full load, so using the washing machine relatively less frequently than people who wear clothes for longer but don't wait for a full load.

Hand washing is now rarely performed, with 66% of respondents saying they never hand wash, and a further 16% saying they do so only very occasionally. Only 6% hand wash more than once a week. Notably, these breakdowns are similar for those who do not own a washing machine too: there are no statistically significant differences in hand washing frequency between washing machine owners and non-owners. Of those who do hand wash at least occasionally, Figure 15 shows the reasons given. The majority say to preserve clothes (64%), and 41% say because the label says to. There is little correlation between these two responses: only 20% who say yes to one say yes to the other. The other responses are given far less often.

Figure 15 Reasons for hand washing

Multiple response question. n = 562 (those who hand wash at least occasionally), weighted by respondent

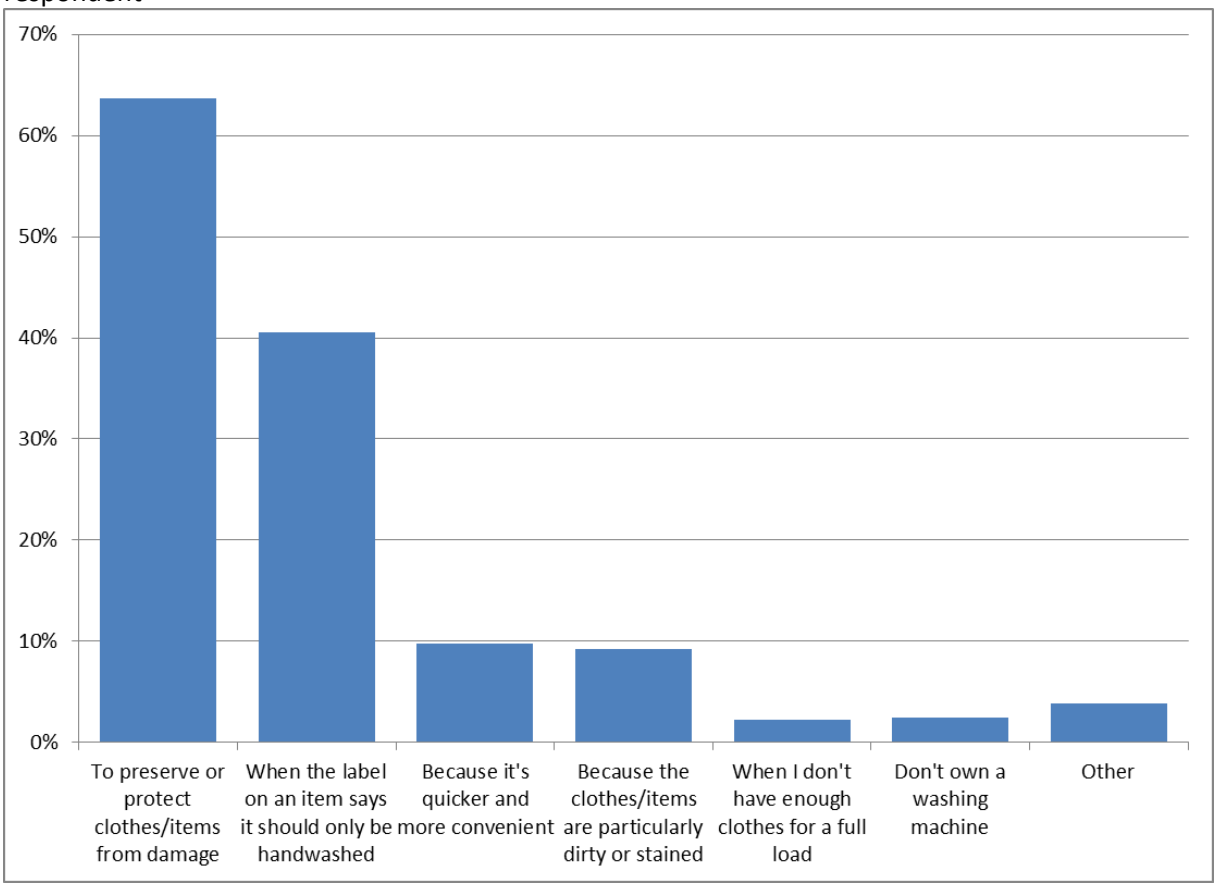
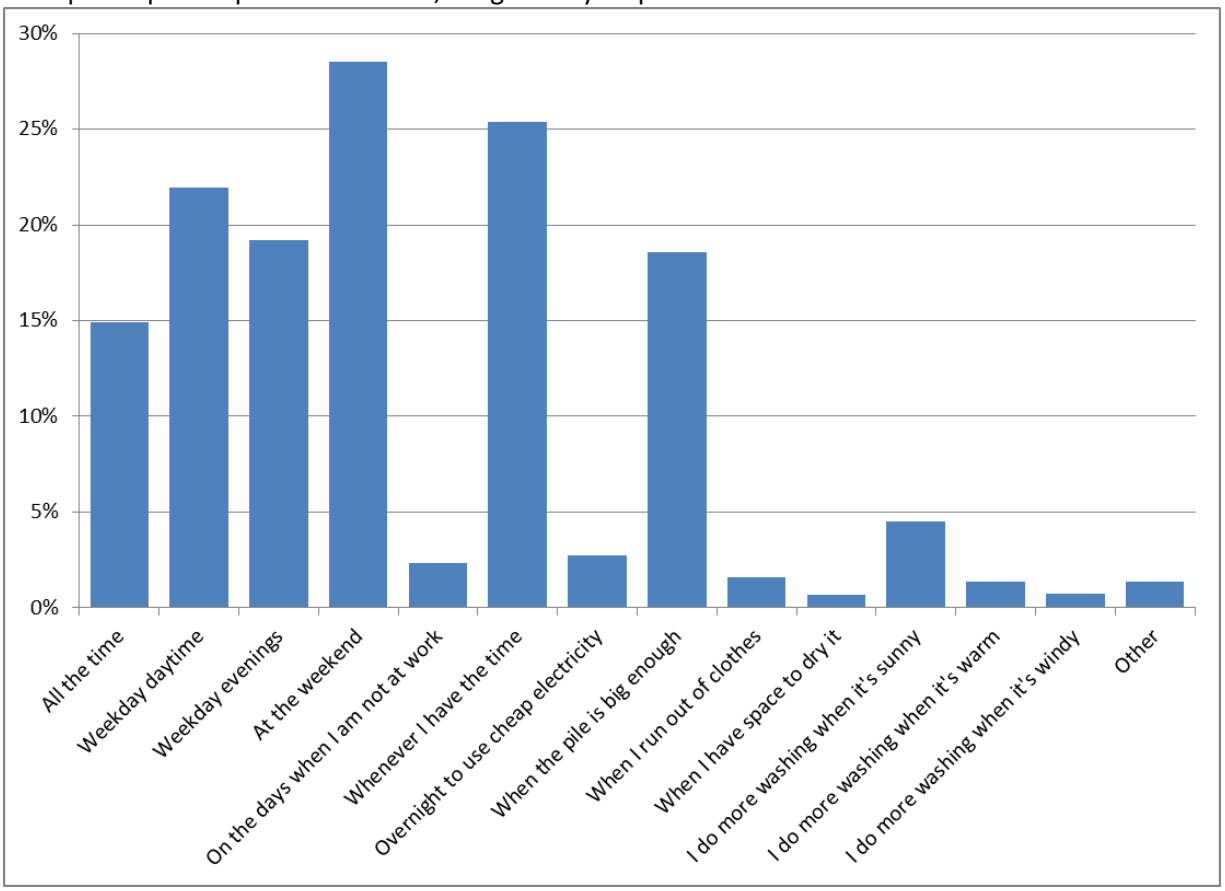


Figure 16 shows responses relating to when people usually do their washing. In terms of the time of day or week that people wash their clothes – weekday daytime, evening, or weekend – there is quite a variation, as shown in the first four bars of the graph. Overall the most common response was at the weekend. 'Whenever there is the time to wash' was also commonly selected, although being at work doesn't seem to be one of the factors contributing to having time or not, as few people answered yes to that option. 19% wait until the pile is big enough. Most of the other options are not really factors considered by many, e.g. waiting for cheap electricity at night. People are not usually so rushed that they wait until clothes run out to wash them, nor are they constrained by not having space to dry clothes. Climatic conditions (being sunny, warm or windy to dry

clothes) do not seem to make much (reported) difference either, an interesting result for those considering the impact of climatic conditions on different aspects of water demand. We included the questions about drying clothing to explore whether the space required to dry clothing also shaped the use of the washing machine but overall it appears in these quantitative results that "it is the washing machine that sets the scene for the rest!" (Shove, 2003, p. 132), except for the 'On-Demand Home Laundry' group, which will be discussed below.

Figure 16 Which of the following best describes when you usually do your washing? Multiple response question. n=1802, weighted by respondent



A final area where there is variation in laundry practices, with potentially large effects on the resultant home water use, is in the number of different outsourced cleaning services people use. The survey asked if the respondent 'ever used' each of the following: laundrettes, dry cleaners, laundry services where clothes are picked up from home, and nappy washing services. 30% use dry cleaners at least occasionally, and 9% use laundrettes. Laundrette use varies statistically significantly by washing machine ownership: 24% of those without a washing machine use a laundrette, compared to 8% of the rest of the population (significant at the 0.1% level). Laundry collection and nappy cleaning services meanwhile are used by 1% and 0.1% of the population respectively.

5.2.2 Six variants of laundry practice

Based on the cluster analysis, six distinct variants of laundry practice were identified in the sample population, defined along the lines of five different dimensions characterising different aspects of laundry practices. The dimensions are described in

Table 18 below, and are based on a selection of the survey questions that formed the basis of the results in the previous section. Frequency is a measure of how soon after first use people put different items of clothing and linen to wash relative to the population as a whole, based on responses to a selection of the questions asking how long different items are used before washing. Diversity is a measure of how much individuals vary the different settings on their washing machine between uses – how much they tailor the settings to what they're washing, by changing pre-wash, extra rinse or pre-soak settings, and changing the wash cycle. Technology is a measure of how often people hand wash – the more they do, the lower the technology score. The outsourcing dimension measures the number of different outsourced services used, out of laundrettes, dry cleaners, pick-up laundry services, and nappy washing services, while efficiency is a measure of how often a person runs the washing machine only part full.

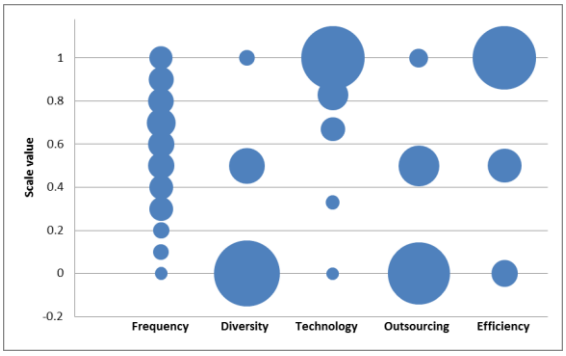
Table 18 Dimensions used to identify variants (clusters) of laundry practice

Dimension	Definition	Scale values
Frequency	Relative frequency with which respondent puts selected clothes and linen items to wash.	0 indicates much less frequently than population average; 1 indicates much more frequently
Diversity	Number of settings on washing machine which are varied between washes.	0 indicates none (never varies); 1 indicates 4 or more.
Technology	How much hand washing is performed, vs. washing machine use.	0 indicates 3+ hand washes per week; 1 indicates never hand washes
Outsourcing	Number of outsourced services used (dry cleaners, laundrette, etc.).	0 indicates none; 1 indicates 2 or more
Efficiency	How often washing machine is run part full.	0 indicates sometimes through to always run part full; 1 indicates never (always full).

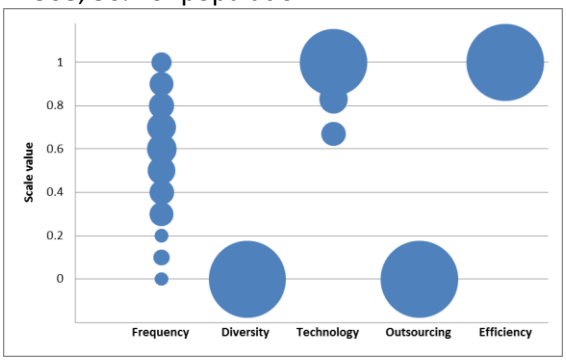
The distributions of the respondents on the dimensions for the population overall, and for each of the six clusters, are shown in Figure 17 below.

Figure 17 Laundry, 6 cluster solution: balloon plots
Bubble sizes represent weighted percentage of respondents having that value on that dimension.

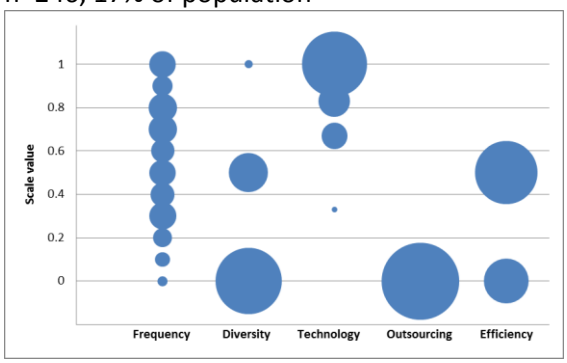
Population as a whole
n = 1464-1802



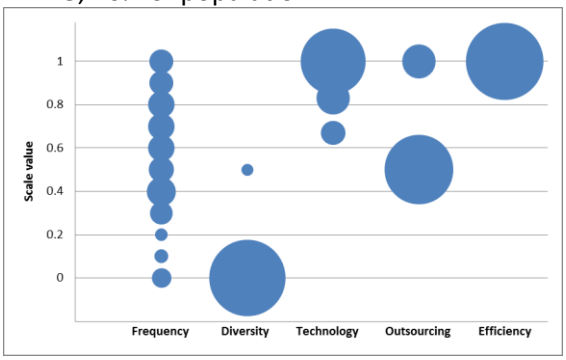
Simple Home Laundry
n=508, 36% of population



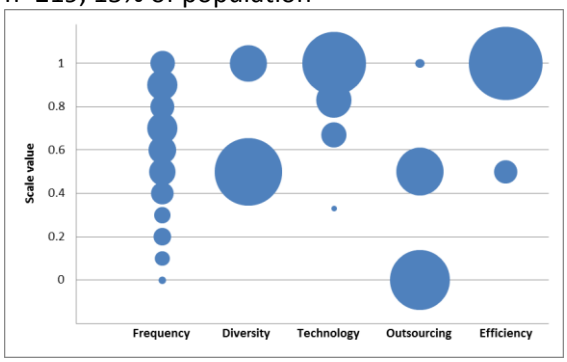
On-Demand Home Laundry
n=246, 17% of population



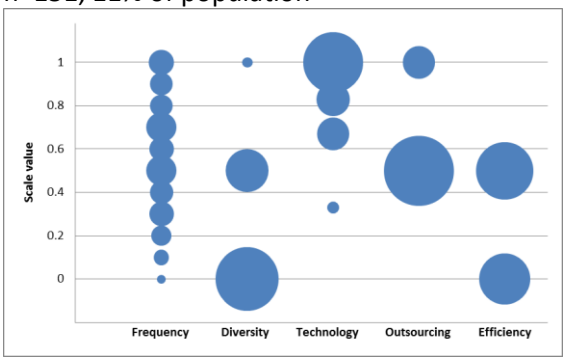
Simple Outsourcing
n=223, 16% of population



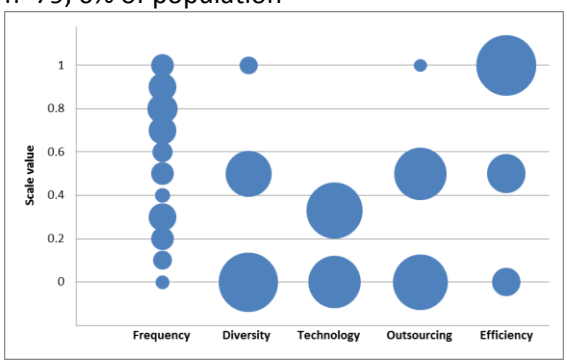
Attentive Clean Laundry
n=219, 15% of population



On-Demand Outsourcing
n=151, 11% of population



Hand Washing
n=79, 6% of population



The first thing that stands out is that there is one large variant or cluster of laundry practice that dominates, with 36% of the population performing it, and that it is particularly homogenous – laundry in this group is done in very similar ways, at least along the dimensions used for the cluster analysis. This way of doing laundry is quite simple, and involves all clothes being washed in the home: washing machine settings are never changed, hand washing of clothes is done rarely if ever, outsourced laundry services are never used, and the washing machine is always run full. As with all the variants, there is a big variation between practitioners in terms of the frequency with which they wash clothes and linen. Other variables in the survey show that, in terms of the timing of washing clothes, people clustering in this group are less likely to wash their laundry during the daytime than the rest of the population (16% do vs 24%), but more likely when the pile is big enough (25% vs 16%). The people clustering in this group are also likely to be less affluent than average, younger than average, more likely to have dependent children, and less likely to be religious. They are also more likely to have a water meter (51% vs 44% do).

The other five clusters tend to vary from this variant along just one or two dimensions. The next most common variant, which 17% of the population follow, is one which we have called 'On-Demand Home Laundry': this differs from Simple Home Laundry primarily in that the washing machine is run part full quite often, perhaps at times to wash clothes as needed, 'on demand', rather than waiting for a full load of similar kinds of dirty washing. People who wash their clothes in this way are slightly more likely than average to be single and living alone (25% vs 17% are) and to be less affluent than average, more likely renting and in a flat or tenement, less likely in a house, and slightly less concerned than average about the environment; but again, all types of individual are found in this group.

The next most common variant of laundry washing, which we have called 'Simple Outsourcing', is performed by 16% of the population. This variant is distinguished by a relatively high level of outsourcing, but is otherwise characterised by a simple practice where washing machine settings are not adjusted, and hand washing is rarely done. Several different outsourced services are used, most commonly dry cleaners, which 92% of practitioners use, compared to just 21% in the rest of the population. Followers of this variant of laundry washing tend to be more affluent than average, and to live in a larger than average house with a mortgage, as opposed to renting, and are more likely to be living with a partner (68% vs 57% are). They are also more likely than average to be concerned about doing more for the environment than they currently do: 15% would like to do a lot more than they do currently, compared to 6% of the rest of the population.

A fourth variant, performed by 15% of the population, we have labelled 'Attentive Clean Laundry'. This variant of practice is characterised by the frequent use of the various settings on the washing machine, and clothes and linen being washed slightly more frequently than average (this is the only variant where the average frequency varies statistically significantly from the rest of the population, albeit still only slightly). This variant of laundry practice is quite diverse in other respects: whether outsourced services are used or not, and how efficiently the washing machine is used. Followers of this variant are more likely than average to have children (38% vs 31% do).

A further variant we have labelled 'On-Demand Outsourcing', followed by 11% of the population. It is characterised by outsourcing relatively a lot and also by using the washing machine part full relatively often. People in this group are more likely than average to live alone (27% vs 18% do), and also less likely than average to put clothes to wash because of concerns over their appearance. They are less likely to live in a semi-

detached home and more likely in a tenement or flat than the rest of the population, and less likely to have a water meter (29% vs 47% do).

One final variant of laundry cleaning we have called 'Hand Washing': performed by just 6% of the population, this is the smallest cluster in the data. This approach to laundry cleaning is distinguished from the other five clusters purely because hand washing is performed substantially more than average, although even in this variant this often does not signify more than a few hand washes per week. Other aspects of the laundry practice are quite varied. Practitioners of this variant of laundry cleaning are more likely than the rest of the population to report that they find hand washing clothes more convenient than other ways. They are also less likely to be in full time work (18% vs 39% are), and more likely than average to have dependent children (44% vs 31% do). They are also more likely to have plans to get a water meter (24% vs 10% plan to), although generally without a clear idea of when they will do it.

We also had questions in the survey about, among other things, the reasons people wash their clothes – broadly, falling into categories of looking clean, smelling clean, and habit. Interestingly, responses to these questions generally did not help predict which of these six variants of laundry practice a person will follow (there are some slight correlations for some clusters only), nor how often people wash their clothes, with the exception of habit, which has a very weak correlation with clothes washing frequency[7]. In short, this research indicates that people's values around clothes cleanliness at most only very weakly correspond to what people actually do when it comes to washing and cleaning those clothes, although qualitative data might reveal more nuanced relationships between these values and actions.

5.2.3 Detailed cluster results, and proxies of practice

The six clusters, representing the six variants of laundry practice, are described in more detail here, along with more details of the factors which correlate with a person's following a particular variant, i.e. falling into a particular cluster, in terms of other aspects of laundry practice and sociodemographic characteristics of the respondent and their household.

See the Technical Appendix for tables of the full statistical results for each cluster.

Simple Home Laundry

Practiced by: 36% of the population (of SE England) (n=508, of 1426, weighted by respondent)

A summary of the cluster

This is by far the most commonly performed variant of laundry practice, and also by far the most homogenous. It thus represents a dominant and consistent variant of laundry practice that Shove (2003) describes as the result of a shift from weekly washing to "a never-ending spiral of refreshing and revitalizing a steady stream of discarded clothing" (p. 131). In this way of washing the laundry, washing machine settings are never

[7] This is based on results of an OLS linear regression with these three variables as independent variables, and clothes washing frequency as the dependent variable. Only habit was a statistically significant predictor of frequency, but the model only predicted 1% of variance in clothes washing frequency (adjusted $R^2 = 0.01$).

changed, clothes are rarely if ever hand washed, outsourced laundry services are never used, and the washing machine is always run full, so that the practice is efficient in that sense. People who perform this variant of practice are slightly more likely than the rest of the population to wash clothes 'all the time' or when the pile is big enough, and less likely during weekday daytimes, 'whenever I have the time' or overnight when there is cheap electricity. They are slightly more likely to hand wash to protect clothes from damage, but less likely to hand wash just because the label says to, and finally clothes are more likely to be combined for washing with those of other household members, but these are mostly only slight trends.

In terms of sociodemographic characteristics, people who wash their laundry in this way are slightly younger than average, and slightly more likely to be non-religious. They are more likely to have dependent children living with them, and so more likely to be in a larger household of more than two people. Although on average likely to be less affluent than others, they live in slightly larger than average homes. They are also more likely to have a water meter. Overall the suggestion is of a simple laundering practice, perhaps driven by convenience in time pressured households with plenty of laundry needing to be done. One can imagine many in this group being part of a family, with a large volume of laundry to deal with, so that the machine is run often, full, and without the time to separate out special loads using special machine settings or to hand wash, except perhaps for a few special garments.

Jacqueline and Tim are a retired couple between 65-74, living in an eight room, semi-detached, metered house that they own outright in a rural town in Essex. They were part of the 'Simple Home Laundry' cluster. Their survey results showed that they only put clothes in the wash when they were dirty, only run the washing machine when full, and do more washing when it's sunny. However, it should be noted that 'full' for this couple might mean a half wash with an efficient machine that has a half load setting. As Jacqueline reflected:

I suppose, washing wise, if you're asking me how many times, I very rarely do anything by hand. Hardly ever.

Interviewer: do you have quite a good washing machine that you can put things on hand wash?

Jacqueline: yes, I can, and I can run it cold, which I have to say I do not do. I have tried it, but I don't find it efficient. But I suppose the use of the washing machine….perhaps about four times a week, but I might do two or three of those in one day, so that, you know, do different colours. And I've got a half load wash as well on there as well, so if I'd got a load of coloured clothes and then only a small half load of whites, I'd put that in and I do it, yes, I often do it on the same day. I suppose, yes, four times a week at the most….sometimes it might be less than that.

Interviewer: so don't, you're not very finicky then about changing sheets and all that kind of stuff? Like you say, some people change their bath towels every day or....

Jacqueline: no, no, no, no, I wouldn't dream of doing that. And sheets – I suppose I would change the bed once a fortnight, but that's it. And bath towels – it depends, I suppose, but mostly it's once a week.

Interviewer: do you find that it is different in winter, do they stay damp?

Jacqueline: no they don't because we've got a radiator in the bathroom and everything dries, you know.

This variant thus represents the 'normal' organisation of washing and cleaning laundry that has been described in more qualitative literature (eg, Shove, 2003). It is the most common variant, and notably homogenous compared to the others, with a schedule of laundry that is all encompassing and slotted into any spare time. The qualitative information reveals how these 'normal' practices of frequent laundering persist over a life course, with a two person household still capable of producing four loads a week of washing, which is tied into the sorting of clothes into different colours to be washed, and fortnightly washes of bed and other linens. This group is more likely to own a water meter, so they may actually be more inclined to consider the water saving potential of various technologies, although, as an approach to intervention, simply providing information to highlight such water saving potential may be too simple to be effective (Russell & Fielding, 2010; Russell, Lux, & Hampton, 2009; Syme, Nancarrow, & Seligman, 2000)! Another way to consider intervention would be how to 'stretch out' the use of clothes that this group wears, before they are seen as 'needing' to be washed. For example, Shove (2003) reflects on an example from San Francisco media (Garofoli, 2001) where the wearing of clothes was 'stretched out' due to a sudden increase in the cost of energy, and therefore the energy associated with doing the laundry. While we are not suggesting raising the prices of water and energy to influence household practices, what is interesting is that in certain situations it is seen to be more acceptable to wear clothes for longer before putting them in the wash – any person that has been camping, to a music festival, been on holiday somewhere, or been sick and rested at home for a few days, wearing the same set of clothes for longer than usual, can probably identify with this. A question then becomes, how can we create interventions that 'stretch out' the collective understandings of normal practice in frequency of wearing clothes in a way that is socially acceptable, particularly socially acceptable in terms of remaining 'presentable' to society. Although there is not the space to talk about this in depth here there are emerging examples of these types of interventions that challenge ideas of normal frequency of clothes washing and turnover of laundry (eg, Doyle & Davies, 2012; Jack, 2012).

On-Demand Home Laundry

Practiced by: 17% of the population (of SE England) (n=246, of 1426, weighted by respondent)

A summary of the cluster

This variant of laundry practice, like the Simple Home Laundry one, involves no, or only rare, hand washing, and no use of outsourced services. For the most part, washing machine settings are also left unchanged between washes, although there is some variation on this 'diversity' dimension between practitioners. The key difference from Simple Home Laundry, however, is that the washing machine is run part full at least occasionally. This could be to wash particular items 'on demand', such as for the next day or for a special event. People who follow this variant of laundry washing are slightly more likely to report doing their washing whenever they have the time, overnight to use cheap electricity, and when there is space to dry it. They are slightly less likely to combine washing with other household members than other groups, and on average run the washing machine slightly less frequently per household member. This latter result is interesting as it might be expected that it would be run more frequently, not less, given

that the machine is run part full sometimes and clothes and linen are washed with the same average frequency as for the rest of the population.

Members of this group are a little less likely than the rest of the population to be living with a partner, more likely to be living alone, slightly more likely to be less affluent than average, somewhat more likely to be renting, and in a slightly smaller than average flat or tenement, rather than owning outright or with a mortgage, or in a detached or semi-detached house. They are also more likely than average to report being happy with what they currently do to help the environment.

Janet is a 55-64 year old female who lives with her husband George (male 75+), and her adult daughter Kate (35-44). The family live in a semi-detached, metered, nine room property, which they own outright, in a leafy and fairly affluent suburb in North London. Janet generally puts clothes in the wash when they smell and/or look dirty, and does the washing whenever she can find the time. Her household was seen to practice 'On Demand Home Laundering' based on her survey responses. Here is what she said about their washing habits in the home:

Janet: In terms of laundry I suppose for George and I, I probably do probably on average two loads of clothes and bed clothes a week. I only change towels when they look like they need it, I'm afraid, I don't do it regularly. And the same with bed sheets.

Interviewer: what is the trigger for that, is it the dirt, the way the fabric feels?

Janet: it might be physical dirt, it might be, especially now when we are out in the garden a lot and you go in and wash your hands and the towels start to look grubby and you think it's time to change it, or it might be because they are beginning to smell a bit stale. Bed clothes the same really. I don't change them religiously every week; I got out of that habit many years ago! I think when I started back to work! [laughter] When they begin to look a bit grubby and the pillows begin to look a bit grubby then I will take them off and put them in the wash. It's the same with clothes. I certainly don't take my clothes off and put them in the laundry every day; Kate does, practically every day. But she changes her clothes quite a lot.

Interviewer: she does her own laundry?

Janet: yes, she probably does two or three loads a week for herself. That's her bedding and her towels and her personal clothing so I guess in all we probably do five sometimes six loads a week. It can't be that much can it?! Maybe it is. I'm just trying to think how often the machine goes on and it's not that frequently. Mmm. Well, say five loads a week.

Interviewer: does that change in the summer?

Janet: it might do, but I couldn't say how much it changes. It might be a little bit more...

An interesting thing about this group is the interpersonal dynamics that may shape the reasons why they don't 'group' laundry amongst the people living in the households as commonly as those who perform 'Simple Home Laundry'. The qualitative information provides an interesting explanation for the social and familial complexities that may shape this pattern of practice – Janet lives with her husband and her adult aged daughter and although washing is combined for the spouses the daughter has responsibility over the flow and rhythm of her own washing, pushing the number of loads in the house up to five per week for three people. The idea of intervention here is complicated by the fact that it cannot rely on the centralisation of labour associated with laundry in the house,

but must instead consider the currently separate routines that are observed in the qualitative data.

Simple Outsourcing

Practiced by: 16% of the population (of SE England) (n=223, of 1426, weighted by respondent)

A summary of the cluster

Like Simple Home Laundry, Simple Outsourcing is a variant of doing the laundry that is characterised by rarely changing the settings on the washing machine (low diversity score), and rare or no hand washes (reflected by a high technology score). It is also characterised by efficiency, with the washing machine always being run full. The key difference from Simple Home Laundry is that people in this group all make use of one or more outsourced laundry services, most notably dry cleaners (which 92% use compared to 21% of the rest of the population) and laundrettes (27% vs 7%). Followers of this variant are also slightly more likely than others to change clothes during working days, less likely when getting into or before leaving the house, and more likely to wash clothes whenever they find the time. They are also more likely to report cleanliness as a reason for washing clothes, and that they hand wash when an item's label says to. They use the washing machine slightly more frequently per person than average, despite washing some of their clothes using outsourced services too.

Less likely than the general population to be unemployed, more likely to be living with a partner, and more likely to be more affluent than average and living in a slightly larger than average home which they own with a mortgage rather than rent, they are also less likely to have long term health problems or incapacities in the household. They are also more likely to report wanting to do more than they currently do for the environment. Many in this group may be part of a relatively affluent dual-earner family, with a large volume of laundry to deal with and little time to do so, so that the machine is run often, full, and without the time to separate out special loads using special machine settings. Suits and clothes for special occasions could mean that they use dry cleaning services more than most, and hand wash, but only when the label says to.

Although not the typical example of a wealthier couple described above, Ellen is someone who follows the Simple Outsourcing approach to laundry, and is a retired single lady in the 75+ age group living in a semi-detached seven room house in suburban London, with a compulsorily fitted water meter. She tends to change what she is wearing depending on what she's doing in the day, and says that she puts things in the wash 'when they have been worn'. She historically used a laundrette service once a week for most of her laundry, doing only small things at home. In her qualitative interview she revealed that she now has a washing machine but still tends to do the laundry based on 'convenience':

Interviewer: do you tend to have that same pattern now [of how you did the laundry when using a laundrette]?

Ellen: no, [laughs] I just throw everything in the washing machine. I do more, I would say, you do don't you. I tend to do more. I just put things in when it is convenient.

Interviewer: do you still hand wash?

Ellen: no, not really, no.

Interviewer: have you got a setting on the machine that you can use for delicates?

Ellen: yes, it has got a hand wash setting, it always amuses me I'm not quite sure what it does!

Interviewer: what is the weekly routine with your washing, do you tend to change bed linens etc. every week?

Ellen: no, I only change bed linen, it sounds filthy, once a month. Towels I do about fortnightly. Basically, I mean really once a week I do the main things and then once a month the bed linen comes off and towels I probably do about the same. I change them, but I don't necessarily wash them.

In some ways followers of this approach to doing the laundry outsource the water consumed in the process of cleaning clothes to somewhere else than their home – to the laundrette, to the drycleaner etc. This highlights the importance of considering water use in locations other than home spaces – the remaining laundrettes, and nappy services, for example. They also seem more tied to ideas of cleanliness (and potentially presentability) as reasons for initiating laundry washing, such that the interventions suggested for 'Simple Home Laundry' could potentially be effective for this group too. There is a question as to whether this variant represents one that is followed throughout the lifecourse by practitioners, or is instead followed as an alternative to something like Simple Home Laundry when conditions (such as not having a washing machine at home) during certain periods require it.

Attentive Clean Laundry

Practiced by: 15% of the population (of SE England) (n=219, of 1426, weighted by respondent)

A summary of the cluster

More than in the other variants of laundry washing, the washing machine settings in this variant are changed to match what is being washed, and it is the only variant in which there is a statistically significantly different spread of scores on the frequency dimension, being slightly higher on average than for the other clusters, indicating that it is more likely clothes are worn and linen used for shorter than average periods of time (and so are washed more frequently). Hand washing occurs never or just occasionally, outsourced services are used and the washing machine is by some practitioners occasionally run part full. Practitioners of this variant of laundry are less likely than average to always wear the same clothes throughout the day, often changing clothes on working days, but not on non-working days or otherwise to suit whatever else is happening. This attentiveness to changing the clothes being worn to suit particular activities translates into using the washing machine slightly more often per household member than average too. In terms of socio-demographic characteristics, apart from being slightly more likely to have dependent children, they do not differ from the rest of the population on any other characteristic tested.

None of the participants who participated in a qualitative interview fell into this cluster, so we constructed a representative vignette highlighting the potential nature of someone in this group when it comes to doing laundry:

Lara is a 23 year old single mother, who lives in a rented ground floor flat with a small garden in outer London. She works part time as a sales assistant in a local fashion store. Her son, Jack, is two years old, and goes to the local childcare centre on the days that Lara

works. Due to the pressures to look good at work, Lara needs to change her clothes every day, and when she comes home she changes out of her clothes, puts them straight in the wash and changes into her comfy 'around the house clothes', which she changes every few days. She gets suit jackets and casual jackets dry-cleaned every month or so, and will put just one or two things in for a hand wash if she has run out of a particular clothing item, if it's particularly dirty, or if she needs it for a special occasion.

This group also presents an interesting case for non-traditional forms of intervention around laundry – with their 'need' for clothes on demand influencing the higher than average frequency of clothes washing and machine use, and with the added attentiveness to issues of cleanliness that is not so explicitly highlighted by followers of other variants of laundry practice. Similarly, the distinctive focus on changing machine settings suggests members of this group tailor the settings to what is being washed, which could potentially improve the life of clothes and linen, and suggests particular time and care taken with clothes. However, this attentiveness could also be the reason for the washing machine occasionally not being used 'full' – because of the splitting of different fabric types and types of washes for different clothes that don't quite make a full wash. The fact that the group does not exhibit distinctive sociodemographic characteristics mean identifying and targeting this group might be particularly difficult.

On-Demand Outsourcing

Practiced by: 11% of the population (of SE England) (n=151, of 1426, weighted by respondent)

A summary of the cluster

'On-Demand Outsourcing' is characterised by the settings on the washing machine usually never being changed (although some who fall into this group change some of them). At least one outsourced laundry service is used, and washing machines are run part-full at least occasionally. Aside from the hand washing group, this is the only other cluster to hand wash more than the population average, although still the majority in the group never do, and the rest do so only occasionally. They are slightly less likely to wash clothes 'all the time', or when the pile is big enough, but more likely during the day, on weekdays and also at the weekend. Keeping up appearances seems to be slightly less important than average as a reason for putting laundry to wash. Members of this group are more likely to be living alone (27% vs 18% do), more likely in a flat or terrace and less likely in a semi-detached house than others. They are also rather less likely to have a water meter (29% do, vs 47%).

Among those who participated in a qualitative interview, Anne followed the 'On Demand Outsourcing' variant of laundry washing. She is a single, retired female aged 65-74. She lives by herself in a five roomed terraced house in a seaside suburb in Essex. She wears the same clothes throughout the day on all days. She says that she does her washing 'all the time', tends to handwash only when it will protect the fabric, and washes clothes to make them feel fresh. Here is her describing the use of the washing machine to create that freshness:

Anne: actually washing – clothes – I find that I can just use the quick rinse thing, all you want to do is freshen up your clothes most of the time don't you.

Interviewer: so you try to do a few things to cut back, in terms of clothes, do you tend to wear the same clothes through the day and then wear them the next day or do you wear

them till they feel dirty, what is the trigger that makes you put them in the washing basket?

Anne: I smoke, it smells. A couple of days of the week I read with the children at my grandchildren's school and I do like to have fresh clothes. I don't think that you smell it on yourself, but other people are aware of it. Weekends I can be quite lazy and wear the same things two or three days running, I change my underwear. Summer is somewhat different, I suppose in the summer I am more inclined to change my blouse every day, but this time of year [early spring] I don't.

Interviewer: do you tend to have enough clothes in your wardrobe to save up a basket load to wash?

Anne: yes [break in conversation to do something else].

Interviewer: so the washing machine now, do you stick with the one setting or does it vary?

Anne: mostly I stick with one setting, I wash on 30 degrees. Today's materials you don't need to wash on a heat.

Interviewer: do you separate?

Anne: I have my colours and my whites. The towels go with the whites. I change the sheets once a fortnight and that is when all the whites go in, other than that it is all normal clothes.

That this group of people are more likely to live alone could be an explanation as to why their washing machine is often 'part full' when doing laundry, that is, there are no opportunities for economies of scale for this group without considering the purchase of greater 'stocks of stuff' that mean that people might have more things to wear between washes and so be able to create that 'big wash'! In fact, this might be a reason that this group is more likely to handwash – that they do not have enough even for a half wash of clothes. As such, considerations of 'interventions' for this group could be problematic – surely encouraging the purchase of extra clothes to ensure that they have fuller washing machine loads has the problem of shifting the 'embedded water' further down the clothes manufacturing process, not to mention increasing the risk of clothes being less used before being replaced, increasing overall resource consumption.

Hand Washing

Practiced by: 6% of the population (of SE England) (n=79, of 1426, weighted by respondent)

A summary of the cluster

The relatively high level of hand washing is the defining feature of this variant of laundry practice. People performing this practice are more likely to say they hand wash when the label says to, and because they find it more convenient, or because they do not own a washing machine. Even in this group however, hand washing is not necessarily common, with the lower end of the range still representing just two hand washes per week. The group's practice is otherwise quite heterogeneous on the other dimensions, and similar to the distribution among for the rest of the population. They are less likely than average to wear the same clothes throughout the day, and more likely to wash laundry in the evenings or when they have run out of things, while cleanliness is more likely to be a motivation for putting clothes to wash.

In terms of sociodemographics, members of this group are much less likely to be in full time work (18% are, compared to 39% of the other respondents). They are more likely to have dependent children living with them, and to be in a home with a total of two or more people rather than living alone. They are also much more likely to report wanting to install a water meter if they don't already have one: 24% have plans to, compared to 10% of the rest of the population, although most of this group do not have any clear plans for when they will have them installed.

The following is a vignette of a potential 'hand washing' family, as none of our interviewees followed this variant of laundry practice, unsurprising considering how small the group who practices this is (6% of the population).

Leanne and Liam are both 35, and share a detached house in an outer suburb of an Essex town with their three children Mattie (10), Kira (7) and Lucy (3). Leanne is a mostly stay at home mum, and Liam works during the day and plays for the local football team regularly throughout the season. Leanne works one day a weekend in a farm shop to provide some extra income for the family. The kids all play a variety of sports, and the young girls both do dancing three days a week. Laundry tends to get done during the week and on weekends due to Liam's work clothes often running out and so that he has clean clothes for football training, as well as the loads that are needed to ensure that the kids' school and sports clothes are clean and presentable. Leanne tends to hand wash the girls ballet and dancing clothes (to preserve the fabric), her own delicates (underwear, nice tops and dresses) and Liam's work and sports clothes also get done by hand when they are particularly grubby (an extra soak before they are put into the washing machine). Most other 'general' clothes that aren't needed immediately get thrown in the basket to do at the end of the week or on the weekend, along with the bed linen and towels.

Although involving a comparatively high frequency of hand washing, there is not obviously much that would otherwise make this cluster a recognisably distinct variant of laundry practice, and it is also followed by only a small group. Being much less likely to be in full time work, it could be that having more time available allows many in this group to hand wash clothes more often when the label says to. It is unclear as to whether the relative size of this group is likely to change much in future – history shows us that hand washing has become less 'normal' than it once was, but this is also influenced by the history of textiles that has resulted in clothes that need hand washing less. Perhaps there is room for different 'labelling interventions' for this and for On Demand Outsourcing, as practitioners of both variants handwash more than the rest of the population: altering washing advice on clothes labels could influence the extent of handwashing. As one of the reasons that people might put things to handwash is to refresh the clothes when there is not enough for a load of washing, and given that this group is also focused on issues of cleanliness, they might be a group that would benefit from other interventions. For example, this might be a group that would respond to the idea of refreshing clothes by hanging them out and airing (on a hanger outside), or putting them in the freezer (as is common with raw denim clothes). These practices also influence the longevity of clothes and linen, and the life of the clothes.

5.2.4 Reflections on laundry

The fact that it is hard to predict which variant of laundering people will follow based on their socio-demographic characteristics – age, gender, affluence, family structure, etc. –

suggests targeting different clusters with different interventions to reduce water use might be difficult if we were to approach it from a conventional approach to water efficiency. However, looking at what might constitute the main possible sites of intervention, that is not necessarily a problem – everyone could be encouraged to wear clothes more before washing them, for example, as this would reduce the volume of clothes being washed per week regardless of the current variant of laundry practice a person follows, and increase the longevity of the fabrics the clothes are made from. Other interventions might include technological changes – clothes which resist becoming smelly more effectively, or repel dirt better and so look cleaner longer; washing machines that always have a half-load setting that uses less water and energy, or which even automatically adjust themselves by detecting how much is in them; dry cleaners and laundrettes that use greener methods (Doyle & Davies, 2012; Jack, 2012). These strategies can help to challenge the cultural conventions through which 'normalised' washing patterns take hold, and could apply across the whole population without the need for targeting.

5.3 Garden watering

Summary of gardening watering practices

- 9 out of 10 people have some kind of outdoor space, 87% having a back garden and 77% a front garden. However, 38% say they have nothing to water outside, perhaps having only artificial surfaces or trees not requiring watering.
- Outdoor space, for those who have it, is most commonly seen as a place for flowers and plants (59%) and/or an outdoor living area (34%).
- Couples, particularly the retired, are the people most likely to see it as a place to grow fruit and vegetables, whilst retired people are the most likely to see it as a place for birds and other wildlife.
- Even among those who do say they have things that require watering, over a quarter do not water them, instead waiting for the rain. This means that only 44% of households actually have outdoor space *and* water it.
- For those who do water their outdoor spaces, the decision about when to water is usually based on how dry things appear (e.g. plants look wilted, soil dry, it hasn't rained for a while), so that in a drying climate, levels of watering might increase.
- Those who actively water their garden tend to be older than average comparing to the rest of the population, usually more likely to be living with a partner, of higher than average affluence and living in a larger detached or semi-detached house which they own rather than rent. This suggests that active gardening can be dependent on having sufficient time, space and finances to support it.
- Low tech rules for watering – most people who water their garden and plants use small containers, buckets or watering cans. Only a third of those who water their outdoor space use hose pipes, or 19% of households including those who don't have any outdoor plants or lawn to water. Around a quarter say they use a water butt, although nearly half of those say theirs does not always have enough water in it for their watering needs. This all has implications for the effectiveness of hose pipe bans: encouraging increased use of water butts and of recycled water systems might be more effective interventions for reducing water use.
- Those with nothing to water meanwhile are more likely to be younger than average, with children, less affluent than average and living in smaller homes, flats or tenements, and more likely renting rather than owning their homes. Whilst about a quarter are likely to stay in this group, as they have no outdoor space, the rest do have some, so could become more active gardeners in future, with potential water use implications.
- As various interest groups are promoting changing gardening practices, from increasing planting of food plants and drought-resilient and native species, to increasing use of shared gardens in tenements and flats, then these social trends could potentially increase levels of active gardening in future, even giving rise to new variants of gardening.

5.3.1 An overview of gardening practices

91% of the population in our sample reported having some kind of outdoor space, 87% having a back garden and 77% a front garden. 30% have a patio or smaller yard, and 3% have a balcony and 6% decking (see Table 19). However, fully 38% of the sample reported having nothing to water. As many of these do have some outdoor space, this means either there are no plants or lawn in it, or that they do not consider what is there as something that they would water.

There are significant differences in the types of outdoor space different household types have. Couples and the retired are significantly more likely to have front and back gardens and patios than other household types, while couples with children are more likely to have decking than others. Singles are more likely to have none of these outdoor spaces meanwhile, whilst retired couples are the most likely to have some kind of outdoor space. Note that the terms couple and single here refer only to whether the survey respondent indicated whether they live with a partner or not: they may have a partner not living with them, and both single and couple households may also include other residents of the household, such as dependent children or related or unrelated adults.

Table 19 Prevalence of different outdoor spaces, by household type
Multiple choice question. n = 1801-2; weighted by household

	Back garden	Front garden*	Patio or smaller yard	Balcony	Decking	None of the above
Single, no children 16 or under	74.9%	63.7%	21.7%	5.1%	4.6%	16.5%
Couple, no children 16 or under	90.4%	79.6%	34.2%	2.3%	7.7%	7.0%
Single, with children 16 or under	84.8%	71.9%	18.6%	2.1%	9.0%	10.3%
Couple, with children 16 or under	87.0%	76.3%	26.7%	2.6%	11.1%	9.0%
Single, retired	87.0%	79.5%	26.8%	2.0%	1.2%	7.9%
Couple, retired	97.2%	93.5%	46.3%	1.6%	3.3%	.8%
Total	**86.7%**	**77.1%**	**29.5%**	**2.8%**	**6.4%**	**8.8%**
Significant at level:	*0.1%*	*0.1%*	*0.1%*	-	*0.1%*	*0.1%*

* including gardens, hard standing and parking areas

How people view their outdoor space also varies between groups, as presented in Table 20 below for households which have at least one of a front garden, back garden or patio or smaller yard. Overall, a place for flowers and plants is by far the most commonly reported response, followed by an outdoor living area or room, then a place to grow food, and as a car parking space. Several of the response rates again vary significantly by household type. Unsurprisingly, saying that it is a playground for children is far more common for those who have children, and quite uncommon otherwise. Using it for flowers and plants is more common among couples, those without children, and the retired. Couples are also more likely to use it for growing food. Couples and households without children seem most likely to see it as an outdoor living area, whilst singles, particularly those without children, seem least likely to have a clear idea of what it is for.

Table 20 Respondent descriptions of how they would describe their outdoor space
Multiple response question. n=1607-8; weighted by household

	A playground for children	A place to grow food, fruit and vegetables	A place for flowers and plants	An outdoor living area/outdoor room	A place for birds and other wildlife	A place to keep pets or other animals	Still being developed	A car parking space	No clear used for anything	Don't know
Single, no children 16 or under	4.6%	19.7%	45.7%	34.3%	10.7%	2.9%	2.2%	18.3%	18.2%	1.8%
Couple, no children 16 or under	4.8%	24.9%	63.4%	38.4%	17.8%	6.4%	2.0%	24.7%	9.7%	1.0%
Single, with children 16 or under	39.1%	16.4%	34.4%	25.8%	7.0%	6.3%	3.1%	22.7%	14.1%	1.6%
Couple, with children 16 or under	54.5%	24.4%	52.4%	35.1%	13.1%	7.4%	2.4%	22.0%	10.1%	.3%
Single, retired	4.4%	14.8%	72.1%	26.3%	21.5%	2.6%	.4%	16.6%	11.4%	.0%
Couple, retired	5.8%	34.7%	78.9%	37.6%	24.0%	5.4%	.4%	23.6%	4.5%	.0%
Total	**18.0%**	**23.3%**	**59.3%**	**34.2%**	**16.2%**	**5.3%**	**1.7%**	**21.5%**	**11.1%**	**.7%**
Significant at level:	*0.1%*	*0.1%*	*0.1%*	*5.0%*	*0.1%*	-	-	-	*0.1%*	-

38% of respondents stated that they do not have any outdoor plants or lawn to water, approximately four times the number of people who said they had none of the different outdoor spaces reported (nearly all of this latter group fall into the former group too). Among those who did report having some kind of outdoor plants or lawn to water, Figure 18 shows the criteria they use for deciding when to water their plants. Firstly, even among those who do have outdoor plants or lawn to water, 26% report that they don't water them, but just wait for the rain. The other common responses involve watering either based on regularity (watering on a regular schedule) or on some measure or proxy of how dry things have got – primarily when the plants are looking wilted, the soil is looking dry, or when it hasn't rained for a while.

Figure 19 below shows the responses to watering criteria split into these two types: time variant (ones where watering frequency is decided on upon grounds of duration between waterings – either on a regular schedule or when the respondent remembers to) and weather variant practices (ones where they are decided upon based on factors at least indirectly linked to the weather – temperature, sunlight, humidity, rainfall). Weather variant criteria dominate. Speculatively, households might adjust their watering practices in a changing climate differently depending on whether they use weather or timing criteria to decide when to water their gardens. Similarly, in a warmer,

drier climate people that use time variant criteria for watering the garden might be more likely to adopt automated and timed household irrigation systems.

Figure 18 Criteria used to determine the timing of watering of garden
n=1173 – those reporting having outdoor lawn or plants to water. Weighted by household.

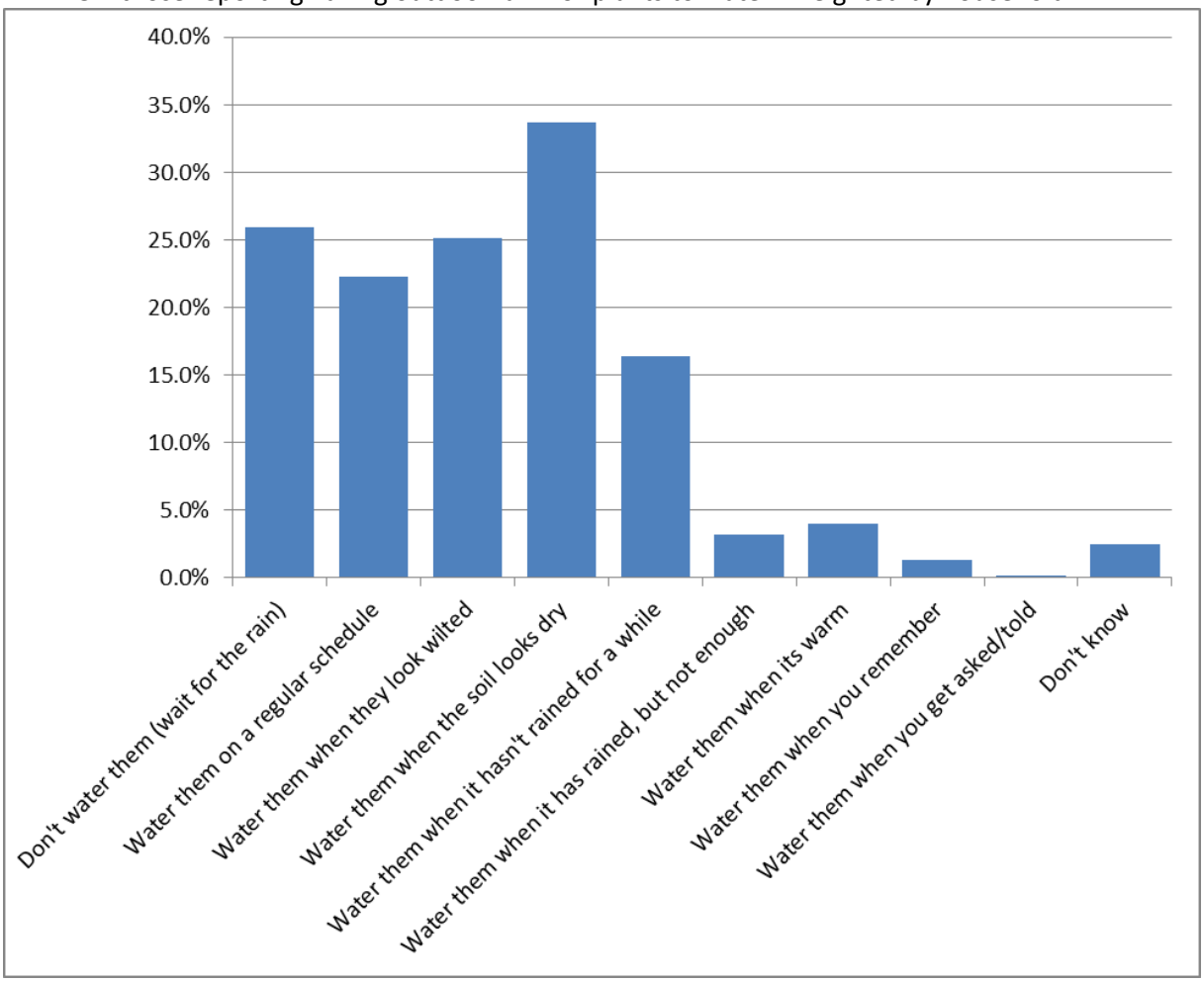
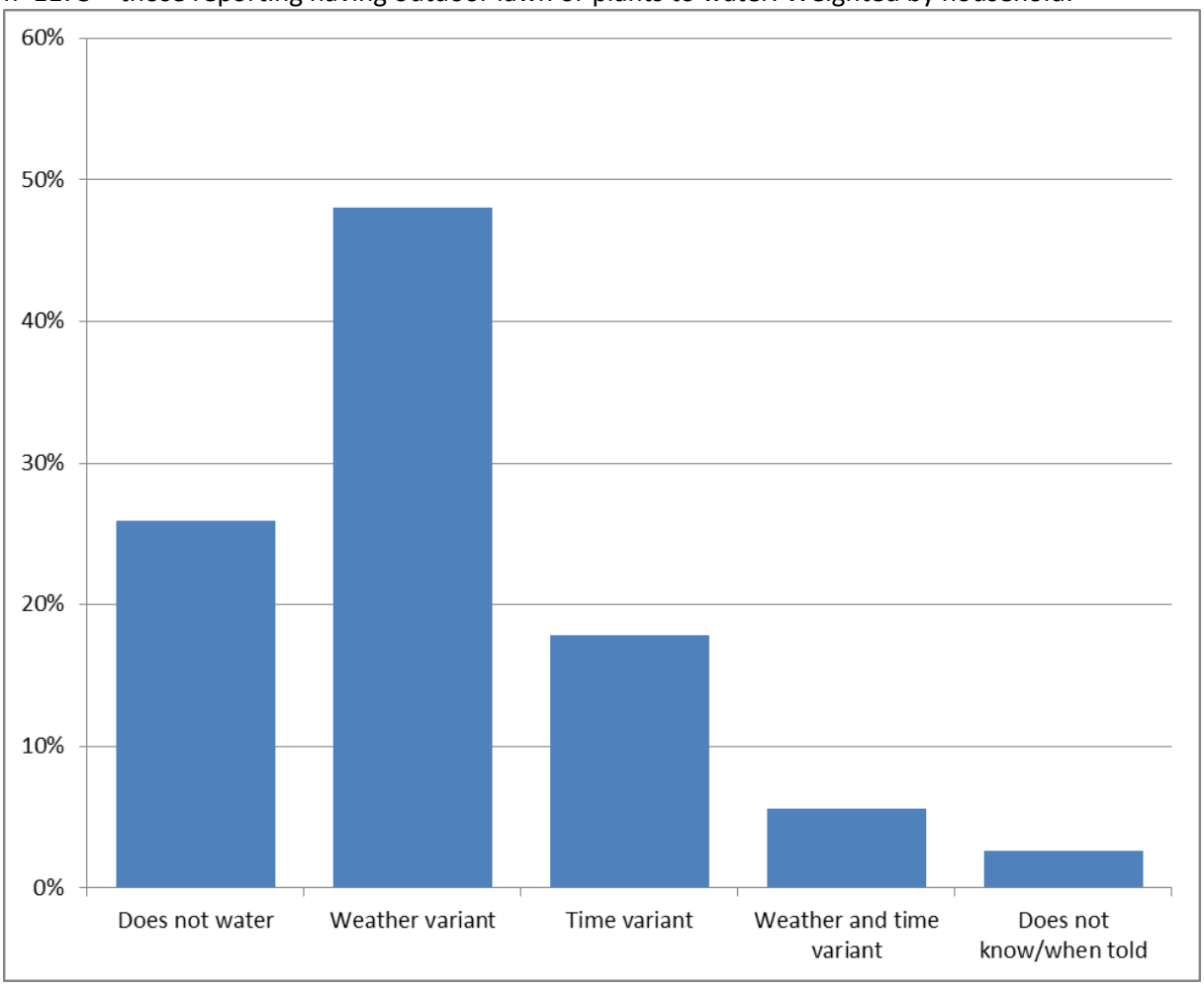


Figure 19 Type of criteria used to determine the timing of watering of garden
n=1173 – those reporting having outdoor lawn or plants to water. Weighted by household.



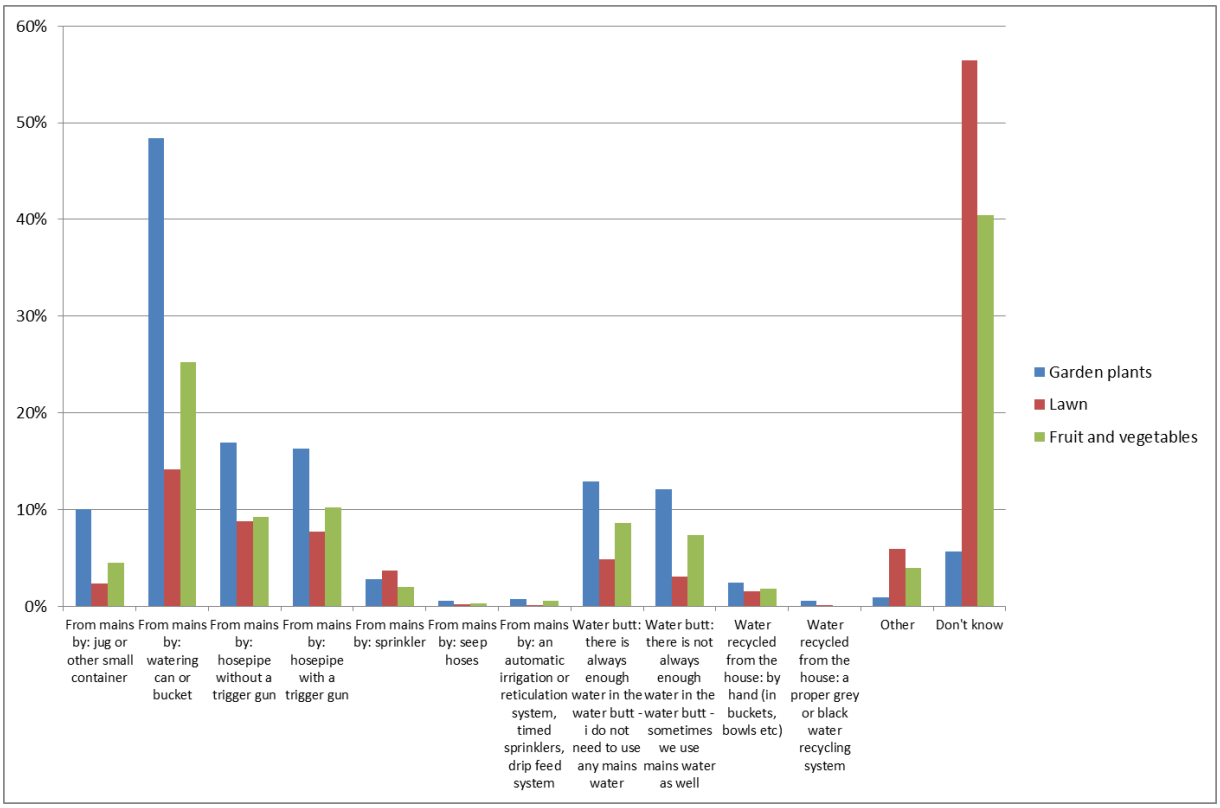
Overall, 49% of the population has outdoor plants or lawn and also waters these. Figure 20 below summarises the responses to the multiple response question regarding how people water their garden plants, lawn, and fruit and veg. This was asked only to those who had responded that they have something to water (plants or a lawn), and that they do water that something. Note that the 'do not know' response in the figure is likely to include respondents who do not have or do not water just that particular outdoor area (i.e. garden plants, lawn or fruit and vegetables), as there was no separate 'do not have/do not water that' option in this question, and they had previously only been asked about whether they had or watered any of these. Overall, the figure demonstrates that, excluding the 'don't know' group, there is little variation in the methods used to water the garden plants, lawn and fruit and vegetables (the heights of the three bars are similar relative to each other within each option). The only major exceptions are sprinkler use and recycled water, both of which are used more for the lawn and relatively less on garden plants and fruit and vegetables.

Overall, low tech rules – most people carry water by hand to the garden in some kind of receptacle, more commonly a large or made to purpose one (a bucket or watering can). Hosepipes are used by about a third of those who water, with an even split between those with and without a trigger gun. More sophisticated technologies like seep hoses and irrigation systems are rare. Around a quarter say they use a water butt, although nearly half of those say theirs does not always have enough water in it for their

watering needs. These points stand out for intervention purposes – hosepipe bans, it suggests, will only affect about a third of people who water their garden, or 19% of households including those who don't have any outdoor plants or lawn to water; there is also potential to greatly increase water butt ownership and usage. Potentially too, these should be larger than they currently typically are, to allow them to store more rainwater, and roof runoff (although low rainfall and rooftop catchment area rather than insufficient storage size could be the limiting factor for whether they have sufficient water or not).

Figure 20 Water source and watering technology used to water garden plants, lawn and fruit and vegetables

Multiple response question. n=883 (those with something to water, and who do water), weighted by household



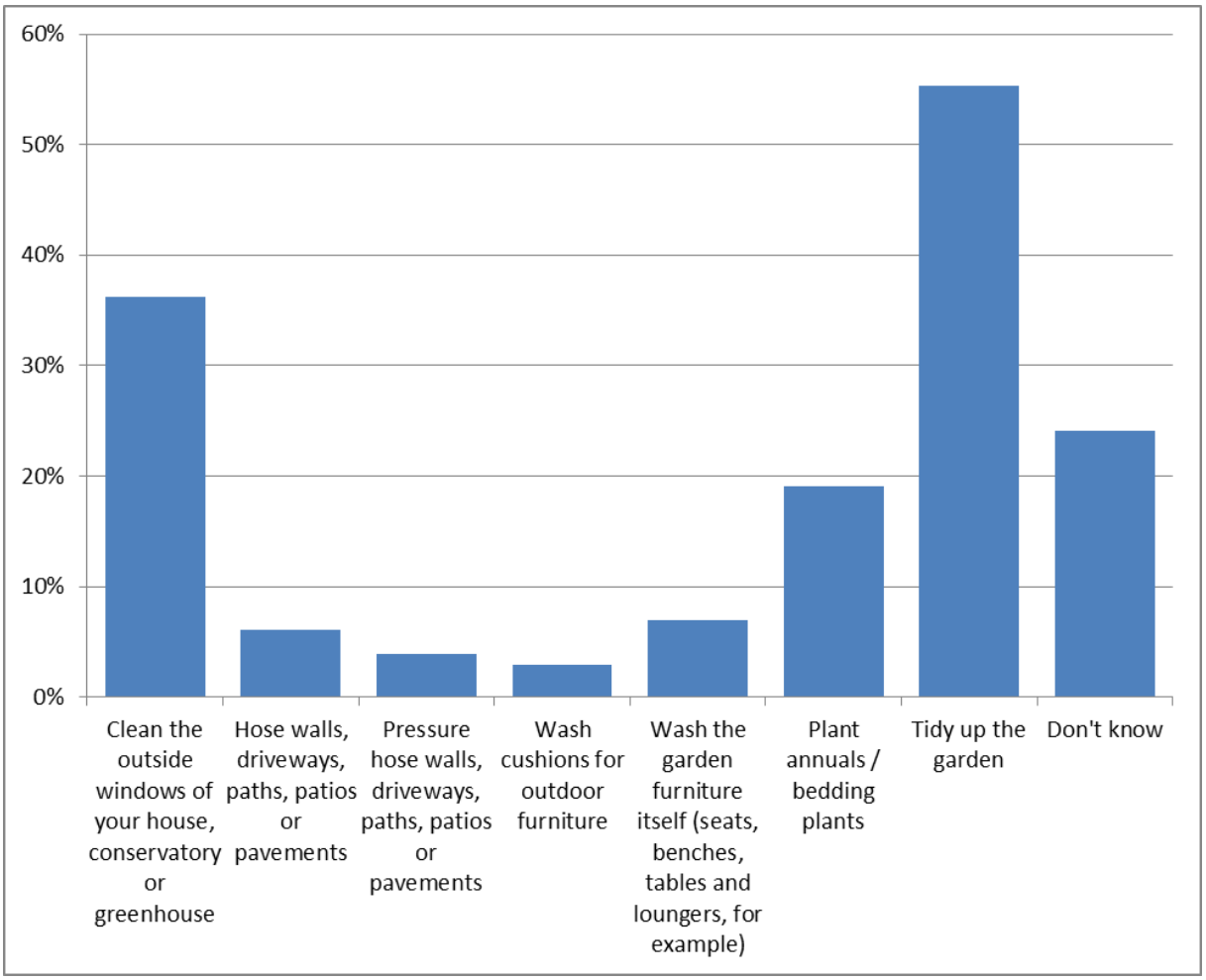
Of those who had reported that they had some kind of outdoor space, 55% respond that they tidy up their garden in preparation for the spring and summer months (see Figure 21 below for responses to this multiple choice question). 36% clean the outside windows of their house, conservatory or greenhouse. After that, numbers are rather lower, with 19% planting new plants, 10% hosing walls, driveways or other outdoor flooring, either with a normal hose or a pressure hose, and 3-7% washing outdoor furniture or cushions for it. The 25% who said that they don't know could perhaps include 'none of the above' responses too, as there was no separate 'none of the above' option.

What the garden is seen to be for seems to have a clear effect on practices here. Planting annuals is a significantly more common practice (at the 0.1% level) among those who see their outdoor space as a place for plants and flowers (30% of those who see it this way do, compared to 4% of those who do not see it this way). Tidying up the garden is also more common (again at the 0.1% level) among this group (66% do so, compared to 43%). There are some statistically significantly increased probabilities of

responding yes to several of these questions among those who see their outdoor space as an outdoor living area or outdoor room too. They are more likely to say yes to window cleaning (50% vs 29%, significant at the 0.1% level), hosing walls etc. (9% vs 5%, at the 0.1% level), washing the garden furniture (3% vs 4%, at the 0.1% level), planting annuals (27% vs 15%, at the 0.1% level), and tidying up the garden (63% vs 53%, at the 0.1% level), and also much less likely to 'not know' (10% vs 30%, at the 0.1% level).

Figure 21 When you are preparing your home for the spring and summer months, what sorts of things do you do?

Multiple response question. n = 1642 (those who have some kind of outdoor space), weighted by household



5.3.2 Six variants of gardening practices

We performed a cluster analysis on the 62% of the respondents who reported having something to water outside (i.e. plants or a lawn). Four dimensions were used to define clusters in the data, described in Table 21 below. Frequency in this case simply measures whether the respondent waters their garden or not: the survey did not ask for more detail about how often they water, in terms of times per week, because this is so dependent on the weather, season, soil and garden type that the reported responses were unlikely to be reliable. The diversity scale measures how many factors influence when a person waters their garden from the range of options that were included in the survey: such as if it is done on a routine, when the soil is dry, when plants look wilted,

when it hasn't rained for a while, etc. Technology is a measure of the watering technology used, rated based on the complexity of the technology involved: at the bottom of the scale are jugs and watering cans, hoses are near the middle, sprinklers a bit higher, and automated irrigation systems right at the top. It could be expected that higher technology also corresponds with higher water use, as it increases the household's capacity to transfer water into the garden (watering cans are far slower and more labour intensive for moving water than a hose, for example). At the same time however, sprinklers and irrigation systems in principle have the potential to use the minimum of water necessary for a given soil type and set of plants, although they also require careful calibration to achieve this. The relationship between technology level and water use is potentially complex therefore, and dependent on other factors too. The efficiency scale, finally, measures the water source used, so is an indicator of the efficiency of mains water use in maintaining the garden. A low efficiency score signifies all mains water, high efficiency is all rain harvested in a water butt or recycled from the house, while medium efficiency is some combination of the two.

By default, respondents who do not water their garden are given diversity scores of zero, technology scores of zero, and efficiency scores of one (as no mains water is implicated), although we have still included them as a cluster, as this enables an understanding of the diversity of practices in the garden, which has interesting implications for potential future interventions and thinking about how these different clusters might change under different climatic and other social/technological conditions.

Table 21 Dimensions used to identify variants (clusters) of garden watering practice

Dimension	Definition	Scale values
Frequency	Whether the respondent waters the garden plants, lawn, and fruit and veg.	0 indicates no; 1 indicates yes.
Diversity	Number of factors which influence the timing of watering.	0 indicates none; 1 indicates 3 or more.
Technology	A measure of the watering technology used, approximately rated based on its relative potential water flow rate (average rating of the technology used on the lawn, garden plants, and fruit and vegetables).	0 indicates jug or watering can, or from water butt or recycled water from house; 0.4 indicates hosepipe without trigger; 0.5 indicates hosepipe with trigger; 0.7 indicates sprinkler; 0.8 indicates seep hose; 1 indicates automatic irrigation.
Efficiency	Efficiency of home mains water use (average rating of the water source used on the lawn, garden plants, and fruit and vegetables).	0 indicates mains water use; 0.5 indicates mix of water butt/recycled and mains; 1 indicates water butt or recycled.

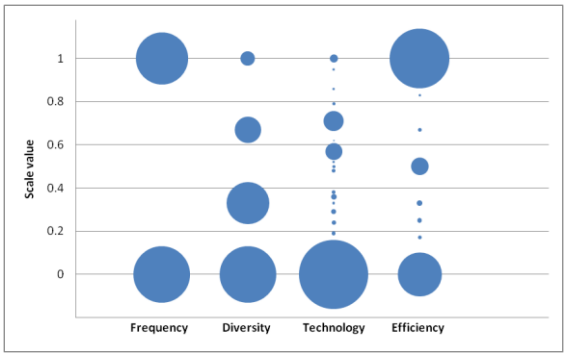
The cluster analysis indicated that five clusters would be an optimum solution for those in the sample with something to water. To that we manually added a sixth cluster to represent the 38% reporting that they had no plants or lawn to water. Distributions of the respondents on the dimensions for each of the six clusters are shown in Figure 22 below. The top two figures show the results for the population as a whole (left), and for just that share of the population which waters their garden (so excluding hands-off gardeners and those with nothing to water) (right). The remaining five figures show the

distributions for each cluster on the four dimensions. Note that the distributions for Hands-off Gardening and for those with nothing to water are the same so they are only presented once.

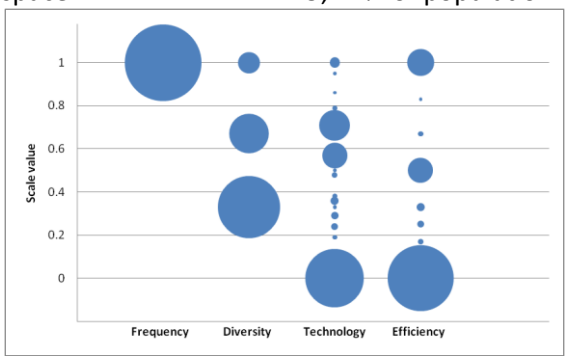
The frequency figures in the cluster analysis diagrams below for the population as a whole show that only 44% actually have some outdoor lawn or plants to water and do water them. The graph for those who do water their garden show that they use differing numbers of criteria to decide when to do so. The technology scale shows that two thirds (66%) of those who have outdoor lawn or plants and actually water them use jugs and watering cans to water their gardens. This has obvious implications for the direct impact of hosepipe bans: including households who do not have outdoor space and who do not water, only 19% of households actually use anything more sophisticated that jugs or watering cans to water their garden. Regarding the efficiency of mains water use, whilst 61% of the population do not use any mains water, if we include only those who do water their gardens, three quarters (76%) use only or mostly mains water to water their garden, and only 12% use only rainwater harvested in a water butt or recycled water. Changing watering practices in terms of the water source used could therefore be an effective avenue for intervention to reduce mains water use both in terms of household use of rainwater and greywater harvesting, and more community/region-wide systems.

Figure 22 Garden watering, 6 cluster solution: balloon plots
Bubble sizes represent weighted percentage of respondents having that value on that dimension.

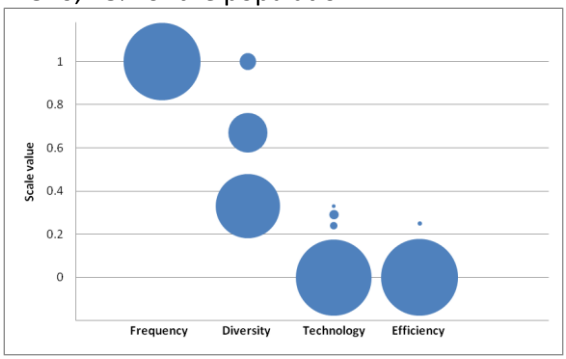
Population as a whole
n= 1769 to 1802



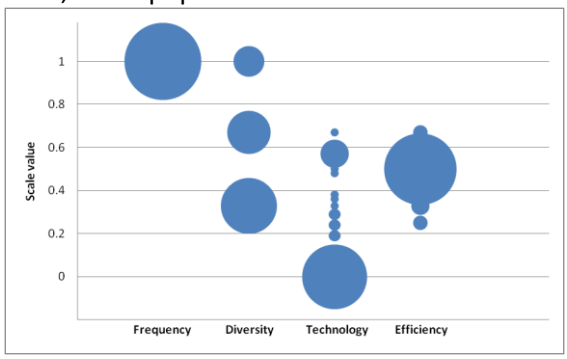
Population as a whole excluding those who do not have, or do not water, their outdoor space[8] n=779, 44% of population



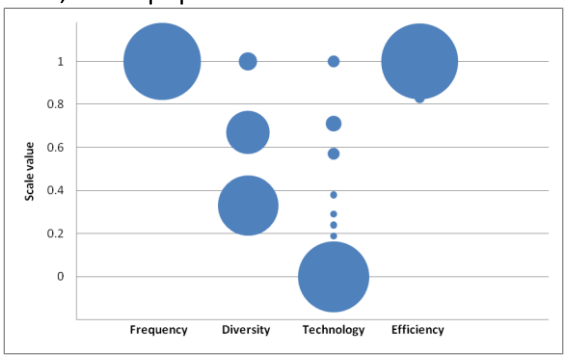
Casual Gardening
n=320, 18% of the population



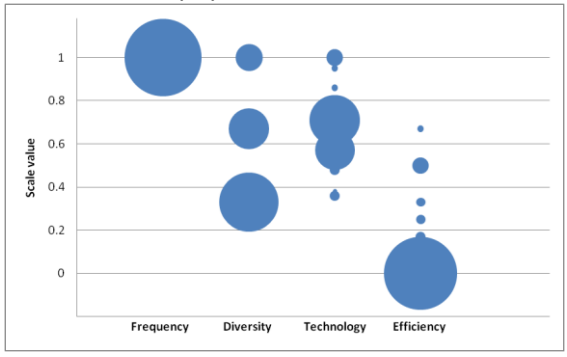
Amateur Enthusiastic Gardening
n=81, 5% of population



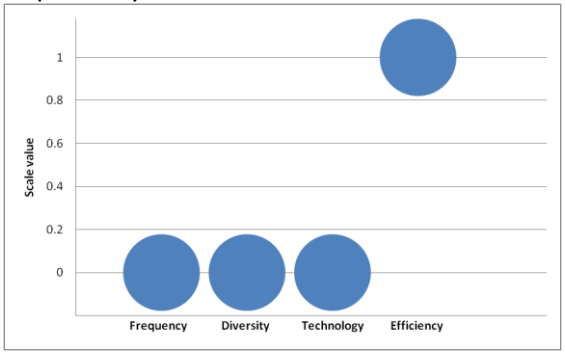
Green Fingered Gardening
n=99, 6% of population



High Tech Gardening
n=279, 16% of population



Hands-off Gardening/ Nothing to water
n=314/660, 18%/38% of population respectively



[8] This includes the first four clusters on this page, and excludes hands-off gardeners and those with nothing to water.

A variant of practice we have called 'Casual Gardening' is followed by the largest group of the population studied who water their garden, 18% of the population (29% of those who have outdoor plants to water). While this group clearly maintains their gardens and enjoys having flowers in them, they have a simple approach to gardening. They use only low tech ways to water the garden – jugs and watering cans; and use only mains water. On the one hand, they probably won't be able or willing to carry as many litres of water to the garden that way as you could using a hosepipe, but then again they also won't be affected by hosepipe bans! The number of criteria used to decide when to water varies in this variant of garden watering.

The next two variants are followed by quite small numbers of people – 'Amateur Enthusiastic Gardening' and 'Green Fingered Gardening' are practiced by 5% and 6% of the population respectively (7% and 9% of those with things outdoors to water). On the cluster dimensions, the main difference from Casual Gardening is on the efficiency scale – Amateur Enthusiastic Gardening uses a mix of mains and water butt water, so is in the middle on the efficiency scale, while Green Fingered Gardening uses only water from a water butt, so is at the top of the scale. Both variants tend to involve watering with watering cans and jugs, but both include a small proportion of people who use other technologies such as hosepipes and sprinklers. Followers of both of these variants are enthusiastic gardeners, and the Green Fingered ones especially are more likely to see their outdoor space as a place to grow their own fruit and vegetables. Both groups are also the most likely to see their garden as a place for wildlife and birds, and to have garden ponds and water features, including for birds and wild animals.

High Tech Gardening is the last variant that actually involves watering the garden. This is practiced by a large group, representing 26% of those who have things outdoors to water, 16% of the population overall. It involves higher levels of watering technology than the other variants above, usually hosepipes, but also sprinklers and automated irrigation systems. Additionally, mains water is always used. This could therefore represent high impact gardening in terms of the mains water required. People who water their gardens in this way are the only ones who are more likely than average to say they would like to do more for the environment than they currently do, so perhaps they would be open to alternative watering methods, and technologies such as larger scale rainwater and greywater recycling systems.

Neither of the final groups, the Hands-Off Gardening or those with nothing to water, actually water their garden. Hands-Off Gardening stands out because people who follow it have outdoor plants or lawns but never water them. They make up 29% of the population with outdoor plants (18% of the overall population), so represent a large share of those with outdoor things potentially needing to be watered. This group is less likely than others to see their outdoor space as a place for recreation (that is, as an outdoor living area or outdoor room). The final group, those who said that they had no outdoor plants or lawn to water, represents 38% of the population. Still, 67% of this group reported that they have a back garden, 56% a front garden, and 75% have at least some kind of outdoor space. They are far less likely than other groups to see this space as somewhere for plants, growing fruit and vegetables or for wildlife or pets, and far more likely to have no clear use for the space.

We can say that the followers of all the variants of active garden watering, i.e. excluding these last two who do not water, are older than average comparing to the rest of the population and more likely to be retired, usually more likely to be living with a partner and less likely to have dependent children living with them, more affluent than average and tend to live in larger than average housing, more likely detached or semi-

detached than terraced or flat, and more likely owned outright or with a mortgage, less likely rented. This is especially the case for those who practice Green Fingered Gardening, where over 42% are 65 or over, compared to 18% of the rest of the population. So what does that mean for how this way of watering the garden might change in future? Might social movements like the Transition movement or SLOW living make Green Fingered Gardening more common in future, or is this going to be a variant of practice restricted mostly to well-off retirees with spare time and money and a probably good-sized area of land? Those who practice Hands-off Gardening meanwhile are, in sociodemographic terms, closest to the population average in most respects, whilst the group with nothing to water are in particular more likely to be younger, with children, less affluent than average and living in smaller homes, flats or tenements, and more likely renting rather than owning their homes.

5.3.3 Detailed cluster results, and proxies of practice

Full statistical results for each cluster can be found in the Technical Appendix.

Casual Gardening

Practiced by: 18% of population (of SE England) (n = 320, of 1753, weighted)

A summary of the cluster

'Casual Gardening' involves watering outdoor areas, and using a range of criteria to decide when the garden should be watered, although on average fewer criteria are used by people who follow this variant of garden watering than are by others who water their gardens. Low technology solutions are almost universally used to water the outdoor spaces – jugs and watering cans – and water is always taken from the mains supply. Practitioners of Casual Gardening are more likely to see their outdoor space as a place for flowers and plants than the rest of the population and are less likely to see it as a car parking space or to have no clear idea what it is for. They are more likely to be slightly older than average and less likely to be 34 or under, less likely unemployed, and slightly more likely to be retired. They are also more likely to be more affluent than average, and more likely to own their home, and less likely to be renting. The homes themselves are more likely to be detached or semi-detached houses, less likely flats, and slightly larger than average.

Lewis is a 16-24 single male, living with his parents in a nine room terraced house in suburban Essex. He took part in the interview but his parents (male 55-64, female 45-54) answered some of the questions for him, particularly when it came to gardening! This household appears to be 'time variant' in its watering routines based on their questionnaire responses, as they said that they watered on a regular schedule, and they are good examples of those who practice Casual Gardening. However, in the qualitative interview it was revealed that they water based on a 'when it needs it' approach from the mains water, and that this is mainly for the vegetables that they grow during the summer months.

Interviewer: in the garden you were saying that you don't plant annuals or do anything?

Lewis's Mum: oh yeah we do vegetables...

Lewis's Dad: yeah we do vegetables.

Lewis: do you do vegetables? [quizzically] [laughter].

Mum: yeah you don't eat them... we do potatoes, green beans, tomatoes, peppers, strawberries, you don't know that we've grown all them.

Dad: I can't believe you didn't know.

Interviewer: do you have a water butt or do you have to water them regularly, like in summer?

Mum: yes we do [have to water them] but we don't have a sprinkler so we aren't that naughty, [laughs] but we have got a hose.

Interviewer: do you water on a regular schedule or do you tend to do it when things are dry?

Dad: when things are dry.

Interviewer: is that from the plants wilting or the soil looks a bit parched?

Dad: in general we get a fair bit of rain down here, even in summer a fair bit of rain, probably every other day, every couple of days, but it's just a quick go like , you know what I mean, it's mainly for the vegetables and yeah not too much but we do do it with a hose.

Interviewer: have you been planting vegetables for quite a while? Is that something that you've always done?

Dad: not really. When I say vegetables, most of the garden is grass in it and at the end I have got a strip about that wide by about 12 foot that has the potatoes in and then a few pots what have everything else in; I'm not allowed to dig the garden up like [Mum laughs] so it's just a few pots, sort of so it's not a vast amount. It's just nice to get a bit of fresh veg now and again ain't it?

Casual Gardening is practiced by a large share of the population (29% of the population who do water their outdoor space), and whilst people in this group clearly maintain their gardens, and enjoy having flowers in them, they do not seem to engage in gardening strongly, or make large investments in terms of technology. Low tech ways are used to water the garden – jugs and watering cans; and only mains water. As they don't use a hosepipe they will not be directly affected by the hosepipe bans. Whilst it is perhaps unlikely that they would be able or willing to carry as many litres into the garden as they could transfer with a hosepipe, during a drought this group will be able to maintain their set of practices, with no disruption to the way they water the garden, still being able to use water collected from mains water taps in the house. This highlights the current problem with hosepipe bans being used as the main drought communication mechanism in the UK – it does not look at the diversity of ways that people garden, and water their garden, and therefore has missed that such a significant proportion of the population will not be affected by hosepipe bans. Given that this group uses solely mains water and low technology ways of watering with buckets or watering cans, could this be a group that could be encouraged to install water butts or used water recycled informally from inside the house to water their plants?

Amateur Enthusiastic Gardening

Practiced by: 5% of population (of SE England) (n = 81, of 1753, weighted)

A summary of the cluster

'Amateur Enthusiastic Gardening' is generally done with low technology – a jug or watering can, as is common with most of the other watering practices, but sprinklers and hose pipes might be used too. A proportion of the water used comes from water butts, but there is not always enough there for what is needed, so the mains supply is also utilised too. Between one and three or more criteria for the timing of the watering of the garden are used, averaging slightly more reasons for watering than the other variants.

Practitioners of amateur enthusiastic gardening generally seem enthusiastic garden users, and have adapted their outdoor space to that end: they are substantially more likely than others to see it as a place to grow fruit and vegetables, and are more likely than any other group to see it as a place for flowers and plants, as an outdoor living area, and as a place for birds and other wildlife. They are more likely to have a patio, decking, a garden pond and other water features than any other group, are quite likely to have water for birds and other animals too (28% vs 12% do), and are more likely to have watering technology – outdoor taps, hosepipes, high pressure hoses and event automatic reticulation systems – again, with the exception of hosepipes, more so than any other group. Leading up to the spring and summer months they are more likely to plant annuals and bedding plants than any other group (42% do vs 17%).

In sociodemographic terms, they are substantially older than average (54% are 55 or over, compared to 31% of the rest of the population, while only 11% are 34 or under, compared to 34%), and a third are retired, compared to 18% of the rest of the population. They are likely to be a couple living together, without any dependent children living with them. They are also more likely to be more affluent than average, substantially more likely to own their home and less likely to rent, whilst their homes tend to be somewhat larger than average, more likely detached or semi-detached, and less likely terrace or flats.

As an example of followers of this variant of garden watering, Janice and Troy are a retired couple (55-64) who live in their semi-detached five room house in suburban Essex, with a large front and back garden. Their watering routines were classified as 'weather variant' in the survey, watering when plants appeared 'wilted', and their qualitative interview revealed the enthusiasm Janice in particular has for gardening, and the wildlife and animals that their garden attracts.

Interviewer: so do you grow your own veggies?

Janice: we do grow some yes, every year, and all that sort of thing, yeah so... We get a lot of badgers, it's a badger run, so we get badgers through every night. There's a lot of foxes in the area. Unfortunately we don't get very many hedgehogs, we've probably had two in all the years that I've lived here. We have a bog garden – we've got all plants that like boggy things, like ferns, that sort of things. We get frogs, we end up with a colony of little frogs every year and there are always toads around and I often find one in the greenhouse.

Troy: we just tend to leave a section at the end of the garden really wilderness.

Janice: we have a big wood pile at the end which is deliberately left to rot, and we've allowed the ivy to cover over it so you've got all the insects and the frogs and the toads can bury there. I deliberately planted an oak tree at the bottom of the garden because you see these gardens are quite long, an oak tree is the tree that provides the best insects in the UK. I've got one big greenhouse at this end and then I've also got a small 6x6 greenhouse down at the far end as well, plus cloches that go up in springtime. So I grow – most of my vegetables I grow from seeds and I've got a range of..... we've got a lot of perennials that come up every year, but I do get a lot of annuals as well, particularly the ones for the

butterflies and the bees, and so ladybirds and all those sorts of things we encourage, because they eat all your bugs and things.

Interviewer: so do you have water butts and things that you use to water?

Janice: yes, there's a big one at the end of the greenhouse, we have another one at the end by the shed and what else we did, years ago Sainsbury's were giving away these big plastic carrying/storage box type things [Interviewer: that are open at the top?] Yeah but they have lids as well so what we tend to do is fill all those up with water at the beginning of the year as well and try to keep them topped up ... at the other end of the shed so we have got a water butt now under one end and at the other end we have just got the drain so it goes straight in to fill up these buckets then we can move it and keep filling those up as well. So, and out the front the downpipe comes down rather than it just going into a soak-away.

Interviewer: great! So you have got your own unofficial rainwater harvesting system going on in the back garden!

Janice: yeah so we try and conserve what we can do where we can do and ....

Interviewer: do you ever.... in the periods of drought that have happened over the past few years have you ever had to use the mains water to keep the veggies going or is it…?

Janice: we have. I'm not going to say we haven't at all, because that's another reason, I mean we only had the one water butt for a while didn't we and I kept saying we must get another one. And actually what we are thinking of doing is putting a third one out the front, it wouldn't look conspicuous, and feed off again the guttering and then whatever, once it's full that goes into the flower bed. [Troy: Assuming it rains] I should think the tubs that we've got down there it should be at least equivalent to a third one because we've got at least half a dozen down there that we keep rotating round to make sure that they're filled up.

Affluent and probably with more free time since they have retired and any children that they had have left home, followers of this variant of watering seem to be ones that garden enthusiastically, perhaps as a pleasant pastime with their husbands or wives. With money to spend they have invested in patios, decking, water features and some watering technology like water butts, and made efforts to collect rainwater as part of that. Is this variant then representative of changes across a life course (that is, people are likely to move into this as they get older) or does it reflect some kind of generational change that is associated mostly with older groups? It is likely to be a combination of the two – with garden spaces increasingly seen as 'outdoor living rooms' (Chappells, Medd, & Shove, 2011), and an increasing generation of retiring baby boomers who suddenly have time to garden! This group is one that collects rainwater as a general rule of thumb – could they be a group who would be early adopters of larger rainwater harvesting infrastructure or greywater harvesting (formally and informally) to support their garden lives?

Green Fingered Gardening

Practiced by: 6% of population (of SE England) (n = 99, of 1753, weighted).

A summary of the cluster

We labelled this variant 'Green Fingered Gardening' in an environmental sense, in that garden water usually comes from a water butt, or else is recycled from the home, with a

few who practice this even having a proper recycling system installed. In 98% of cases Green Fingered Gardening uses no mains water at all in the garden. The technology for distributing the water that is used is usually low, such as jugs or watering cans, but the full range of technologies are present, with a few per cent of practitioners using hoses and even sprinkler or irrigation systems. The number of criteria for deciding when to water varies between one and three, in line with the other clusters of watering, and aside from slightly fewer practitioners reporting watering the garden because it is warm as a criterion (1% did vs 6.2%), there is no difference in the distribution in the types of criteria used either.

Practitioners of Green Fingered Gardening are more likely than any other group to see their outdoor space as a place to grow fruit and vegetables (just over half do, compared to 20% of the rest of the population), and they are also more likely than average to see it as a place for flowers and for wildlife. They are much more likely to have water in the garden for birds and wildlife (over a third do, compared to 12% of the rest of the population), and more likely to have ponds, other water features, and water toys for children. Although they are more likely to plant annuals when spring comes, they are no more likely to perform any other outdoor preparations then.

The group is the oldest of all the clusters on average, with 42% being 65 or over (compared to 18% of the rest of the population), and 40% being retired (compared to 17%), and they are less likely to have dependent children at home as a result (only 19% do). They are more likely to be female (65% are), and more likely living singly or with their partner (70% vs 57% are couples). They are again more affluent than average, and more likely than any other group to own their home outright (57% do, compared to 31%), which is usually slightly larger than average and more likely a detached or semi-detached home, less likely a flat or terrace. They are more likely to have a water meter (61% compared to 45% do).

Jacqueline and Tim are a retired couple between 65 and 74 who live in a semi-detached home that they own outright. Their gardening routines were classified as 'weather dependent' in the survey, watering when plants wilted or the soil looked dry, and their qualitative interview revealed a range of 'green fingered' skills in their home garden, their allotment space, and in other people's gardens! Here is what they said about their gardening across both the home and allotment spaces:

Interviewer: are you big gardeners?

Jacqueline: yeah we are, and we've got an allotment as well.

Interviewer: what do you grow?

Jacqueline: we grow most of our own vegetables at the allotment and the back garden is ah..... we've got a greenhouse.

Tim: it's really just a playground for badgers and foxes.

Jacqueline: yeah it is, unfortunately.

Interviewer: the allotment or the back garden?

Jacqueline: no, the garden. We have badgers and foxes in there and they do quite a lot of damage I have to say!

Interviewer: so even though you'd like it to be a place for flowers....

Jacqueline: well, it looks nice if you were to look at it yeah it looks nice.

Tim: it looks alright from a distance but if you walk along to the bottom you see little holes

and scratch marks you know and they try to....

Jacqueline: and we've got four water butts.

Interviewer: so you don't water the garden by any mains water at all? Do you just rely on the water butts?

Jacqueline: we do yeah.

Tim: I think last year, which was a very dry year, we only watered twice using the hose in the whole year and that's...

Jacqueline: but that is mostly to fill up, if the butts are empty by the green house and the two up here then we usually use the hose to fill the butts and then water from there, so we don't use it [the hose] very often.

Tim: but that's only just a couple of times last year.

Interviewer: and is that just like the flowers and the plants rather than the lawn...?

Jacqueline: it's mostly just the pots, never the lawn.

Interviewer: so the pots that kind of wilt and dry quicker.

Tim: and also, I mean we wouldn't bother with sort of little annual plants, but if you buy shrubs for instance and put them in, then obviously you've got to water those otherwise they just die off.

Interviewer: so is your garden mostly kind of perennials or do you plant the annuals as well?

Jacqueline: I plant the annuals [laughs].

Tim: I would never bother.

Jacqueline: I like to see the colour and mostly the annuals are planted in tubs you know so, and I have to say we don't have a huge amount of them - perhaps – I don't know, I suppose I've just ordered - what? - about 100.

Tim: three or four hundred.

Jacqueline: a hundred different plants.

Interviewer: .... so does that take a lot of time then to, in preparation, preparing the tubs?

Jacqueline: well, they'll arrive soon so they come quite small and then they have to go and be potted on and then they go in, but once they're in, I mean, they're – no it's not bad, but we've got a greenhouse down the garden and we usually keep tomatoes, cucumbers and peppers in there.

Interviewer: and do you water them with the butts as well?

Jacqueline: yeah yep. Yes, and of course they take up a reasonable amount of water don't they?

Tim: yeah about five gallons every day.

Jacqueline: we put them in grow bags.

Tim: which I have to say they've got to be watered every day and they dry out a lot quicker than if they were in the ground, but the ground is covered with - ah - concrete slabs so so...

Jacqueline: that's it. And at the allotment, we pay an allotment fee, which is quite small compared to a lot of other allotments, but there is also, during the summer, sort of from

March till November, there's use of water. So as part of the allotment fee that includes the use of water. You're not allowed to use a hose pipe, but, up there, but the water butt and tap is right close to our allotment, so you know, but I have to say that we don't over-water because it's a menace to have to keep going up there and watering and we don't go up every day, we might go perhaps once or twice a week if it's very dry.

Tim: I think the thing of it is if you look overall, I mean a lot of people go up there and water every day and it's not necessary. Certain things like runner beans do need a water, but a really good water once a week is plenty, whereas a lot of people go up there and they just water, they don't know what they're doing really, they just sort of walk on and water the tops and it only goes that much and all it does is bring the roots back to the surface and that does more damage than good really.

Jacqueline: we're not quite self-sufficient with vegetables, but we are well on the way to that.

Interviewer: so is that the kind of aim, to be able to produce and....?

Jacqueline: well yes, I mean it's money saving and all of it isn't it, it is the taste and it's convenient.

The people who practice Green Fingered Gardening represent the oldest group among the different variants of garden watering. The prominence of growing food and using only rain harvested or recycled water implies a low water footprint for their gardening, and a potentially lower carbon and embodied water footprint for food too. Although there seems little need for interventions for this group's watering practice, they also represent a small percentage of the population – is this a variant of gardening that could be adopted by others in future, particularly if initiatives like the Transition or SLOW food movements gain ground, or does the need for time and space restrict its feasibility to mostly affluent retired people? An interesting consideration is the implications for biodiversity and food water footprints of this group. Although this group use mostly non-mains water, what if climate changes were so dramatic that they no longer had sufficient access to rainwater and other non-mains water sources to fulfil their 'green fingered' ambitions? Would they be a group likely to adopt new infrastructures such as larger rainwater systems, or greywater systems in order to supplement their water use rather than resorting to mains water? In some ways this group has the most to lose from a changed climatic environment – would people like Jacqueline and Tim be able and willing to sustain this alternative food provisioning lifestyle even if they had to use mains water to achieve this?

High Tech Gardening

Practiced by: 16% of population (of SE England) (n = 279, of 1753, weighted)

A summary of the cluster

'High Tech Gardening' is a commonly practiced variant of garden watering. Watering is usually done using mains water, and with higher than average technology – mostly hosepipes, but also sprinklers (particularly for the lawn) and irrigation systems, and rarely watering cans or jugs. As many as six different criteria are used for judging when to water, although just one or two is more common, and on average no more are used than for other active watering practices. Practitioners of high tech gardening are more likely to cite the full range of uses asked about for the outdoors spaces, including using it

for car parking. All the different spring and summer preparations of the garden asked about (hosing walls, windows, pavements etc.) are more likely to be performed, with the exception of washing cushions for outdoor furniture. They are more likely to have the range of different outdoor watering technology asked about, from an outdoor tap to hosepipes and irrigation systems, as well as being more likely to have other water features, including some for wildlife, and even spa baths/Jacuzzis (although still only 3.2% have this latter, compared to 0.5% of the rest of the population).

Sociodemographically, this group's members are more likely older, retired, in a couple, and without dependent children living with them. They are likely more affluent than average, and more likely to own their home, which tends to be somewhat larger than average, and more likely detached or semi-detached, less likely terraced or a flat. They are unique among the clusters in having slightly stronger environmental attitudes than average – they are more likely to want to do more than they currently do for the environment (56% vs 67% are happy with what they currently do).

As an example of people who practice High Tech Gardening, Cheryl and Matthew are a couple between 55 and 64 years old who live in a detached house that they own outright on the outskirts of a small rural town in Essex. In the survey answers they appeared as 'time variant' in their watering schedule, saying that they water on a regular schedule. From their qualitative interview, the significant value that they place on their outdoor space is evident, from the landscaping that they have created there, to the preparations that they go through every year to preen it. An observational comment – this garden really appeared to be their outdoor living room, an extension of their immaculately decorated house but something that they were starting to struggle with in terms of size of the garden and the maintenance as they were in the process of selling to a more manageably sized house and garden.

Cheryl: Matthew likes the garden. I like to see it looking nice but I do a fair bit, weeding and sweeping and that.

Interviewer: so is it mostly.... do you grow vegetables and fruit?

Matthew: I did, but the garden – to make it worthwhile you need quite a bit, I used to have an allotment, we used to have gardens that have been big enough to put veg in, we tried it here, and I had sort of like what I call a kitchen garden I suppose, but now just herbs and stuff I've grown before it's now become – I've put a sun room on it now, I've paved it over and put a sun room on it.

Interviewer: is it mostly trees and lawn or do you like the kind of colour to look at in summer as well?

Cheryl: yes, there's a lot of patio because the house is built up high, so it's steps everywhere you go, there's steps down, we've got a garage at the back, steps up to the garage, the lawn is actually sunken.

Matthew: we try to make it interesting because you can walk different ways and walk around it; there are little areas that you can go to. But it's mainly lawn, in fact it's lawn on one side and it's lawn on the other side, but that's because of the grandchildren, it's actually artificial. But you wouldn't notice it. Astroturf. In fact, it looks better than my real lawn!

Interviewer: do you water?

Matthew: yes, admittedly years ago I used to use sprinklers quite a bit, and we came here and then we had a water meter put in and I admit it made us more conscious about the

water we're using and so I actually stopped then using the sprinkler because I knew I was paying for it.

Interviewer: so have you had to change the type of plants and things that you have used?

Matthew: no, because I use a watering can. I grow lots of hanging baskets in the summertime, so I use a watering can for those, but the lawn, um I now have – I pay for a guy to fertilise it for me, it's a slow release fertiliser, it's not expensive, but he comes every three months and puts different fertilisers, and that actually compensates for the water and I find that the natural rain is enough. A couple of years it has burnt and dried off, but it does always come back again so we don't worry that much.

Interviewer: do you have water butts or anything like that?

Matthew: I did, I can't think what happened to it, the reason why it, erm ….we had a water butt didn't we, for a long time.

Cheryl: yeah I don't know what happened to it.

Interviewer: so do you hose down outdoor furniture, when you are preparing yourselves for summer etc.?

Cheryl: yes we do, we have a big glass table and that is all washed and hosed down every spring time.

Matthew: I mean, sort of being frank, I know it's probably not that much of a water use but it is an annual water use, we are a north [north-west] facing garden and all my patio is natural York stone, which we dug up and found in this garden when we moved here so we used it, and it's big York stone slabs. Down the sides here and all the patio is natural York stone. And of course with being north facing, every year it gets an algae on it and turns a bit green so I always pressure wash it every year so I spend a couple of hours I suppose with a jet wash doing that. When it has been pressure washed it looks back to its lovely colour again, so that uses water, I know.

Interviewer: so do you just use the pressure washer or with a broom as well?

Matthew: well, I make it easier for myself and also to use less water what I do is I buy a very cheap bleach from Tesco's, the real cheap stuff and I've actually found by just damping the patio, just a quick spray, nothing more, pour the bleach over it, brush it up with a broom so it froths, leave it for two hours and then spray it off with a hose, which again – not a lot of water, and then re-brush it, the actual jet spray is dead easy then the algae is softened, whatever is left, so the jet spray is then very easy for me. Otherwise, it could take an awful long time, and I've tried buying stuff that's supposed to clean your paths, but it's a waste of money, you still have to use water. And it doesn't actually do it. It's the cheapest way. You end up using – as I say I can do two hours I suppose easy with a jet wash, and a jet wash doesn't really use too much.

High Tech Gardening, with the use of mains water, and a propensity for having other water features (from bird baths to spa baths) is likely to be a very high water using approach to gardening. Interestingly, people that practice this variant of garden watering have on average slightly stronger environmental attitudes than the rest of the population – they are more likely to want to do more than they currently do for the environment. This is not surprising if the 'attitude-behaviour' gap is taken into consideration – people who have strong environmental values do not necessarily (and often do not) act in the most environmentally friendly ways (eg, Kollmuss & Agyeman, 2002). This group's use of water in the garden is potentially significantly higher than

many groups. One also has to think of the potential for this group to adopt automated reticulation and irrigation technologies in a more widespread way in the home garden, although this is not necessarily problematic as often these approaches are more water efficient than sprinklers (e.g. drip irrigation). How possible would it be to transition this group from using high mains water consuming technologies to alternative technologies such as bigger rainwater harvesting and recycled water systems? The potential future transitions of the 'High Tech Gardeners' are significant, as this group is larger than average, and consideration needs to be made to the implications of the growth of this group in the future if high tech 'outdoor rooms' and outdoor lifestyles are encouraged more in future.

Hands-Off Gardening

Practiced by: 18% of population (of SE England) (n = 314, of 1753, weighted)

A summary of the cluster

Among the five variants of garden watering that are followed by people with outdoor space with plants, 'Hands-Off Gardening' is notable in that it does not involve any watering! Perhaps this should be called the 'non-performed' practice cluster! Although, compared to the population as a whole, the large group who follow this approach to gardening are less likely than average to see their outdoor space as an outdoor living area, and more likely to say it is 'still being developed', these are not extremely strong trends. They are also more likely than average to see it as a place for plants and flowers, and less likely than average to *not* have a clear idea of its use. There might be for example lawn or plants which don't require watering at any point throughout the year. Although the outdoor space is unlikely to be used intensely for recreational purposes, come springtime practitioners are slightly more likely than average to tidy the area up. Among the five variants of practice performed by people that say they have outdoor spaces with plants, this is the only one whose members are not likely to be older or more affluent than average. They are more likely to be single, and more likely to be living in a semi-detached or terraced home, less likely in a detached house or a flat. They are also more likely than the rest of the population to be happy with what they currently do to help the environment, and less likely to have a water meter.

Anna and Christian are a retired couple who are 75+, live in a semi-detached house that they own outright in the northern suburbs of Greater London, and are examples of a household that follows 'Hands-Off Gardening'. They don't water and wait for rain. The interesting aspect of their qualitative interview was the way that they reflected upon the history of gardening at this house, which provided an extra depth to the understanding of them as 'Hands Off Gardeners' than was afforded solely through the quantitative survey.

Interviewer: did you use to work in this garden yourself [before you got the gardener]?

Christian: a little bit, yes, not very much because I was always travelling on business. I used to go out in a morning and come back late in the evening six or seven days a week, weekends included. And on the weekends, it always rained – you know what this country is like! It used to rain more I have a feeling judging by my garden. So the grass grew and grew and I came home at eleven o'clock on a Monday night so there is not much gardening that you can do.

Interviewer: so for you what is the garden? Is it something nice to look at and for you to sit in on a nice day or do you tend not to use it very much?

Christian: we don't tend to use it very much. We do on occasion, I haven't got the patience to sit down. I don't have very much patience to sit down and watch paint dry or whatever the saying is.

Anna: we've got four apple trees and we're still eating the apples.

Christian: again we tend to plant things which need comparatively little water because otherwise – it isn't only for saving, it's a question of otherwise I'd be standing there for two hours a day watering the things. I haven't got the patience to stand there in the garden for hours like some people do. [To Anna] Your brother-in-law used to grow roses for shows and things like that it'd drive me potty.

Interviewer: you haven't watered the garden at all?

Christian: very little. I try to water as little as possible, to be honest it's as much laziness as anything else. We've tended in the last few years, because of using the water, we've tended to change things in the garden to things that grow on their own and need very little attention except pruning. There is a limit... I used to plant hundreds of flowers and whatnot; I tend to do less of that now. If I can get as much from bushes that don't need water, they have deep roots.

Interviewer: are you saying that you get as much colour from them as you would annuals?

Christian: no it is a different kind of garden. They don't need watering a lot. It is just a different type of garden [to what it used to be] we don't have many flower beds now.

The qualitative interview with Christian and Anna revealed a couple who were never really 'big gardeners' but who as time has passed have possibly become even more 'hands off' than they originally were! This dispels certain assumptions that you could make about the more hands-on gardening being a function of age and retirement – it is clear that this couple clearly value not having to do anything in the garden, and actively engage with making it fairly self-sufficient (in terms of watering, they do reflect that they have plants they need to prune). Certainly the Hands-Off Gardening group's water impact from gardening should currently be relatively low, if anything at all. However, an interesting question relates to what would happen to this variant of practice (including changes in infrastructures and habits of watering) if the climate changed to a warmer, drier one in future in which the grass, key trees and plants that currently are not watered went brown, or other similar changes to the garden occurred. Would followers of Hands Off Gardening do as Anna and Christian have done and actively change the nature of their garden so that it doesn't require watering, or would they adopt one of the other variants of garden watering? It is likely that there would be a diversity of responses: some people in this group could remain 'hands off', perhaps changing the types of plants that are in the garden to be more tolerate to the changed conditions, while there is potential for others in the group to be recruited into garden watering and more water intensive maintenance practices. This group is obviously an important one to watch in terms of future trajectories, and also potentially an important group for whom to think about potential interventions.

Nothing to Water

Practiced by: 38% of population (of SE England) (n = 660, of 1753, weighted)

A summary of the cluster

This is by far the largest group in the sample, and comprises those who report not having any outdoor plants or lawn to water. This is in contrast to the hands-off gardeners who *do* have outdoor plants or lawn but who do not water them. Nevertheless, only a quarter of this group have no outdoor space at all – 67% have a front garden, 56% a back garden, and smaller numbers have other kinds of outdoor space. Presumably they either have only artificial surfaces in their outdoor space, or else plants or trees which they do not consider as needing watering. Unsurprisingly they are much less likely than the rest of the population to have outdoor taps, outdoor watering technology or outdoor water features (with the exception of a slightly higher chance of having a permanent swimming pool, which 0.8% have compared to 0.4% of others). Those that do have outdoor space are far less likely to see it as being for most of the uses asked about (such as for flowers, growing fruit and vegetables or for wildlife), and are much more likely to not have any clear use for it (29% do not compared to 3.4% of the rest of the population). They are also much less likely to engage in most of the outdoor spring preparations asked about, although 41% still tidy up the garden in spring (compared to 63% of the rest of the population). Sociodemographically, members of this group are more likely to be younger than average, slightly more likely to be male, and in either full time work or unemployed. They are also more likely to have children and less likely to be living with a partner. They are more likely to be less affluent than average, renting rather than owning their home, and in a flat or terraced housing rather than a detached or semi-detached house.

Clearly this is low-impact gardening in watering terms, and is a variant of gardening that is very common. As housing stock is slow to change, it is likely that a significant proportion of the population in the future will remain in this group even if they do wish to garden, simply because they do not have outdoor space. However, as the majority in this group *do* have outdoor space, then there is potential for many to become more active gardeners. How likely is this to happen, and what factors would influence this?

5.3.4 Reflections on garden watering

The cluster analysis revealed strong correlations for active gardening clusters (i.e. High Tech Gardening, Green Fingered Gardening, Amateur Enthusiastic Gardening and Casual Gardening) with older age, higher affluence and larger detached or semi-detached housing. This set of correlations suggests that actively gardening (to various degrees of enthusiasm!) is related to having the time to garden (e.g. in retirement, with children moving away, etc.), the affluence to support a larger home with a correspondingly larger garden, and perhaps an increasing interest in gardening as a leisure activity with age.

The analysis also revealed that there was a low level of hosepipe and other high tech watering technologies being used, which suggests that the direct impact of hosepipe bans might not be large as it will not impact upon the majority who use low technology watering options like watering cans and buckets, which might even be filled from taps inside the home. Encouraging increased use of (sufficiently large) water butts and of (informal and formal) recycled water systems might be more effective interventions to reduce the mains water used in gardening, particularly for people enthusiastic about

using high technology! As various interest groups are promoting changing gardening practices, from increasing planting of food plants and drought-resilient and native species, to increasing use of shared gardens in tenements and flats, then these social trends could potentially increase levels of active gardening in future, even giving rise to new variants of gardening (and related water use). More detailed questions about what people grow in their garden, particularly food and biodiversity-enhancing plants, would be interesting additions to future surveys to assess the wider environmental impacts of garden practices.

5.4 Kitchen use

Summary of kitchen practices

- Three quarters of households prepare all, or nearly all, of their meals in the home. The retired and couples with children produce most at home, while younger people prepare the fewest meals at home.
- 94% of households wash vegetables and meat before preparing or eating them, most commonly under a running tap.
- Nearly half of households consume water in the home in addition to or instead of unprocessed tap water, most commonly bottled, but also filtered tap water. Younger people, and those living in the London region, are particularly more likely to drink such alternatives to tap water. 50% of households also run the kitchen tap before drawing water from it for use, for various reasons, most commonly to get it to the right temperature.
- Taps are also left running to rinse recyclates by roughly half of those who recycle. Just over half rinse dishes before washing them, mostly under a running tap, and regardless of whether they use a dishwasher or hand wash them. Only 29% rinse dishes after washing them, again mostly under a running tap. This is lower for dishwasher users.
- 44% of the sample reported having a dishwasher in the home, although it is notable that 22% of these rarely or never use it - it should not be assumed that because a technology is owned that it is used extensively or even at all!
- There was substantial variation in the timing and frequency of washing up, which varied too by dishwasher ownership.
- Our cluster analysis of kitchen practices revealed no variants that were distinctly different from others – all combinations of possible responses to the questions used to define clusters were provided by respondents. This could be because the links between food preparation and cleaning practices in the kitchen are quite complex and/or weak, or that the questions used were not refined enough to pick out the relationships between them.

5.4.1 An overview of kitchen practices

A range of practices occur in the kitchen which implicate water use, from preparing drinks and food to washing dishes and recycling. Waterwise UK suggest that kitchen taps and dishwashers account for about 8-14% of water use in the home[9]. This section focuses on a description of the diversity of kitchen practices overall in the sample, beginning with cooking and drinking. The approach taken to searching for clusters in these practices is described in the next section, although no distinct clusters of kitchen use were found.

[9] Source: http://www.waterwise.org.uk/pages/indoors.html, accessed 14/09/12.

In terms of meal preparation, 75% of respondents said that they prepare all, or nearly all, of their meals at home. 12% said that they make about three quarters at home, 9% responded half, and just 6% one quarter (n=1802, weighted by respondent). Response rates vary significantly by household structure and by the age band of the respondent (both at the 0.1% level). The retired and couples[10] with children are the households who produce most meals in the house, followed by singles with children, and then by households without children (Table 22). The proportion of people who prepare all or nearly all of their meals at home also increases with the age of the respondent, with the youngest age band having notably more households who produce fewer of their own meals (Table 23). The proportion of meals prepared in the home is likely to influence kitchen water use in various ways, as water is required for washing food for use (see below), cooking various types of food, and cleaning pans, dishes, etc.

Table 22 Proportion of meals prepared at home by household structure
n = 1801, weighted by respondent. Numbers of cases and column percentages

Household structure:	Single, no children 16 or under	Couple, no children 16 or under	Single, with children 16 or under	Couple, with children 16 or under	Single, retired	Couple, retired	Total
One quarter	39	27	13	16	10	4	109
	9.3%	5.6%	7.8%	3.9%	6.0%	2.5%	6.1%
Half	53	56	14	24	8	6	161
	12.7%	11.7%	8.4%	5.9%	4.8%	3.7%	8.9%
Three quarters	60	62	20	51	11	20	224
	14.4%	12.9%	12.0%	12.5%	6.5%	12.3%	12.4%
All or nearly all	266	334	120	316	139	132	1307
	63.6%	69.7%	71.9%	77.6%	82.7%	81.5%	72.6%
Totals	418	479	167	407	168	162	1801
	100%	100%	100%	100%	100%	100%	100%

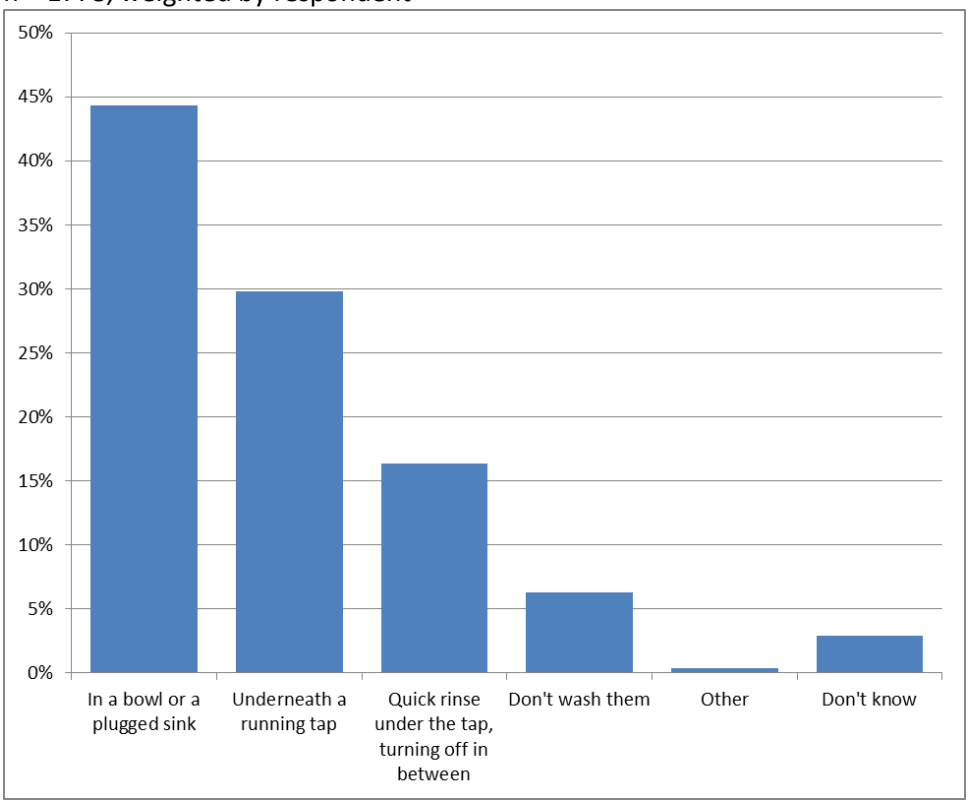
Table 23 Proportion of meals prepared at home by age of respondent
n = 1773, weighted by respondent. Numbers of cases and column percentages

Age band, years:	16-24	25-34	35-44	45-54	55-64	65-74	75+	Total
One quarter	34	27	15	14	6	5	10	111
	12.5%	8.7%	4.5%	4.8%	2.5%	2.9%	6.1%	6.2%
Half	34	39	25	24	19	10	5	156
	12.5%	12.5%	7.6%	8.2%	7.9%	5.8%	3.1%	8.8%
Three quarters	40	45	36	38	34	14	15	222
	14.8%	14.4%	10.9%	13.1%	14.2%	8.1%	9.2%	12.5%
All or nearly all	163	201	254	215	180	144	133	1290
	60.1%	64.4%	77.0%	73.9%	75.3%	83.2%	81.6%	72.5%
Totals	271	312	330	291	239	173	163	1779
	100%	100%	100%	100%	100%	100%	100%	100%

[10] Note that 'couple' and 'single' here refer to whether the respondent reported living with a partner or not. In both cases there may also be other residents in the household who are not the respondent's partner.

Nearly everyone washes vegetables and/or meat before eating or cooking them (Figure 23) – 94% excluding the 'don't knows', who possibly were not responsible for cooking in the household. Methods vary though, with the balance between washing them in a bowl of water or under a tap being very even. For those who do wash food under a tap, it is more usual to leave it running than to turn it off in between items. Methods also vary by age, but there is no clear pattern except that washing in a bowl seems to be more common in older age groups, rising from around 40% in the under 45s to a little over 54% in the over 64s.

Figure 23 Method of washing vegetables and/or meat products before eating or cooking them
n = 1778, weighted by respondent



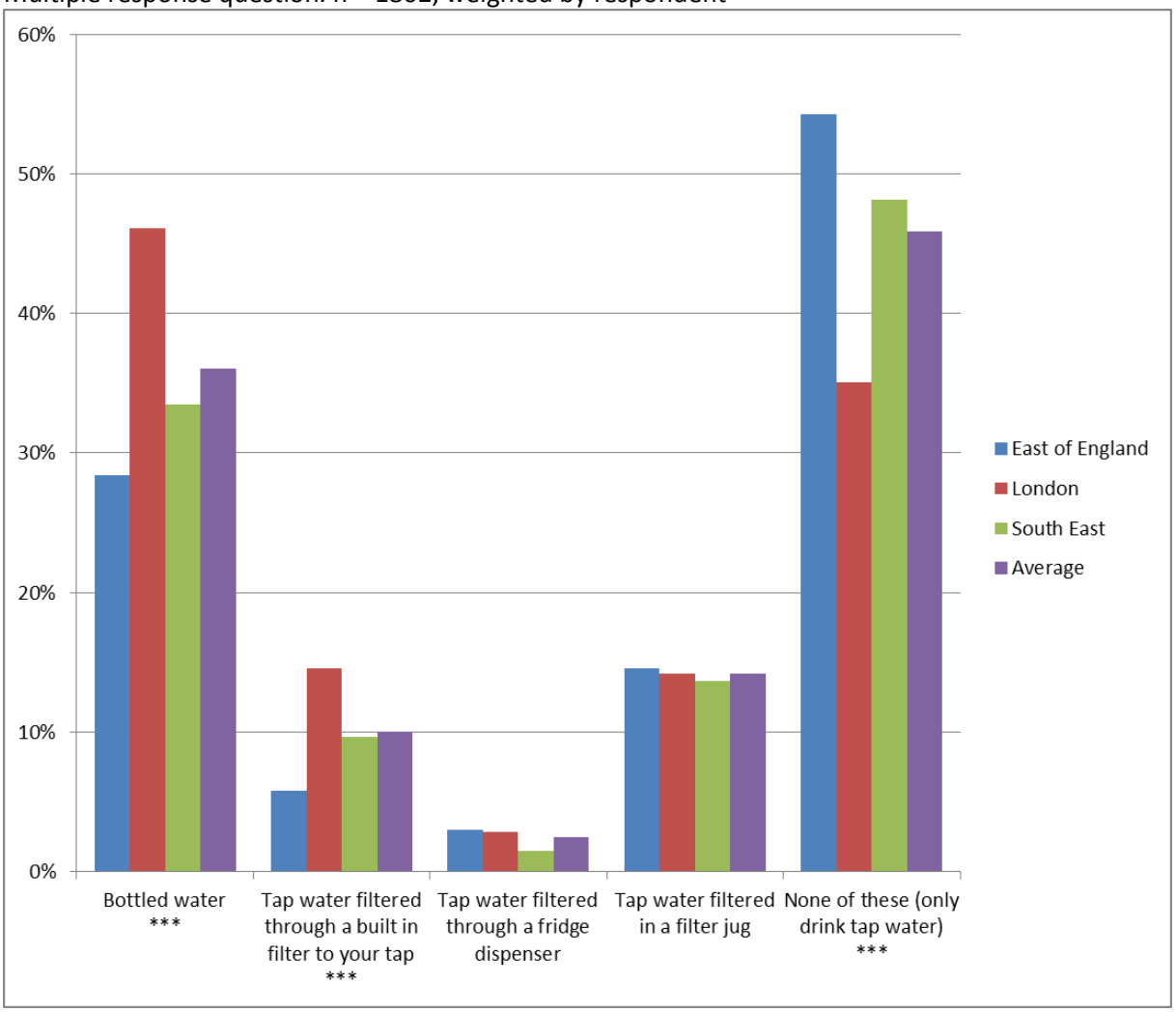
54% of the respondents drink water in the home in addition to, or instead of, tap water. What else they drink, broken down by the three government office regions in the survey, are present in Figure 24. Two thirds of those who do drink something in addition to or instead of tap water drink bottled water, a quarter drink tap water filtered in a jug, 18% filtered via a filter on the tap, and 5% filtered from a fridge dispenser. Residents in the London region are substantially less likely than average to drink only tap water, whilst people in the east of England are more likely to. Londoners are more likely to have a filter built into their tap, or to drink bottled water, than average, and those from the east of England are less likely to have or do these things. Interestingly, in neither region are there statistically significant differences in the use of filter jugs or filters on a fridge dispenser.

A couple of these practices also vary significantly by age (both at the 0.1% level). Firstly, those who only drink tap water in the home hover between 38% and 46% of the sample until the age of 54, then the figures rise, reaching 62% in the oldest age band (75+). In other words, sole consumption of tap water is positively correlated with age. Secondly, those who also drink bottled water is again stable at around 38-43% until the age of 54, then drops, down to just 19% in the 75+ group. As bottled water use is a fairly

recent phenomenon, perhaps this reflects variation in exposure to, and susceptibility to adoption of, bottled water using practices by age, with those below the age of 54 more likely to see and adopt practices of bottled water use in the home, through those around them and from marketing.

The result for bottled water raises interesting questions. It would be interesting to see what kind of water is being drunk, and why. Is it still or fizzy? As for why, clearly drinking bottled water outside the home has a convenience aspect to it, but what is the benefit in the home? Is it a taste issue, or perceived water quality issue (Drinking Water Inspectorate, 2010; Rogers, 2001)? What proportion of the respondent's water intake does it represent? Harvey and Evans' project, 'Bottled Water Consumption and Markets: An International Comparison', as part of the Sustainable Practices Research Group consortium, may go some way in explaining these issues around taste, aesthetics and preference for bottled water consumption in the UK (see http://www.sprg.ac.uk/projects-fellowships/bottled-water-consumption).

Figure 24 Drinks drunk in the home in addition to, or instead of, tapwater
Multiple response question. n = 1802, weighted by respondent

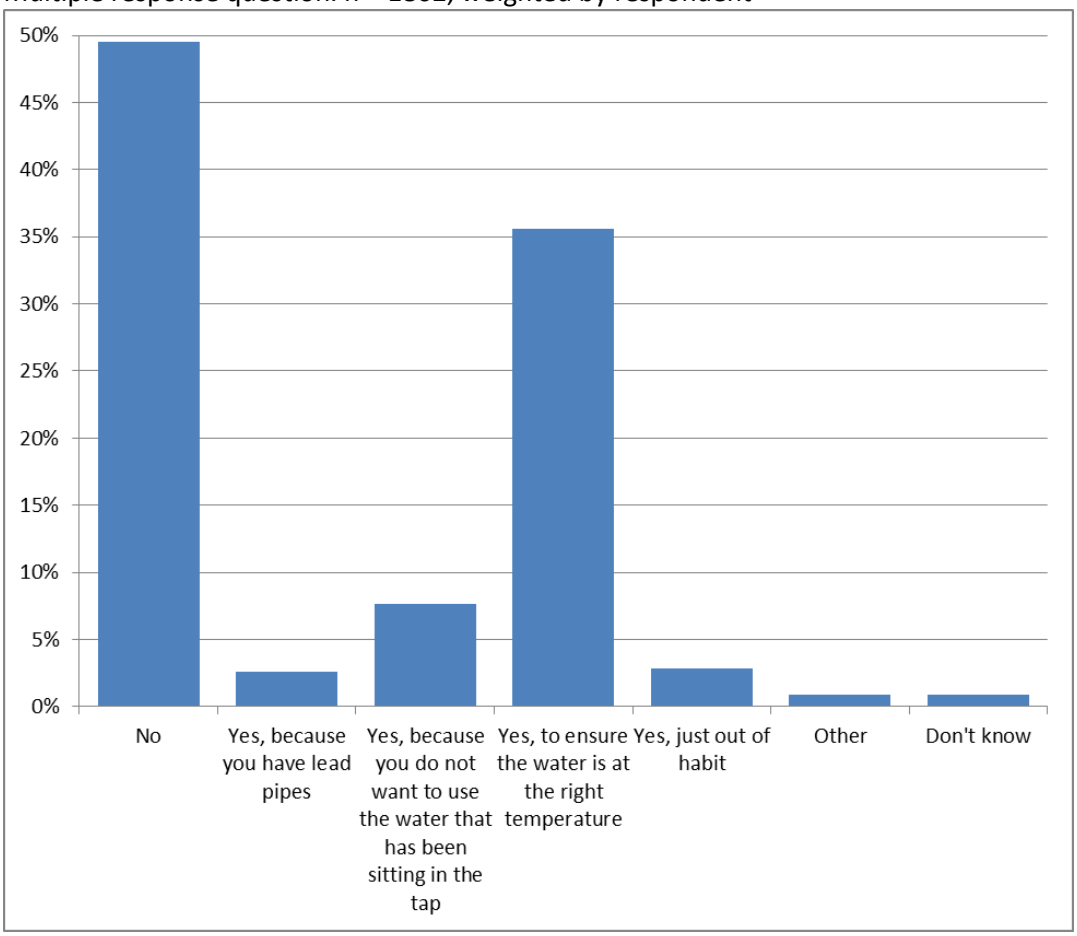


*** Indicates statistically significant differences in this response between regions, at the 0.1% level

In addition to washing food as described above, another moment when the tap may be left to run is before water is taken from it for drinking or cooking. 50% of the population do this, for various reasons (Figure 25). Of those that do this, 71% do so to get the water to the right temperature. For around 15% of those that do, it is because they do not want

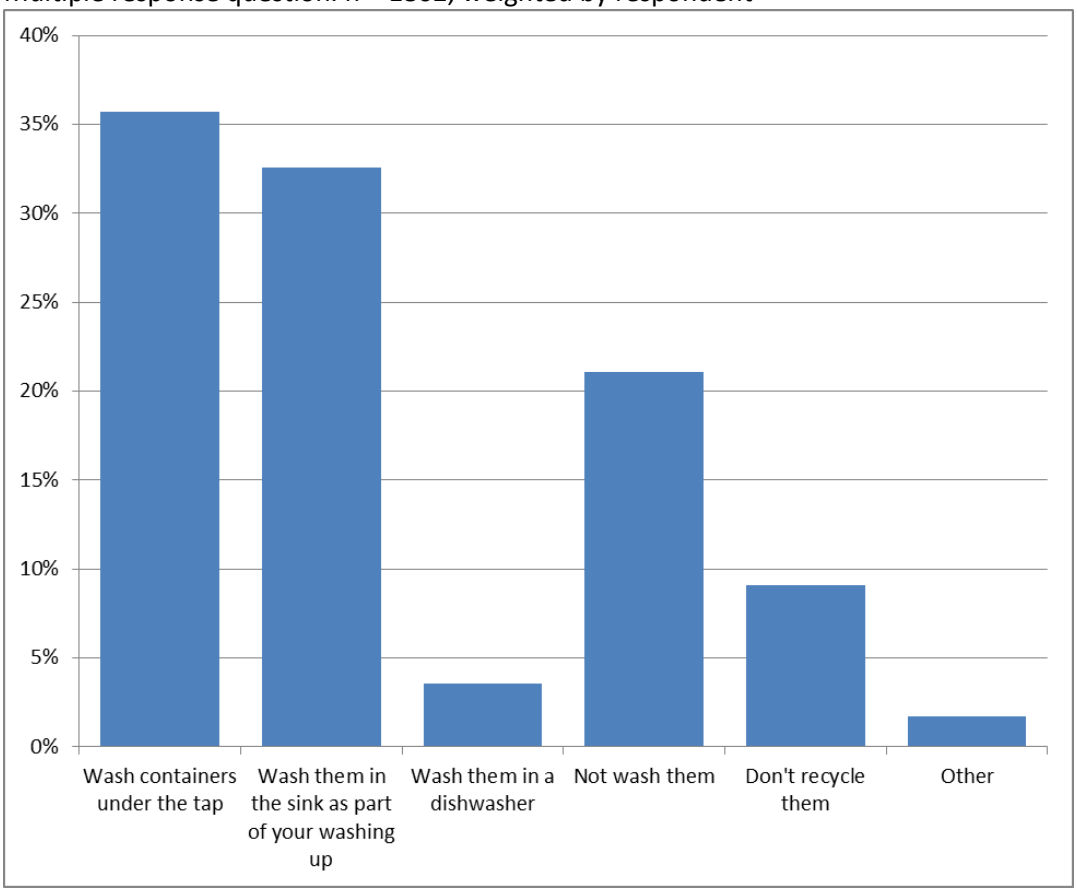
to use water that has been sitting in the tap. 5% do because they have lead pipes, while 6% say they do so simply out of habit. There are no significant variations in responses by age for this question.

Figure 25 Do you ever run the cold water for a period of time before you take water from the tap for drinking or cooking?
Multiple response question. n = 1802, weighted by respondent



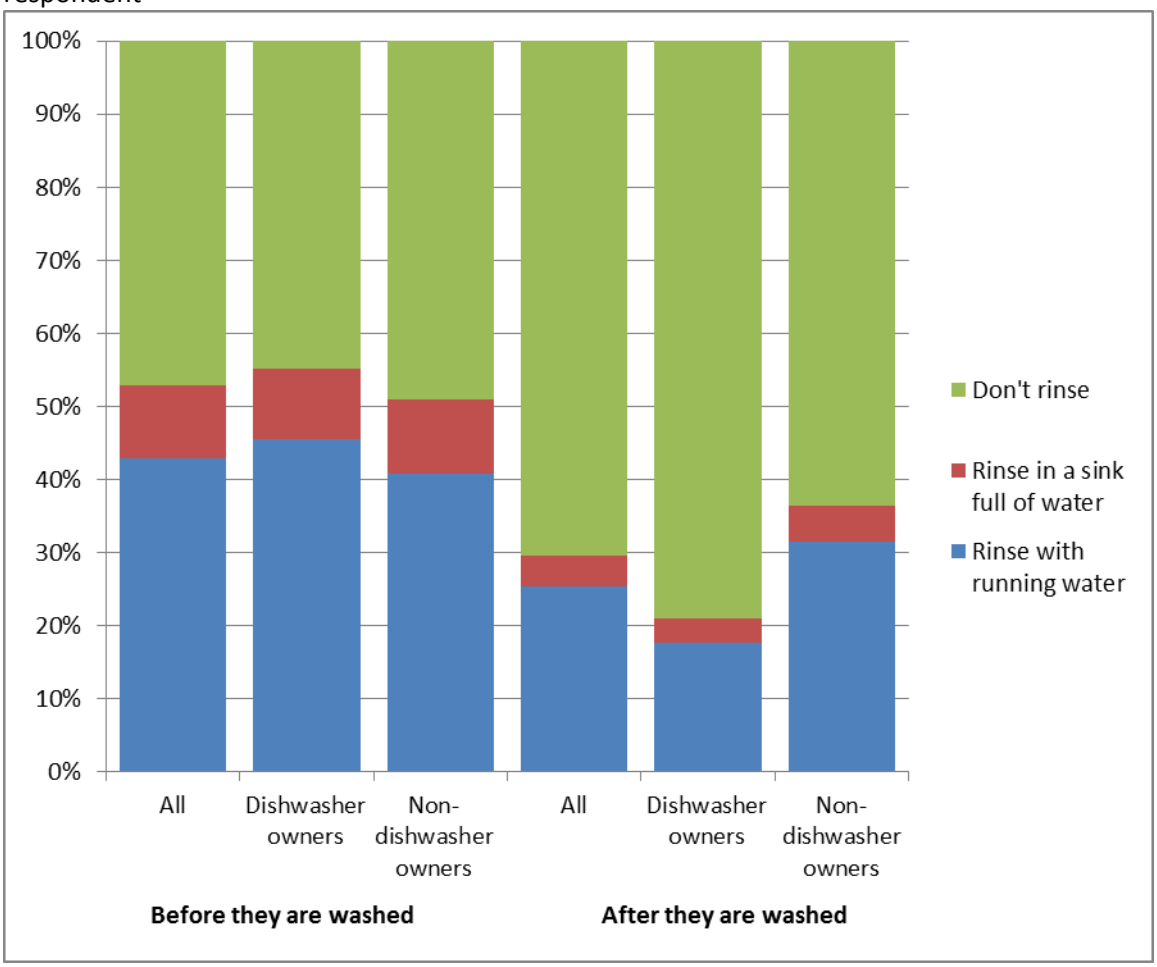
Two further cases where the tap may be left running for substantial amounts of time, with potentially large water use implications, both relate to washing in the kitchen – both washing recyclates before disposal, and washing up crockery. Regarding recyclates, 91% of the weighted sample recycles food and drink packaging, and the breakdown of how they wash them is given in Figure 26 below. 36% of respondents wash them under the tap, and a similar proportion (33%) washes them as part of the washing up. Only 4% put them in the dishwasher. 21% do not wash their packaging at all before recycling it.

Figure 26 How food and drink packaging is washed for recycling
Multiple response question. n = 1802, weighted by respondent



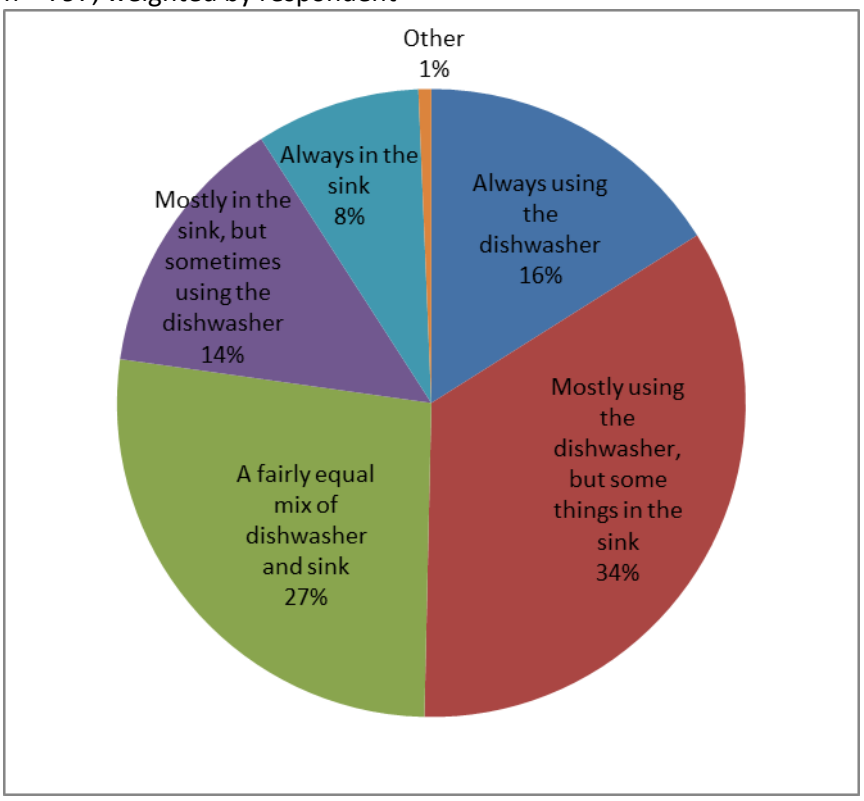
In terms of rinsing dishes, practices are shown in Figure 27 below. As the need to pre- or post-rinse varies by the washing method used, results are split into those who do and do not own a dishwasher (however, some in the dishwasher owning group will still be answering at least in part based on how they wash up in the sink too). About half (53%) of respondents rinse their plates before washing them, mostly with running water (43%) as opposed to in a sink of water (10%). Surprisingly, rinsing dishes before washing them does not vary noticeably by washing method (dishwasher or hand wash), perhaps because modern dishwashers no longer need you to do this to get things clean. Only 29% rinse dishes after washing them, again mostly under a running tap (25%) rather than in a sink of water (4%). This response does vary more between groups – fewer rinse their dishes when they use (or, at least, have) a dishwasher, presumably because the dishwasher already rinses them. 64% of those who wash up in the sink do not rinse the plates after washing.

Figure 27 Dish rinsing practices, before and after washing them
n = 1802 overall; 797 for dishwasher owners, 1005 for non-dishwasher owners; weighted by respondent



Aside from rinsing, the survey asked about the technology used in washing up, and the timing of washing up. In terms of the technology used, our survey revealed that 44% of the population in the south and south east of England have a dishwasher in the home. This is higher than the UK ownership of 28% quoted in the Market Transformation Programme (2008). However, even in this group there is variety in the split between dishwasher and sink use, as presented in Figure 28 below. Of those with a dishwasher, a third use it for most of their washing up, and only slightly fewer (27%) report that the mix between dishwasher and sink use is fairly equal. 16% say they only use the dishwasher, while 18% mostly use the sink. 8% do not use their dishwasher at all. This is an important finding, as even though ownership of technology is a precursor to many practices, it should not be assumed that because a technology is owned that it is used extensively or even at all!

Figure 28 Sink and dishwasher use among those who have a dishwasher in the home
n = 797, weighted by respondent



Respondents were also asked to describe which of a set of options best described when they would wash up in the sink, and when in the dishwasher. The dishwasher question was only asked to those who have one in their home, but it would be expected that the sink use responses vary by dishwasher ownership too, so they are split in the results presented in Figure 29 below. Among non-dishwasher owners, the most common time to wash up is after every meal, although this is still only a third of respondents, and the answers are quite varied. 23% say 2-3 times per day, but not after meals, and similar numbers (24%) say once a day, whilst 13% wash things up every time they are used. Less frequent timings, or reacting to when the sink is full or there is nothing left clean, are rarely given. For sink use among dishwasher owners, by contrast, 30% of respondents just wash in the sink once a day, and 16% wash up in the sink only every couple of days or never, while another 10% do so only when the sink is full. Dishwasher use practices are different again, split mostly between running it once a day, once every couple of days, or whenever it is full. Note though that this was not a multiple response question, however these three responses are not necessarily mutually exclusive, as the first two are frequencies whilst the latter is a reason for running the dishwasher, that is, a proportion of the frequency responses might also be based on the dishwasher being full too.

These results also fit with the information from the qualitative interviews, with many people indicating that they used the dishwasher every 'x.5' days, where x means the number of days, e.g. every one and a half days, or every two and a half days, depending on how many people there were in the home and whether they waited for the dishwasher to be full. There were also qualitative descriptions of how and why dishwashing use coexists with washing dishes by hand. For example, Jacqueline and Tim, who are a 65-74 year old retired couple who we introduced earlier in the laundry

cluster analysis (they perform 'Simple Home Laundering') described their dishwasher use as follows:

Jacqueline: we do use it [the dishwasher], it's not quite every day, but I reckon, I estimated it a few weeks ago for some reason or other, I reckon that we put it on once every one and a half days.

Interviewer: so you kind of just fill it up and put it on?

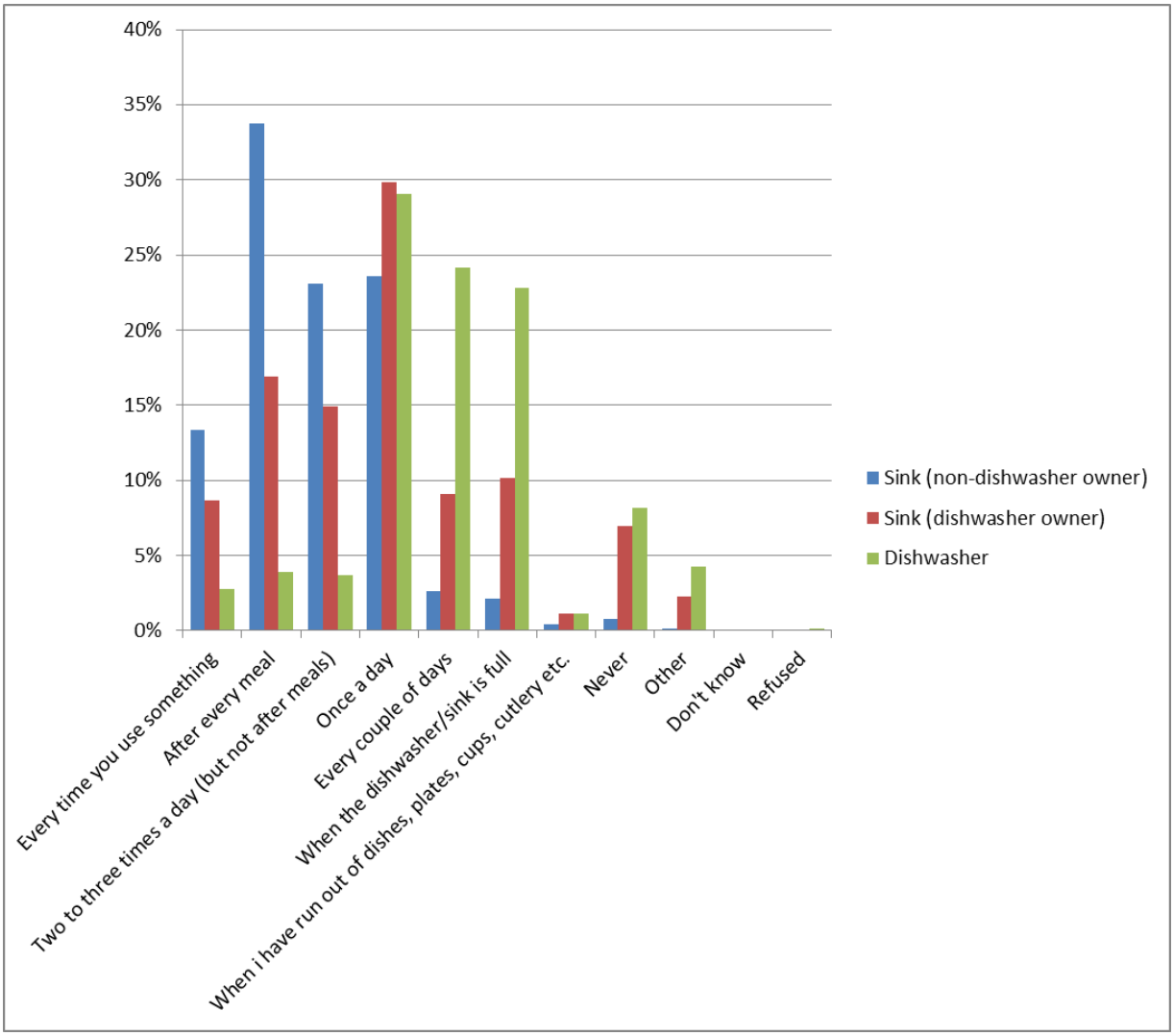
Jacqueline: yes.

Interviewer: do you wash up in the sink as well, pots and things?

Jacqueline: I do, but we've got – it depends, because we've got two sinks. We have got a big ... well, big, it's about that size [indicating normal sink size] and then we have got a little half sink and if I'm going to wash anything up then, I always wash my frying pans for instance because I don't put them in the dishwasher, so if I'm washing that then I just usually fill the small sink. I very rarely have the big sink full of water um, not often really, unless, if we've had people to dinner and the whole dishwasher's full and I'm just left with the pans I might think oh, I might just do those and I would have them in the big sink, but mostly I just fill the small half sink. And yes, I suppose there's always something every morning that I'll wash in that little sink, it might be I don't know it might be because the dishwasher's full and I've only got one more saucepan and I think I'll just wash it up or it might be because it's a frying pan and I'll wash it. So, I suppose every day I wash something in that small sink, but I don't often run a large, the big sink with water.

Figure 29 Most appropriate description of when respondents wash up in the sink, and in the dishwasher

n = 797 for dishwasher owners, 1005 for non-dishwasher owners; weighted by respondent



5.4.2 Variants of kitchen practices

The survey questions for kitchen practices can be collapsed into three of the five dimensions being used for cluster analyses: a technology dimension, which is a measure of the ratio of dishwasher to sink use for washing dishes, etc. in the kitchen; an outsourcing dimension, which is a measure of the share of meals prepared outside the home (from takeaways and restaurants) as opposed to in the home; and an 'efficiency' dimension, which is a measure of how the respondent uses mains tap water for different purposes, namely for washing food (meat and vegetables) before eating, for washing dishes, for washing recyclates, and running before taking water for drinking or cooking purposes. The lower the efficiency score, the more of these things they do under a running tap; the higher the score, the more they do without any water (that is, not rinsing dishes, or washing recyclates, or running the tap before drawing drinking water). Mid-range scores represent a mixture, or doing with a sink full of water rather than a running tap, for example. Again, a high efficiency score does not imply

normatively "better" kitchen practices, simply that less mains water is used in performing them.

Table 24 Dimensions used to identify variants (clusters) of kitchen practice

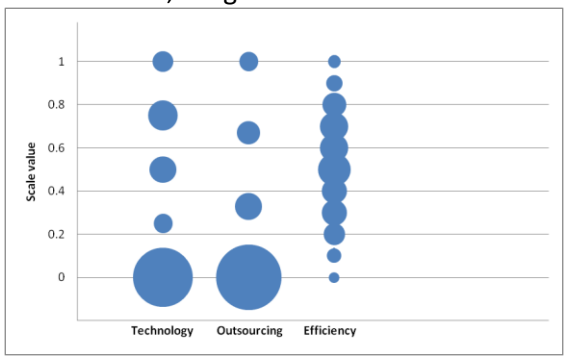
Dimension	Definition	Scale values
Technology	Ratio of dishwasher to sink use.	0 indicates always sink; 0.5 indicates about equal; 1 indicates always dishwasher
Outsourcing	Proportion of meals bought in from outside the home.	0 indicates none or nearly none; 1 indicates three quarters or more.
Efficiency	Efficiency of home mains water use for cleaning food and recyclates, rinsing dishes, drawing water	0 indicates running tap is used for all of these; 1 indicates no water used for any of these.

The main result of the cluster analysis for kitchens is that there are not, in fact, any discernible clusters along these dimensions. As a cluster analysis will, however, group cases into clusters even if there are no 'real' distinct groups in the data, the results of a four cluster solution, which seemed most appropriate based on the analysis, are presented below in Figure 30. The figure in the first row shows the distribution of the respondents on the three dimensions by which the clusters are defined. The remaining figures show the distribution of members of each of the four clusters in turn on these same dimensions, so that their relative differences from each other and from the population overall can be seen. The clusters however represent the four possible solutions on the technology and outsourcing dimensions (i.e. scores of low-low; low-high; high-low; high-high), with a range of efficiency scores on each. In short, all possible responses across the three dimensions occur in the population, so that all possible varieties of practice occur and there are no distinct groups that are comparatively dissimilar from one another. As such, the clusters add no helpful information over simply just analysing the dimensions separately from one another, in isolation. This likely reflects the fact that there are actually several quite distinct practices performed in the kitchen that are included in the dimensions – food preparation; cleaning of crockery; recycling – which are seemingly not statistically related to one another in terms of the ways in which they are performed. However, from a theoretical perspective, the ways in which practices bundle together, and the complexes of elements upon which they rely and from which they are constituted (Shove, et al., 2012) mean that these seemingly diverse and disconnected practices could be 'connected'. For example, it could be argued that they are all tied together by meanings about self, family and home care, as well as care of the wider 'environment' through recycling. Another could be the extent to which the 'production' and 'consumption' of these forms of care are dealt with 'in-house' or 'outsourced', reflecting the elements of skills, performances, and competences involved in these tasks. For example, cooking at home implies that one will need to clean dishes even if the practices of cooking and cleaning could be defined as two different practices. This is in contrast to people/households/families who either regularly get takeaways or prepackaged 'ready meals' from the supermarket or who eat regularly outside of the home; each of these come with different implications for water use for washing dishes and recyclates in the home. Although there is not room to explore these issues here, it would be interesting to reflect further upon the connections between water using practices related to kitchens, drawing in the historical, current and emerging patterns of eating as explored in studies of consumption and practice theory

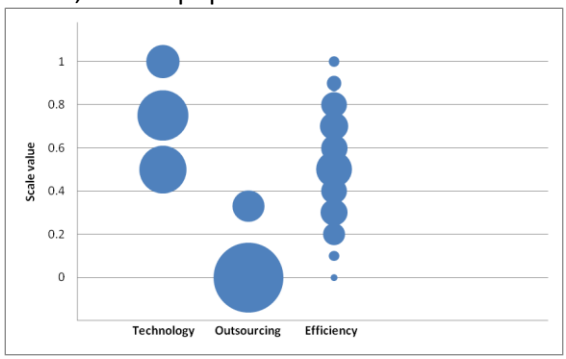
(Warde, Cheng, Olsen, & Southerton, 2007; Warde & Martens, 2000). All of these issues also need to be thought about when considering 'change' associated with practices related to water use in the kitchen.

Figure 30 Kitchen practices, 4 cluster solution: balloon plot
Bubble sizes represent percentage of respondents having that value on that dimension.

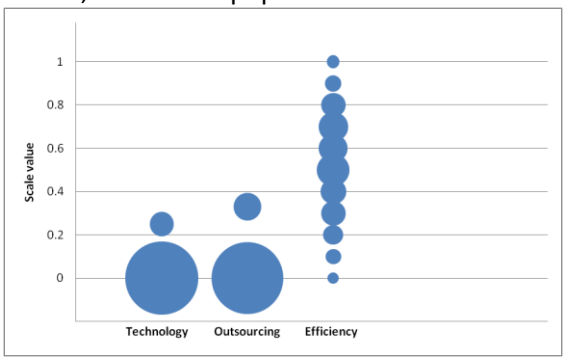
Population as a whole
n= 1797-1802; weighted



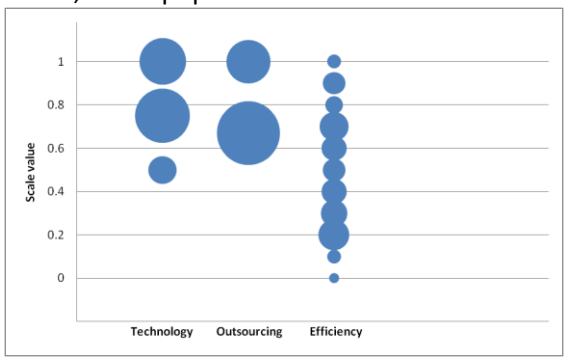
Cluster 1. Home cookers and dishwashers
n=535, 30% of population



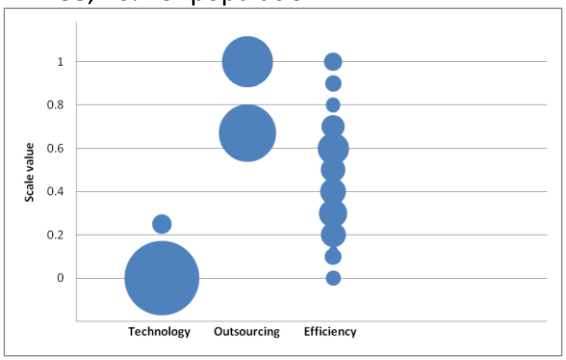
Cluster 2. Home cookers and sink washers
n =993, 55% of the population



Cluster 3. Takeaways and dishwashing
n = 80, 4% of population



Cluster 4. Takeaways and sink washing
n = 188, 10% of population



5.4.3 Reflections on kitchen water use

Our cluster analysis of kitchen practices did not reveal any distinct variants that provide a coherent interpretation of the data beyond the descriptive statistics. From a methodological and conceptual point of view, this might be because we aggregated the questions that addressed several different practices in the kitchen that used water into one analysis. For example, whilst the practices that take place in the kitchen include

both the consumption of food (including the purchase, preparation, and then actual physical consumption/eating of the food) and a set of potentially separate practices associated with cleaning the results of that production and consumption (doing the dishes, which consumes water and energy), our cluster analysis did not identify any 'bundles of practices' that occur between these two. This could be because the links between food preparation and subsequent cleaning vary in complex ways and are not strongly linked. Alternatively, it might mean that the quantitative methodology we adopted was insufficiently subtle to pick up the relationships between these separate but still connected practices of cooking and eating, and doing the dishes, perhaps for example because we have not yet found the right combination of questions to quantitatively reveal how these practices interrelate or combined them in suitable ways in the cluster analysis. This does not mean that evidence of this relationship does not exist – a lot of practices literature has explored the subtle details of the relationships between cooking, washing and kitchen use, often based on detailed qualitative and observational data from households (Pink, 2012).

5.5 Vehicle cleaning

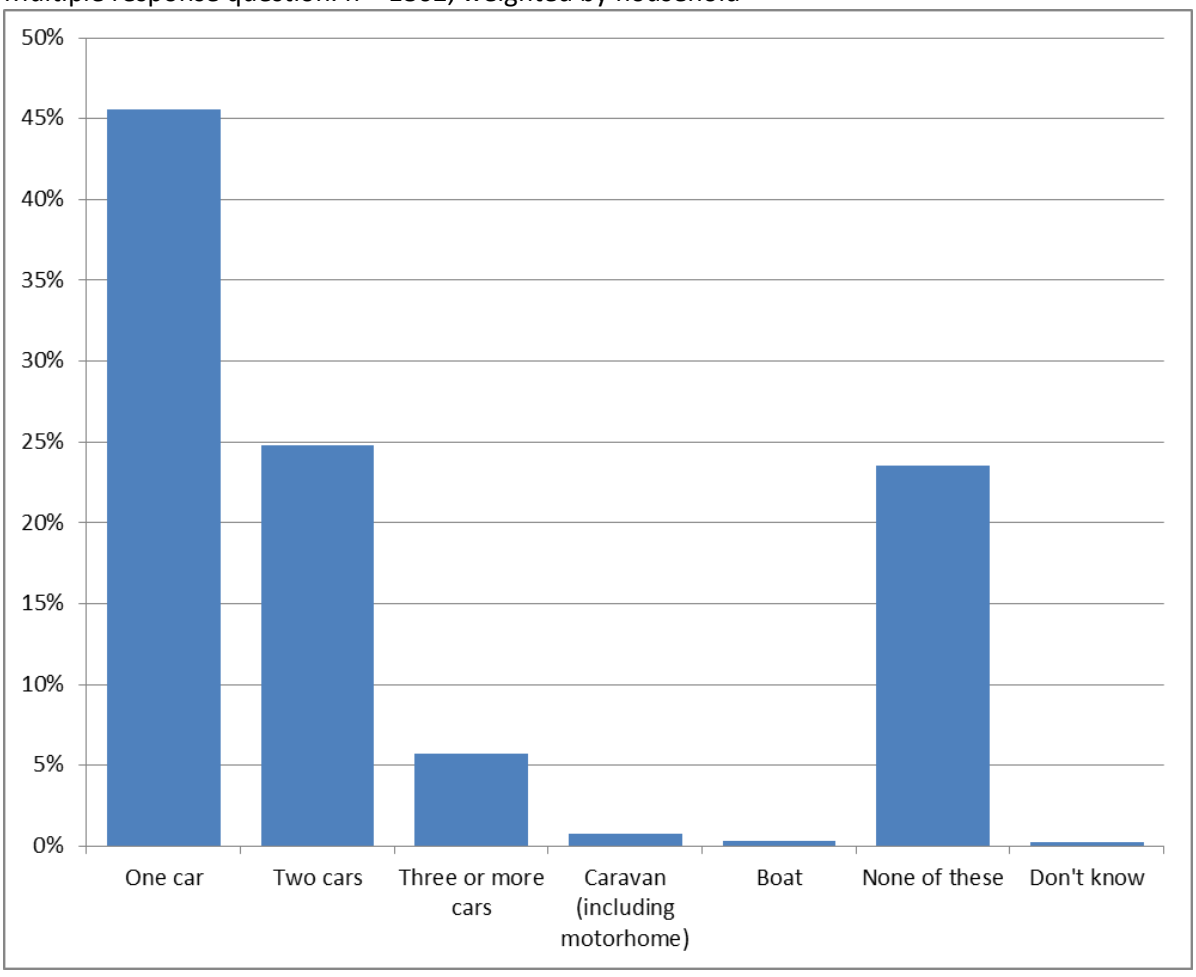
Summary of vehicle cleaning practices

- Three quarters of households own at least one car, with 40% owning two or more.
- Car washing frequency varies between at least once a month through to less than quarterly for most people.
- About half wash their car(s) at home, usually with just a bucket and sponge. 37% outsource car washing to a professional hand washing service, and 17% to automated services.
- Home mains water use for vehicle washing is therefore likely to be low for many households, although outsourced water use in many cases replaces what would otherwise be used at home to wash vehicles.
- Innovations in professional car washing services, such as those using recycled water or waterless cleaning systems, could therefore reduce water use associated with vehicle cleaning, as could wider policy related to vehicle taxes, public transport provision, urban planning and road building which in turn influence car ownership and use.

5.5.1 An overview of vehicle cleaning practices

Patterns of vehicle cleaning obviously relate to vehicle ownership, among other things, and Figure 31 below shows vehicle ownership responses. 76% of respondents' households own at least one car, with 60% of those owning one only, 33% owning two, and 7.5% owning three or more. Caravan/motorhome and boat ownership sit at less than 1% each of the surveyed population.

Figure 31 Car, boat and caravan ownership
Multiple response question. n = 1802, weighted by household



Of those who do own a car or cars, the frequency with which they wash it/them varies substantially, mostly between at least once a month through to less than quarterly (see Figure 32). 10% report that they never wash their car, although this could include people who respond this way because it is another household member who washes it. There are too few caravan and boat owners to be able to say anything about practices relating to washing those.

Figure 32 Frequency of car washing
n = 1802, weighted by household

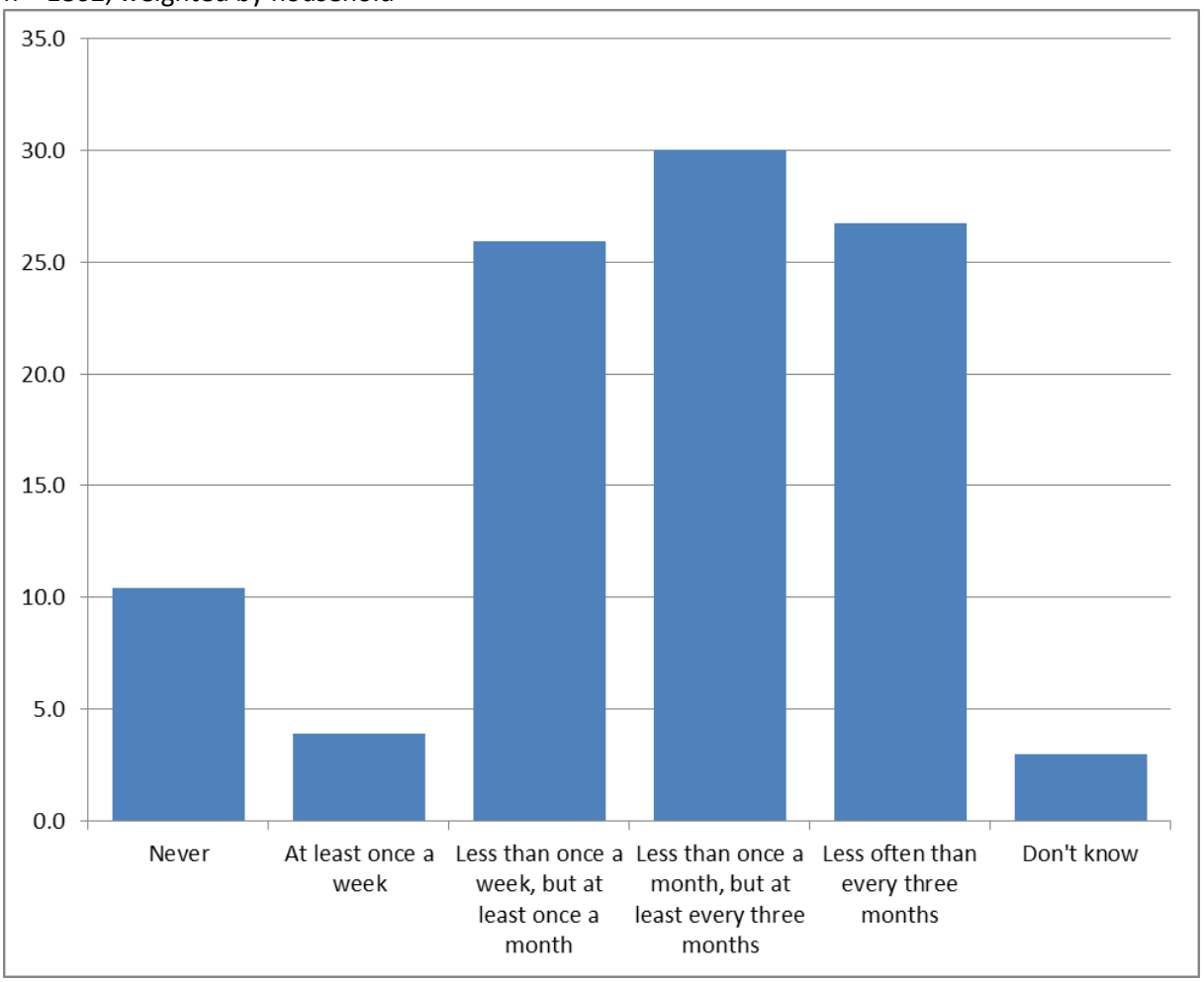
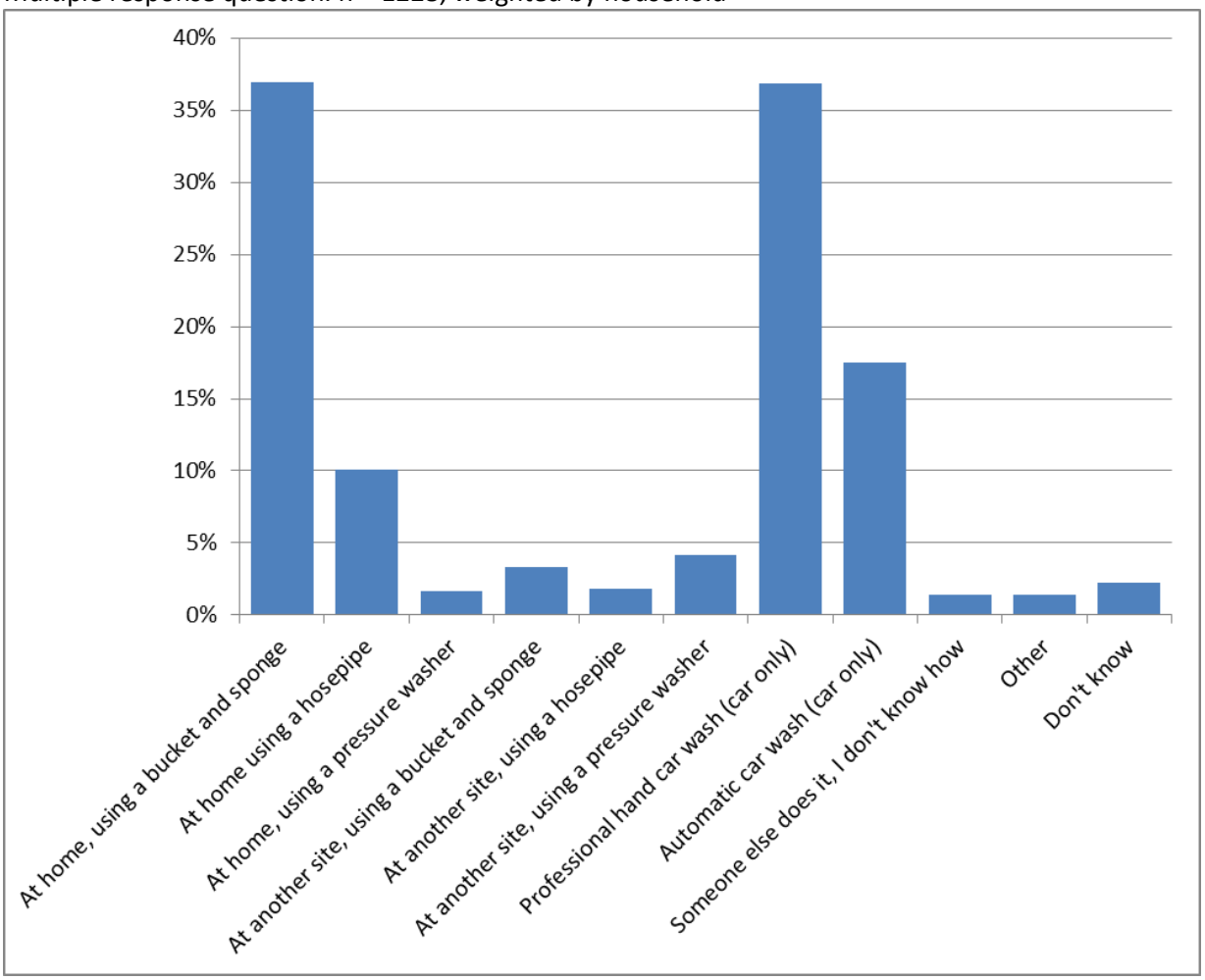


Figure 33 below presents responses relating to how car owning households usually wash their car. 37% outsource car washing to a professional hand washing service, and 17% to automated services. About half wash their car at home though, with a bucket and sponge being the most popular method by far, used by 37% overall. Other responses, such as washing at another site, were chosen by just a few per cent each at most.

Both the frequency of washing and methods used suggests that home mains water use for vehicle washing is low for most households, although there is clearly outsourced water use that in many cases replaces what would otherwise be used at home to wash vehicles.

Figure 33 Normal method for car washing (as performed by the person who washes it)
Multiple response question. n = 1228, weighted by household



Overall, car washing uses only a marginal proportion of overall home water use, and we only asked some basic questions in the survey because of the limited potential as a site of intervention. Only two of the five dimensions used for cluster analyses could be operationalised for car washing using these questions, and as such a cluster analysis was not performed.

5.5.2 Reflections on vehicle cleaning

For most people, car washing is a fairly infrequent practice. It is disputed whether washing a car with a bucket or with a hosepipe with a trigger gun is a more efficient way to wash the car in terms of overall water use (Waterwise, 2012). Either way, this is still a potential location for saving water within homes. Examples such as waterless car washing products and professional car washes that either utilise water-recycling and/or some kind of waterless cleaning demonstrate the potential for business development and innovation that could lead to changes in practice that reduce water use. This is a particularly important location for encouraging future water efficiency considering our analysis revealed that professional car washing services were the dominant way of cleaning the car among the respondents. At a more macro level, policy affecting car ownership and use, from congestion charging to public transport provision, road tax to

fuel duty, to joint car ownership schemes could all influence water used on car washing by influencing car ownership and use, as could trends relating to urban planning, public transport development and road building.

6 The overall story of household water use: one of diversity

Summary of the overall story of household water use

- Individual practices, or their constituent elements, might be expected to correlate, forming stable bundles or complexes under the influence, for example, of a shared norm relating to cleanliness, or common technological constraints. Equally, the diverse, distributed and differing factors which influence the performances of practices could also imply correlations between them will be weak or absent.
- Between variants in personal washing, laundry and gardening practices, we find correlations in particular between laundry and personal washing practices, perhaps shaped by common ideals relating to convenience and cleanliness, or common financial constraints.
- Individual elements of each practice also correlate in some instances.
- However, we find that in general the relationships between water using practices are quite weak or absent.
- Taking a different approach, we analyse the water using practices of a set of five single occupancy households all of whom have close to average overall per capita levels of water consumption. Again, we find substantial diversity between them in terms of the way in which they perform the separate practices.
- Combined with the often weak ability of standard sociodemographic variables and environmental values to predict which variant of a practice a person will follow, the results present a picture of complexity, in which diverse and different factors shape the different practices, in ways not strongly related to sociodemographics or values.
- This has implications for common approaches to understanding and forecasting water demand and to segmenting households into common "types" of water consumer, as both approaches assume households with similar sociodemographic characteristics or similar levels of per capita water consumption will behave and change over time in similar ways. These results demonstrate that behind these assumed-to-be average households lies substantial diversity in practices, which implies diversity too in their future water using trajectories.

This section moves from individual practices and turns to the respondent, or household, as the unit of analysis. Certain questions arise when looking at the overall picture of household water use, as presented previously in the report (in section 2.1):

- What can be said about the relationships between how individuals perform different practices (washing, doing the laundry, gardening, etc.) – do common variants "bundle" together?
- Drawing on that, is it still possible to create a meaningful typology of households, based not on litres of water used or environmental values, but on similarities between them looking across all their water using practices?

- Looking beyond the average water using household (in terms of litres per day), what does the perspective taken here let one say about the diversity in practices hidden behind this average?

These questions have relevance for modelling household water use, and for assessing the applicability of 'behavioural' models of households which link water use to a set of sociodemographic, attitudinal and value based psychological and economic 'drivers'. The measure of 'water use' in such models is usually either overall household water use, often converted into pcc (per capita consumption) – total household litres divided by the number of occupants – or, more rarely, extends to include microcomponent data on the amount of water used from each water using device in the home, e.g. kitchen sink, toilet, shower, bath, outdoor tap, etc. Even such microcomponent monitors cannot however give an indication to the 'service' that water is providing, e.g. a shower to wake up, versus to relieve aches and pains, versus to get clean, or water drawn from an outdoor tap to help grow fruit and vegetables or to provide a clean car. Whether it be pcc or microcomponent data, water use figures are typically 'averaged' in order to construct a fairly simplified picture of what consumers are doing with water in their homes. Zoe Sofoulis's work 'Skirting complexity: the retarding quest for the average water user' highlights the systemic issues that shape this continual search for the normal, average consumer within the water industry (Sofoulis, 2011b).

The value of our approach is that it attempts to disaggregate this 'average consumer' to explore the diversity in actual practices that are hidden behind that average. This allows us to explore whether such apparently 'average' water users are similar or dissimilar to one another when looking at *how and why* they use water in the home. This has implications for the validity of models which assume households with similar pcc will all change in similar ways in future or respond similarly to interventions – if the practices being performed that lead to that same level of water use actually differ substantially between households, and the practices are not closely related to one another ('bundled'), then it suggests that households with similar water use today could in fact change in very different ways in future, or in response to a particular intervention. The analysis in this chapter has two parts which allow us to investigate these issues.

In section 6.1 we investigate the relationships between how individuals perform different practices, by searching for correlations between variants of practice, and between elements of each practice (frequency of performance, technology used, etc.), at the respondent level. We then discuss how the generally weak or absent correlations found tend to suggest that the way an individual performs one practice often has no or only a weak relationship to how they perform any other. However, this could simply be a statistical artefact, a difficulty in identifying such relationships from the data available, and so we set out to explore this diversity further.

A second stage, in section 6.2, further demonstrates this diversity in practices by selecting from the survey sample a set of five average water using households (in terms of their litres used per day) and investigating the variants of each of their water using practices (i.e. their cluster memberships for each practice). This is equivalent to the method employed by Medd and Shove (2006), which used microcomponent analysis to explore the diversity within what is consistently constructed as the 'average'. We add value to this research by linking actual use (although regretfully not microcomponent data) with detailed descriptions of actual practices in the home. The results here reconfirm the findings of that earlier research, again demonstrating that a sample of

supposedly average households, in terms of their water use, are in fact very diverse in terms of what they actually do, in terms of their practices, to use that water.

These results have implications for water demand forecasting as it is conventionally implemented – any model which analyses trends in overall household water use, even in a very detailed way like many microcomponent studies (Parker & Wilby, 2013) is unlikely to be able to realistically capture the diversity of the underlying practices nor the multiple distributed influences on each of them and their variants. It also follows from these results that there is not a simple, small set of 'typical water users' in the population, which has implications for approaches to understanding water customer 'behaviour' that use segmentation approaches to categorise households into a small set of ideal types based on a set of psychological 'drivers' of behaviour that are assumed to apply to all areas of water use.

6.1 Diversity in water using practices

This section tests the relationships between different practices, looking at correlations between cluster memberships and also between the separate elements between practices, for example correlations between frequency dimensions. As discussed previously, there are reasons why the variants in the way certain practices are performed, and also their separate elements, might correlate – personal washing and doing the laundry, for example, may both be shaped by a common idea of standards of cleanliness, such that the frequency of both may correlate, shaped by this common underlying influence. At the same time, the diverse and distributed influences on the separate practices suggest that they may be performed in quite unrelated ways (Shove, et al., 2012). Existing empirical work lends support to this too: Medd & Shove (2006) used micro-component data as proxies of practices to demonstrate how even among households with similar water use in one area, such as baths and showers, there can be greatly diverging water use in other areas, and hence likely very different practices.

Table 25 to Table 27 below show correlations between the variants of pairs of practices for the three practices which were found to have variants through the cluster analyses presented previously – personal washing, laundry and gardening. Correlations between washing and laundry are the most apparent, whilst correlations between either of these and variants of gardening are less frequent and generally statistically weaker.

There are multiple correlations between laundry and washing clusters (see Table 25). Simple Daily Showering in particular has strong correlations with three laundry clusters. The strong correlation with Simple Home Laundry makes intuitive sense, if both practices are followed in a routinized way without substantial time or energy invested in tailoring the practices to particular purposes. The negative correlations with On-Demand Home Laundry and Hand Washing could also be for the same reason, as both these latter require more effort. The correlation between Low Frequency Bathing and Hand Washing could be indicative of a low technology approach to both practices, and the negative relationship with Simple Outsourcing could be because of affluence (people who practice Low Frequency Bathing are, as earlier results demonstrated, likely to be less affluent that average, whilst those performing Simple Outsourcing are more likely to be more affluent). Technological constraints could also influence the positive correlation between High Frequency Bathing and Hand Washing that is observed – we have observed in section 5.1 that bathing rather than taking a shower could simply be due to not having a shower in the home, itself sometimes due to financial barriers to installing one, and a similar constraint (not having or being able to get a washing

machine) might drive hand washing in some cases, strengthening the correlation between these two variants of practice. Attentive Cleaning as a personal washing practice meanwhile is more likely to correlate with Attentive Clean Laundry, again making intuitive sense as both are indicative of diverse washing practices where shower length and bath height on the one hand, and the settings used on the washing machine on the other, are tailored substantially between performances as required. A reason for Low Frequency Showering being less likely correlated with Attentive Clean Laundry could be because of intersecting 'meanings' of what it means to be clean that are shared amongst these two variants of practice. In this case, lower frequency and less attentiveness may be required for these people to feel 'clean' in their daily lives. These are all speculative reasons for these correlations. Possible reasons for the remaining correlations are less clear: why are people who practice Out and About Washing less likely to perform Simple Home Laundry, and more likely to practice Simple Outsourcing? Could it be that the practice of Out and About Washing, described previously as a potentially urban, young, busy social lifestyle, could also involve sending clothes required for these busy 'out and about' lives to the drycleaners, whether for convenience, to save time, or because the clothes they wear 'out and about' require drycleaning, for example? Why is Low Frequency Showering more likely to be associated with On-Demand Home Laundry?

Table 25 Chi square correlations between individual variants of washing and laundry practices
n = 1407, weighted by respondent

		Washing					
		Low Frequency Showering	Attentive Cleaning	High Frequency Bathing	Low Frequency Bathing	Out and About Washing	Simple Daily Showering
Laundry	On-Demand Home Laundry	More likely (26.5% vs 16.2%)**					Less likely (13.7% vs 19.5%)**
	Simple Home Laundry					Less likely (19.1% vs 38.9%)***	More likely (44.3% vs 30.2%)***
	Attentive Clean Laundry	Less likely (7.1% vs 16.4%)**	More likely (20.8% vs 14.3%)*				
	Simple Outsourcing				Less likely (7.3% vs 16.2%)*	More likely (25.3% vs 13.6%)***	
	Hand Washing			More likely (9.0% vs 5.0%)*	More likely (13.7% vs 4.9%)***		Less likely (2.3% vs 7.4%)***
	On-Demand Outsourcing				Less likely (4.2% vs 11.1%)*		

Percentages indicate the likelihood of being in a given laundry cluster if the respondent is in a particular washing cluster compared to not being in it. Only statistically significant differences are presented.
Significant at: * 5% level; ** 1% level; *** 0.1% level

There are far fewer correlations between variants of washing and garden watering, and those that are there are only weakly significant (Table 26). People who practice Low Frequency Showering are slightly more likely to practice Green Fingered Gardening and less likely to have nothing to water. This could possibly be because of common

correlations with older age – retirement may give people the freedom to not shower as frequently, and to do a lot more gardening! People who perform Low Frequency Bathing meanwhile are more likely to have nothing to water. Finally, Out and About Washing is more likely to be associated with High Tech Gardening.

Table 26 Chi square correlations between individual variants of washing and gardening practices

n = 1701, weighted by respondent

		Washing					
		Low Frequency Showering	Attentive Cleaning	High Frequency Bathing	Low Frequency Bathing	Out and About Washing	Simple Daily Showering
Gardening	Amateur Enthusiastic Gardening						
	Casual Gardening						
	Green Fingered Gardening	More likely (8.7% vs 5.3%)*					
	Hands-off gardeners						
	High Tech Gardening					More likely (21.5% vs 14.8%)*	
	Nothing to water	Less likely (30.8% vs 38.5%)*			More likely (47.5% vs 36.8%)*		

Percentages indicate the likelihood of being in a given gardening cluster if the respondent is in a particular washing cluster compared to not being in it. Only statistically significant differences are presented.

Significant at: * 5% level; ** 1% level; *** 0.1% level

There are more correlations between variants of laundry and garden watering practices (Table 27). As with the relationships between washing and gardening, the reasons behind these correlations are not always immediately apparent. People who practice On-Demand Home Laundry are less likely to practice High Tech Gardening, and more likely to have nothing to water. Simple Home Laundry is less likely to be associated with High Tech Gardening. Attentive Clean Laundry is more likely to be found with Hands-Off Gardening. Practitioners of Simple Outsourcing for laundry meanwhile are more likely to also practice Casual Gardening and less likely to have nothing to water. People who practice Hand Washing are less likely to follow Hands-Off Gardening and more likely to do High Tech Gardening, perhaps because of a common enthusiasm for being hands on in such practices, or simply because they feel hand washing is the best way to remove stubborn dirt from gardening! Finally, On-Demand Outsourcing is less likely to be associated with Green Fingered Gardening and more likely with High Tech Gardening.

Table 27 Chi square correlations between individual variants of laundry and gardening practices

n = 1387, weighted by respondent

		Laundry					
		On-Demand Home Laundry	Simple Home Laundry	Attentive Clean Laundry	Simple Out-sourcing	Hand Washing	On-Demand Out-sourcing
Gardening	Amateur Enthusiastic Gardening						
	Casual Gardening				More likely (22.6% vs 17.1%)*		
	Green Fingered Gardening						Less likely (2.0% vs 6.2%)*
	Hands-off gardeners			More likely (23.8% vs 17.0%)*		Less likely (7.9% vs 18.6%)*	
	High Tech Gardening	Less likely (11.2% vs 16.5%)*	Less likely (12.0% vs 17.4%)**			More likely (27.6% vs 14.9%)**	More likely (25.2% vs 14.4%)***
	Nothing to water	More likely (47.1% vs 35.8%)**			Less likely (29.3% vs 39.4%)**		

Percentages indicate the likelihood of being in a given gardening cluster if the respondent is in a particular laundry cluster compared to not being in it. Only statistically significant differences are presented.

Significant at: * 5% level; ** 1% level; *** 0.1% level

In many cases the reasons behind the correlations described above are unclear, and even the reasons suggested above are merely hypotheses. Further analysis of the survey data and the qualitative interviews with some of the respondents might help trace some of the reasons that these particular variants of practice correlate, and whether they constitute stable bundles and complexes in the senses used by Shove et al (2012).

However, the important point for the current research questions is that, overall, the analysis demonstrates that there is a rather low level of correlation between how individuals perform one practice compared to other practices. This has particular implications for traditional approaches to categorising the 'average consumer', of which customer segmentation based on behavioural psychology or economics is one example. The implication therefore is that households do not fall into a small number of neat groups which one can identify as involving, for example, the practices of On-Demand Home Laundry, High Frequency Showering and Green Fingered Gardening, or other such combinations. Reflecting again on the results in chapter 5, they demonstrated that sociodemographic characteristics and environmental values often only weakly predict the variants of each individual practice that a person will perform. The overall picture is therefore one of complexity – the reasons for which a person performs a particular variant of one practice are not simply and easily related to standard sociodemographic characteristics or environmental values, and not strongly related to how they perform other practices. This is a problem for traditional segmentation approaches based on behavioural psychology or economics, where the procedure is to start with the

individual to segment households into a small set of similar water using types, or to predict overall water use, based on such variables.

Next, Table 28 presents correlations between the individual elements of the practices, as represented by the dimensions used throughout this report for the cluster analyses. Again, there are various statistically significant correlations, although in most cases they are quite weak (a value of 1 indicates perfect correlation, 0 indicates no correlation). In some cases, the correlations appear to have intuitive reasons behind them, although more research would be needed to test these. For example, the correlation between higher personal washing frequency and both higher laundry and higher car washing frequency could relate to common underlying values that practitioners hold relating to cleanliness both of bodies and of things such as clothes and cars that 'present' to the world a particular social, professional and economic identity. Correlation between the diversity of bath height or shower duration, and of changing laundry settings, might be due to a common strategy of consciously adapting the respective practices between performances as a way to achieve the best results, in terms of personal appearance and cleanliness. The typically positive correlations between technology scores meanwhile might indicate a common approach to using higher or more modern technology in performing everyday practices, or may be because they all represent increased convenience, or because higher technology in all cases requires higher financial resources. Correlations between outsourcing scores for washing, doing the laundry and kitchen (food preparation) practices may all relate to how active a person's lifestyle is, and again to their financial resources, which shape their ability to outsource particular aspects of their life outside of the home. For efficiency, the correlations, albeit weak, between kitchen practices and tooth brushing, laundry and gardening practices may be because of the common influence of a concern for the environment, or due to whether or not the home is on a water meter.

Table 28 Spearman's rho correlations between dimensions of practice
n = varied, weighted by respondent.
Significant at: *: 5% level, **: 1% level; ***: 0.1% level; - : no statistically significant correlation
Cells that are greyed out are for correlations that are already presented in other cells of the same table, or for autocorrelations

Frequency

	Washing	Laundry	Car washing
Washing		.234***	.139***
Laundry			-

Diversity

	Washing	Laundry	Gardening
Washing		.081***	-
Laundry			-

Technology

	Washing	Laundry	Gardening	Kitchen
Washing		.066**	0.50*	.165***
Laundry			-.063**	-
Gardening				.157**

Outsourcing

	Washing	Laundry	Kitchen
Washing		.118**	.162**
Laundry			-

Efficiency

	Tooth brushing[#]	Laundry	Gardening	Kitchen
Tooth brushing[#]		-	-	.074**
Laundry			-	.096**
Gardening				.069**

[#] Tooth brushing efficiency is a measure of how the respondent uses water during tooth brushing. A low efficiency score indicates that they leave the tap running.

6.2 Diversity in the 'average' water using household: a practices perspective

In part of the work of Medd & Shove (2006) analysing household micro-component data (the so-called 'Golden 100' dataset), they presented how water usage for households that were close to average, in terms of the litres of water they used per day, still varied greatly in terms of in which areas this water was used (e.g. toilet, shower, bath, kitchen sink, outside tap, etc.), revealing through this micro-component consumption data that household practices varied greatly even between households that had the same overall water use. We repeat this analysis here using the current dataset, selecting, from the households for which we have data on their water usage based on their meter readings,

five with close to current national average daily per capita consumption (pcc) of water, which is approximately 150 litres per day (DEFRA, 2008b), and analysing variation in their practices, in terms of the clusters to which they belong and their values on the individual elements/dimensions of each practice.

To control for the potential effect of numbers of household members on pcc and respondent practices, only single occupancy households were selected. The pcc of the five selected households ranges from 144 to 166 litres per day. All the individuals had outdoor space with things requiring watering, all reporting having front and back gardens and patios, but no balconies or decking. Table 29 shows the differences in cluster membership of the five respondents for the practices for which we found clusters: personal washing, laundry and gardening. The differences in the variants of these practices which they perform are indicative of the substantial variation in *how* water is used in the different practices even in average water using households.

This diversity is also demonstrated visually in Figure 34, which presents a bubble plot of the scores of these respondents for the different constituent elements or dimensions of each practice. As with the bubble plots elsewhere in the report, the size of each bubble represents the proportion of the five respondents that have that value for that dimension. Using washing as an example, the first column of bubbles, representing the frequency dimension, shows that three of the five have a score of 0.86 for that dimension, and one has a score of one (the fifth has a missing value for this dimension). For the next column, diversity, two have a score of zero, two more a score of 0.25, and the last a score of 0.5. For technology, all five have a score of one, while for outsourcing, the last column for washing practices, all have a score of zero. For many of the dimensions of the different practices there is substantial variation in the values for these five respondents, which means that there is large diversity between them within each of their water using practices even though the overall resultant water use appears average in terms of litres used.

As we have already seen, sociodemographic variables only weakly predict which variant of a practice a person will perform, so these results again imply that forecasting future water use based on sociodemographic changes, which assume everyone in a particular sociodemographic group will change in the same way, is unlikely to produce accurate results, as each variant of each practice is likely to change in diverse ways over time.

Table 29 The variants of practice performed by five single occupancy households of close to average overall per capita consumption of water

Household	Water use, litres per day	Practice		
		Washing	Laundry	Gardening
A	159.8	*[Not calculated - missing data]*	Attentive Clean Laundry	Casual Gardening
B	143.7	Simple Daily Showering	On-Demand Outsourcing	Casual Gardening
C	148.4	Attentive Cleaning	Simple Home Laundry	Hands-off gardeners
D	165.7	Simple Daily Showering	On-Demand Outsourcing	High Tech Gardening
E	148.6	Simple Daily Showering	Simple Home Laundry	Hands-off gardeners

Figure 34 Bubble plot of scores for the different elements/dimensions of water using practice performed by five single occupancy households of close to average overall per capita consumption of water

Bubble sizes represent the number of respondents having that value on that dimension

The columns of bubbles represent (from left to right), the following elements/dimensions of practice:

Washing: Frequency; Diversity; Technology; Outsourcing

Laundry: Frequency; Diversity; Technology; Outsourcing; Efficiency

Gardening: Frequency; Diversity; Technology; Efficiency

Kitchen: Technology; Outsourcing; Efficiency

Car washing: Frequency; Rate

Tooth brushing: Efficiency

7 Discussion and conclusion

Summary of key points from the discussion and conclusion

- The research presented in this report has tested a mixed methods approach to "scaling up and out" a focus on practices to increase understanding of how household water use is enacted in everyday life.
- From the revealed diversity in how practices are performed, with a cluster analysis we were able to identify common variants of everyday routines that involve water use, notably those related to personal hygiene, doing the laundry and gardening.
- We find, consistent with earlier research and practices theory, that how a person performs a particular practice is at most only weakly related to their sociodemographic characteristics, environmental values, and the reasons why they perform it. The data also suggest that how one water using practice is performed also only weakly relates to how other practices are performed.
- These results imply that current models used to predict and forecast overall household water demand based on sociodemographic characteristics and psychological and economic variables fail to account for the complex sociological reality of how water use is constituted, enacted and maintained in everyday life, including what services it provides such as cleanliness, comfort, convenience, and ideas of 'outdoor rooms' and other ideas of the good life in the garden. We outline an approach to supplement such forecasting techniques with descriptions of possible future trajectories in common practices.
- With respect to interventions, the influence of wider systems of provision, social norms, technologies and environmental conditions on individual routines suggests new points of possible entry for influencing more sustainable practices that could be explored in future research.
- Future work could also address some of the limitations of the current research, such as by considering in more detail how practices are shaped by other household members, and the effect of "outsourcing" water use beyond the home through the use of services such as restaurants and laundrettes.
- The approach could also be developed in further work by linking practices survey, qualitative, and other related data to microcomponent and smart meter data, allowing fine-grained analysis of how practices influence water (or other resources such as energy) use, and contributing to projects which attempt to tailor interventions to unique features of the performances of individuals and households, thus avoiding the need to categorise customers into "actionable groups" based on their demographic characteristics.
- In combination with the data above, a periodically repeated practices survey could be a valuable tool in monitoring how practices and common variants change in the population over time, aiding evaluations of the effectiveness of different interventions that aim to increase the sustainability of everyday practices.

The main aim of the research presented in this report has been to test the potential of a new methodological approach to reveal and understand the diversity of water using practices in a study population, that is, the everyday habits and routines by which their water use is constituted. The approach presented here sought to apply the social scientific study of practices in a piece of mixed methods research, scaling the usually qualitative methods associated with practice theories 'up and out' into a quantitative survey linked to accompanying qualitative interviews. The statistical results that arise allow increased understanding of the diversity of practices that consume water across the population, and to search for common 'variants' of each practice within the diversity. The qualitative data meanwhile provides greater depth of understanding to some of the patterns identified in the survey data.

The results presented in this report demonstrate that there is often great diversity between individuals and households in how everyday routines such as personal washing, doing the laundry or gardening are performed. At the same time, the cluster analysis method used to analyse the data has revealed that there are often groups with identifiably similar approaches to performing these practices when viewed along particular dimensions. In this research, we identified such variants of each practice based on similarities in aspects of their physical performance – the frequency of performance, the diversity with which an individual varies their practice between performances, the technology used upon which the practice relies, the level to which it is outsourced to outside service providers or distributed locations, and the efficiency with which it is performed in terms of the level of mains water used given the other aspects of its performance. Other aspects of the practices were considered separately – the timing of performances and, importantly, the meanings that integrate elements of the various practices.

The results here demonstrate the potential of a mixed methods practices approach to increase understanding of how household water use is constituted, adding insights that even approaches such as micro-component monitoring cannot. As a simple example, the approach increases understanding of how water use from an outdoor tap is constituted. Comparing a set of households with the same level of outdoor tap water use, one might be found to be using it all to water their small lawn once a week with a sprinkler, another to clean their car with a hose every fortnight, another to hose down their patio furniture to maintain a clean 'outdoor room', or a fourth to be watering their fruit and vegetable patch every day with a watering can. The relevance of such extra insights for water demand management is that, whilst these households might be using equal amounts of water outdoors today, and hence appear the same in this respect based on micro-component data alone, their usage in future might change in dramatically different ways in response to changing family and life situations, new technologies, changing social norms regarding vehicle cleanliness or garden appearances, altered weather patterns, and so on. Equally, they are likely to respond very differently to any given intervention, such as a hosepipe ban, that attempts to alter their outdoor water use.

The approach has implications for both water demand forecasting and intervention design. A key finding, in line with the theoretical expectations of the practices perspective, is that how a person or household performs a particular practice is only weakly predicted by their sociodemographic characteristics, environmental values, or indeed the reasons why they perform that practice. Diverse other factors influence how they are performed, likely to include the nature and pricing of technologies available on the market, structural systems of provision, technological and

environmental factors, social norms relating to cleanliness, expectations of comfort, convenience and appearances, and so on. Equally, as the factors that influence how a person washes themselves, for example, are only partly related to how they do their laundry or gardening, we find that how one practice is performed at most only weakly predicts how others will be performed.

The implications for water demand forecasting as it is used to inform modelling of the water supply and demand system are that approaches which attempt to predict overall household per capita consumption based on sociodemographic variables, and to then predict future average trends based on how these sociodemographic characteristics are likely to change over time in the population, miss the diversity and complexity of how water use is constituted and is shaped and constrained by distributed factors at multiple levels. The practices approach does not directly produce more certain numbers for predicting future water use than current approaches but, by increasing our understanding of the complex features that create and maintain current expressions of water related practice, has the potential to help imagine how water using practices might change, disappear, or emerge under different scenarios and what might be done to influence that, thus providing a valuable addition to future scenario modelling and forecasting (see Environment Agency, 2009). Quantitative practices surveys, repeated periodically in combination with the collection of a range of other related data, could, for their part, also serve as a valuable monitoring tool to identify how different variants of practices change in popularity over time, with some remaining stable, some declining, and new variants emerging. We have explored these ideas for methodologies to track change elsewhere (Browne, Medd, et al., 2013; Browne, et al., in press 2013). Such data would in turn help to explore how different interventions, as well as other diverse and distributed factors, influence the sustainability of the varied patterns of everyday practices found in society.

In terms of the contribution of this approach to intervention design, we have discussed specific possibilities for different interventions at the end of each results section in chapter 5, for each of the main sites of water using practice. It should be noted that the focus of this research was not to test or explore 'interventions', although there are learnings that we can draw on that hint at what could be possible. Speaking generally, the approach and results highlight reasons why common intervention designs which provide information related to changing values/attitudes related to economic or environmental considerations, or supply technologies to households to improve water efficiency, may meet with limited success. With individual actions shaped and constrained by a wide range of situational, technological, environmental and social factors, such targeting of individuals or households based on their sociodemographic characteristics or their environmental attitudes or values may not be the most effective way to alter practices. Although not an aim of this research to specifically consider implications for interventions, the approach highlights the potential to target and harness multiple and diverse channels to influence household water use in ways that reflect the diversity and complexity of the elements (materials, meanings and skills) that shape water use.

With respect to household level interventions, the increased understanding that this approach can provide of the diverse factors which shape routines and habits could help open possibilities for interventions that are not predicated upon a rational actor model of individual behaviour. There are a range of 'material' interventions that could be made at multiple levels – from household infrastructures, to the provision of alternative water infrastructures or even other 'stuff' linked to water use such as products like dry shampoo in a system where there is a distributed construction and

maintenance of demand (Browne, et al., in press 2013). This applies equally to interventions that could address the other integrating elements of practice – meanings and images, and the skills and competences associated with self, home and 'other' care practices (Browne, et al., in press 2013; Jack, 2012; Kuijer & De Jong, 2012; Scott, et al., 2012).

There are also implications for the tailoring and targeting of interventions to particular groups of households or performing segmentation of water company customers by identifying a small set of 'typical' water users, based on their pcc, house type, or residential postcode. How people perform one practice is quite distinct from how they perform other practices in most instances, or at best only weakly correlates in the population. This means that classifying individuals or households into a small set of common actionable groups is either not possible or else simply hides the large diversity in how people perform these everyday practices and the complexities of if and how they relate to one another. At the same time, as neither sociodemographic characteristics nor environmental values predict individual practices strongly, approaches to 'segmenting' water industry customers into such groups based on these variables are unlikely to optimally match interventions with the people that may be receptive to them. We do recognise the practical difficulties of creating strategies for interventions when there are not ready made 'groups' of customers to target, in fact these 'tailor made' groupings could be exactly what is appealing to companies trying to implement demand management or water efficiency interventions (Browne, et al., in press 2013; Sofoulis, 2011b). We hope that future research, in collaboration with water companies and other distributed demand-makers for water (e.g. garden centres/societies and product manufacturers), will go some way to identifying possible strategies for water companies, as well as a range of strategies that link with these other organisations and intermediaries.

This project, as a methodological experiment, inevitably has encountered some limitations in its implementation, which also serve to point the way to the future development of this approach to increase its value further for forecasting and intervention design. One area of further complexity that was not fully explored in this project relates to how the practices of individuals in families and of others living together influence and interrelate with one another. For example, how is 'dirt' negotiated in homes, related to washing dishes, laundry or bodily care? These issues were further explored in the interviews and the focus groups and so future writing will focus on these issues in more detail. A further issue that can be explored further is the extent to which households outsource services such as laundry, vehicle washing and food preparation and the way in which this distributes their total water demand between sites, reducing their home water use without necessarily reducing their overall water demand. There is also a need to recognise that these clusters of practice are not static, actually existing entities, and that they were an attempt to use quantitative methodology in a descriptive way – opening up the 'average' consumer to reflect the complexity of practice. The links between practices and water demand, in terms of if and how practices and the way in which they are performed help to predict the daily litres of water used by a person or household, could also be valuably explored further. The ability to do this in this research was in part limited by the low number of (metered) participants for whom it was possible to link their survey responses to their water meter data, this in turn being due to a variety of factors, primarily the low level of consent from participants to allow us to do this, and also as only a limited number of water companies agreed to link to their data. However, to really explore these links, more detailed micro-component data would be needed, and this linking of fine-grained

micro-component data (recorded hourly at least) with practices data, including multiple household members in shared accommodation, would be a fruitful avenue for future research.

Such an approach would also allow an investigation of the potential of widespread "smart meter" usage in households to support the more effective targeting of household-level interventions, given that variants of practice cannot be predicted well based on standard sociodemographics. If temporal water use profiles from such metering can be used to predict the variants of practices that a household follows then this could allow fine-grained, semi-automatic tailoring and targeting of household level interventions on a per customer basis. The sociological understanding of practices that lead to the observed water consumption could potentially contribute to increasing the effectiveness of automated feedback provided to households through in-home display technologies (Strengers, 2011), while such per customer tailoring of feedback would also remove the need to try to classify (or miss-classify) customers into 'actionable groups' at all, since each would appear to both themselves and the water provider as a 'market of one'. Such an approach has applicability to studying the effectiveness of interventions focusing on household usage of other resources too, notably electricity and gas use.

We therefore see much potential for further developing this approach, and feel that future research has three potential, but interlinked, pathways:

a. Validating the approach contained in this report, including attempting to refine a 'practice based quantitative measure' that captures the diversity and patterns of practice, and includes a fuller triangulation with qualitative data, other quantitative (e.g. micro-component) data, and related datasets (e.g. weather, food, time use and consumption databases).
b. Developing the quantitative practices approach as an alternative to customer segmentation, in close collaboration with the water, energy and other utility industries, in order to improve their understanding of their customers, what they do with water and other utilities and why, and how this can be incorporated to increase the effectiveness of current demand planning and the design and targeting of interventions.
c. Using a playfully experimental approach, exploring how the application of the findings from this research could be used to inform 'interventions' into the different elements of practice – materials, meanings, skills – that make up laundry, gardening and washing practices.

Technical appendix

This Technical appendix presents tables of the full set of correlations between variants of practices, other practice variables and other sociodemographic variables that are used as the basis for the descriptions of each variant of each practice presented in chapter 5.

Personal washing practice cluster results

Table 30 Correlations between variants of personal washing practice and other variables
Statistically significant at: * 5% level; ** 1% level; *** 0.1% level

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
Practices - underlying variables for the clustering dimensions						
Frequency						
How many baths and showers do you have per week?	At least 6, but nearly always 7 or more (high frequency scores)***	Usually at least 7, but a few have fewer (85.8% have 7+) (usually high frequency score)***	Usually at least 7, mostly even more (59.2% vs. 23.6% have 8+), although a small percentage have less, down to 3 per week (usually high frequency scores)***	No more than 5 baths/showers per week, averaging about 4 (middle to low frequency score)***	No more than 5 baths/showers per week, averaging 3 or 4, never 0 (middle to low frequency score)***	Usually daily (68.5%) although sometimes more (18.5%), or 5 or 6 (high frequency scores)*
Technology						
Bath to shower ratio	Nearly always showers, but occasionally up to half baths (middle to high technology scores)***	Between about half to all showers (middle to high technology scores)***	A spread of usually between about half to all showers (middle to high technology scores)***	Between half and all are showers as opposed to baths (middle to high technology score)***	Usually always have baths (96.7%), or at least mostly do (low technology scores)***	Usually always have baths (89.5%), or at least usually do (low technology scores)***
Diversity						
How many factors influence shower duration or bath height?	Usually never vary, but for at most one reason (low complexity scores)***	Full range of scores, but fewer than rest of population do not vary (43.4% vs 55.6% do not)***	At least 1, usually 2 or more, factors affect shower duration or bath height (moderately low to high	Only 0 or 1 (or rarely 2) factors affect shower duration or bath water level (low to middle complexity	Usually do not vary (66.1%), or only by one factor (33.1%), very rarely 2 (0.8%) (usually low complexity scores)	Usually do not vary, or only by one factor (low complexity scores) NB. This is largely inherent in their

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
				diversity score)***	score)***	NB. This is largely inherent in their being bathers - only 4 of 136 people responded to the variation in shower duration questions.***	being bathers - only 22 of 204 people responded to the variation in shower duration questions.***
Does the time you spend in the shower vary from day to day depending on any of the following?	Shaving	Less likely (4.6% vs 23.3%)***	More likely (18.9% vs 14.0%)*	More likely (46.0% vs 8.4%)***	Less likely (6.4% vs 16.2%)***		
	Washing your hair	Less likely (13.6% vs 33.4%)***		More likely (62.5% vs 16.5%)***	Less likely (11.3% vs 26.6%)***		
	The amount of hot water in the tank	Less likely (0.1% vs 2.4%)***		More likely (5.8% vs 0.4%)***			
	Other people want to use the bathroom	Less likely (2.1% vs 10.3%)***		More likely (20.7% vs 3.6%)***	Less likely (2.5% vs 7.3%)*	Much more likely (66.7% vs 6.5%)***	
	How much time you have	Less likely (5.3% vs 24.2%)***	More likely (20.6% vs 14.6%)*	More likely (45.4% vs 9.5%)***	Less likely (8.4% vs 16.8%)**		Less likely (0.0% vs 15.9%)*
	How cold it is in the bathroom	Less likely (0.6% vs 3.5%)***		More likely (6.5% vs 1.3%)***			
	Because it's a working day	Less likely (0.3% vs 6.8%)***		More likely (13.5% vs 1.9%)***	Less likely (1.0% vs 4.2%)*		
	Because it's a day off work	Less likely (0.7% vs 5.5%)***	More likely (5.3% vs 3.0%)*	More likely (10.8% vs 1.8%)***	Less likely (0.0% vs 3.9%)**		
	How long it takes for the water to run warm	Less likely (0.0% vs 2.4%)***		More likely (5.0% vs 0.6%)***			
	Other	Less likely (0.0% vs 0.6%)*		More likely (1.5% vs 0.1%)***			
	None of the above – does not vary	More likely (72.7% vs 42.2%)***	Less likely (48.0% vs 57.7%)**	Less likely (3.4% vs 66.9%)***	More likely (72.9% vs 53.2%)***		
	Refused						
How full to you fill your bath for	a wash?	More likely to the top (18.3% vs 10.6%)**		More likely to use less (37.7% vs 25.6% fill it "just enough to wash")*		Less likely to fill to the top or near the top (5.1% vs 13.4%)*	
	for relaxation?					Less likely to fill to	

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
						the top or near the top; more likely to fill just enough to wash, or vary it (10.0% vs 20.5%; 24.4% vs 14.2%; 13.3% vs 7.8%)**	
	for children					More likely to fill just enough to wash; less likely full or halfway (69.4% vs 43.4%; 0.0% vs 6.6%; 16.7% vs 27.4%)*	
Outsourcing/infrastructure							
In how many places do you shower/bathe outside the home?		Always 0 (low outsourcing score)***	Much more likely (100.0% vs 8.6% do) (middle to high outsourcing score)***	Less likely to shower outside the home (in at most one other place, but usually none) (middle to low outsourcing score)***	Less likely to shower outside the home (in at most one other place, but usually none) (middle to low outsourcing score)***	Less likely to shower outside the home (82.5% vs 76.8% do not) (usually low outsourcing score)*	No difference to rest of population (full range of outsourcing scores, tending to lower ones)
Do you also shower/bathe at...?	Home of friends/family/partner	Less likely (0.0% vs 14.2%)***	More likely (38.1% vs 3.5%)***		Less likely (3.0% vs 9.7%)**		
	Work	Less likely (0.0% vs 5.6%)***	More likely (17.8% vs 0.9%)***	Less likely (0.8% vs 4.0%)**			Less likely (0.5% vs 3.9%)*
	Gym, fitness centre or swimming pool	Less likely (0.0% vs 24.0%)***	More likely (67.6% vs 5.2%)***	Less likely (6.2% vs 16.4%)***	Less likely (6.9% vs 16.0%)***		
	Other		More likely (0.4% vs 0.0%)*				
	None of the above	More likely (100.0% vs 62.9%)***	Less likely (0.0% vs 91.2%)***	More likely (86.9% vs 75.2%)***	More likely (87.6% vs 75.5%)***		
	Refused						

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
Practices - practice variables *not* used for the clustering dimensions							
How often do you have other kinds of wash, e.g. flannel?		More likely to never (75.7% vs 63.2%)***	Less likely to never; more likely to at least daily (62.3% vs 69.0% don't; 25.6% vs 17.5%)*				
Reasons for...having a bath	To get clean					More likely (90.0% vs 82.1%)*	More likely (96.5% vs 79.3%)***
	To smell nice/stop smells			More likely (36.1% vs 28.0%)*	Less likely (10.5% vs 30.6%)**		
	To freshen up			More likely (55.2% vs 38.7%)***			
	To wake up	Less likely (7.5% vs 13.3%)*		More likely (23.0% vs 9.2%)***		Less likely (5.0% vs 13.2%)**	
	To help me go to sleep/bed			More likely (13.7% vs 6.7%)**		Less likely (3.3% vs 8.7%)*	
	When I get back from work			More likely (20.8% vs 9.3%)***			Less likely (7.5% vs 12.9%)*
	To get ready to go out	Less likely (8.1% vs 18.5%)***		More likely (29.5% vs 13.0%)***		Less likely (8.3% vs 17.6%)*	
	For relaxation		More likely (45.5% vs 29.8%)***	More likely (42.1% vs 29.4%)**		Less likely (22.5% vs 33.3%)*	Less likely (24.5% vs 34.1%)**
	To ease aches and pains			More likely (21.3% vs 11.7%)***			Less likely (8.0% vs 15.3%)**
	To escape/have some time to myself			More likely (8.7% vs 3.5%)**			
	To get warm (when it's cold)						
	To get cool (when it's hot)	Less likely (0.5% vs 4.8%)**	More likely (9.9% vs 2.8%)***				
	It's quicker than anything else						
	I find it easier to get into and out of, or to use						
	It's safer						
	After I take public transport			More likely (2.2% vs 0.6%)*			

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
	After doing work in the house, garage or garden						
	After sport						
	For religious / cultural reasons						
	Other						
	None of the above			Less likely (0.0% vs 2.9%)*			Less likely (0.0% vs 3.0%)*
Reasons for...showering	To get clean		More likely (90.7% vs 83.1%)**				
	To smell nice/stop smells			More likely (38.1% vs 29.8%)**	Less likely (24.6% vs 32.3%)*		
	To freshen up			More likely (54.0% vs 45.1%)**	Less likely (39.4% vs 47.8%)*		
	To wake up		More likely (26.3% vs 17.1%)***	More likely (28.5% vs 16.7%)***	Less likely (6.9% vs 20.6%)***		
	To help me go to sleep/bed			More likely (11.5% vs 4.0%)***	Less likely (1.0% vs 5.9%)**		
	When I get back from work		More likely (15.7% vs 8.8%)***	More likely (13.8% vs 9.3%)*	Less likely (5.4% vs 10.8%)*		
	To get ready to go out		More likely (27.8% vs 14.1%)***		Less likely (5.9% vs 18.3%)***		
	For relaxation	Less likely (8.9% vs 12.1%)*	More likely (16.4% vs 9.4%)***	More likely (16.2% vs 9.5%)**	Less likely (3.0% vs 11.9%)***		
	To ease aches and pains	Less likely (2.5% vs 7.8%)***	More likely (10.3% vs 4.2%)***	More likely (8.8% vs 4.6%)**			
	To escape/have some time to myself	Less likely (0.3% vs 2.5%)***	More likely (4.3% vs 0.8%)***				
	To get warm (when it's cold)	Less likely (1.3% vs 4.6)***	More likely (5.7% vs 2.6%)**	More likely (8.4% vs 2.1%)***	Less likely (0.5% vs 3.6%)*		
	To get cool (when it's hot)	Less likely (1.5% vs 6.3%)***	More likely (8.5% vs 3.1%)***	More likely (9.2% vs 3.1%)***	Less likely (1.0% vs 4.6%)*		
	It's quicker than anything else		More likely (14.9% vs 9.9%)*				
	I find it easier to get into and out of, or to use						

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
	It's safer						
	After I take public transport	Less likely (0.1% vs 1.0%)*	More likely (1.8% vs 0.3%)**				
	After doing work in the house, garage or garden	Less likely (1.6% vs 4.9%)***	More likely (8.2% vs 2.3%)***				
	After sport	Less likely (4.0% vs 9.0%)***	More likely (17.4% vs 4.3%)***		Less likely (1.5% vs 7.6%)**		
	For religious / cultural reasons						
	Other						More likely (9.1% vs 1.2%)***
	None of the above	Less likely (0.1% vs 2.8%)***	Less likely (0.0% vs 2.0%)*	Less likely (0.0% vs 1.9%)*			
Reasons for...other washing	To get clean						More likely (82.5% vs 68.9%)*
	To smell nice/stop smells						
	To freshen up	More likely (54.9% vs 45.7%)*					
	To wake up						
	To help me go to sleep/bed						
	When I get back from work				Less likely (1.5% vs 8.6%)*		
	To get ready to go out						More likely (20.7% vs 11.3%)*
	For relaxation	Less likely (0.0% vs 5.6%)**		More likely (11.8% vs 2.5%)***		More likely (15.0% vs 3.2%)***	
	To ease aches and pains						
	To escape/have some time to myself			More likely (3.2% vs 0.0%)***			
	To get warm (when it's cold)	Less likely (0.0% vs 2.7%)*		More likely (5.4% vs 1.2%)**			
	To get cool (when it's hot)		More likely (7.5% vs 2.8%)*				
	It's quicker than anything else						
	I find it easier to get into			More likely (3.2%			

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
	and out of, or to use			vs 0.6%)*			
	It's safer						
	After I take public transport		More likely (2.8% vs 0.4%)*				
	After doing work in the house, garage or garden		More likely (4.7% vs 1.1%)**				
	After sport		More likely (6.5% vs 0.2%)***				
	For religious / cultural reasons						
	Other						
	None of the above		Less likely (0.0% vs 9.5%)***		Less likely (1.5% vs 8.8)*		Less likely (0.0% vs 8.6%)*
Do you take baths instead of, or in addition to, the showers?	Baths instead of showers	Less likely (12.4% vs 23.6%)**					More likely (66.7% vs 18.5%)***
	Baths in addition to showers	More likely (31.2% vs 20.3%)**					
	Shower before a bath	Less likely (2.7% vs 6.9%)*	More likely (13.1% vs 3.7%)***				
	Shower after a bath	Less likely (0.0% vs 3.1%)*	More likely (4.9% vs 1.4%)*				
	None of the above						
How do you shave your...? Everyone	Face		More likely to shave (67.6% vs 58.0%)***	More likely to wet shave with water running; less likely to dry shave (13.1% vs 7,2%; 7.3% vs 15.1%)***	More likely to dry shave, less likely to wet shave with water running (22.7% vs 12.8%; 3.8% vs 8.6%)*** NB. Note too that respondents were substantially less likely to refuse to answer these questions		Less likely to shave (52.0% vs 39.1% don't)**
	Legs	More likely to not shave; less likely to	More likely to wet shave with water	More likely to wet shave, either	Less likely to shave (72.8% vs 54.4%		More likely to shave, more likely

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
		wet shave with water not running (59.3% vs 55.0% don't; 8.6% vs 13.9%)*	running (12.1% vs 7.9%)*	without or with water running; or use depilatory cream/wax; less likely to not shave (16.5% vs 11.2%; 15.0% vs 7.5%; 8.8% vs 4.9%; 43.8% vs 58.8%)***	don't)***		wet shave without water running (51.0% vs 42.4%; 19.8% vs 10.9%)**
	Underarms	More likely to not shave; less likely to wet shave with water not running (57.3% vs 50.5% don't; 10.4% vs 16.0%)*		More likely to wet shave, either without or with water running; or use depilatory cream/wax; less likely to not shave (19.9% vs 12.8%; 19.9%vs 9.0%; 7.7% vs 4.1%; 33.7% vs 56.3%)***	Less likely to shave (70.1% vs 50.8% don't)***		More likely to shave; more likely wet shave without water running; less likely wet shave with running water (53.8% vs 46.1%; 23.1% vs 12.7%; 5.5% vs 11.2%)***
	Bikini line			More likely to wet shave, either without or with water running; or use depilatory cream/wax; less likely to not shave (13.5% vs 7.7%; 10.8% vs 5.5%; 8.5% vs 4.2%; 50.0% vs 64.7%)***	Less likely to shave (78.2% vs 60.5% don't)***	Less likely to shave; less likely to wet shave with water running (75.8% vs 61.6% don't; 0.8% vs 6.7%)*	More likely to shave; more likely wet shave without water running; less likely wet shave with running water (46.8% vs 36.3%; 15.9% vs 7.0%; 3.0% vs 6.7%)***
	Head		More likely to dry shave or wet shave with water running (2.5% vs 1.3%; 3.2%	More likely to wet shave with water running; less likely to not shave (3.1%			

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
			vs 1.0%)**	vs 1.0%; 78.9% vs 81.8%)*			
	Other parts of the body	More likely to not shave; less likely to wet shave with water not running (79.8% vs 74.5% don't; 1.8% vs 3.4%)**		More likely to wet shave, either without or with water running; or use depilatory cream/wax; less likely to not shave (5.0% vs 2.4%; 5.0% vs 1.5%; 2.7% vs 0.9%; 68.5% vs 77.8%)***	Less likely to shave (85.8% vs 75.2% don't)**	Less likely to shave; less likely to wet shave with water running (81.0% vs 76.1% don't; 0.0% vs 2.2%)*	
How do you shave your...? Men	Face			Less likely to dry shave; more likely to wet shave with water running (14.7% vs 28.5%; 27.5% vs 12.7%)***	More likely to dry shave, less likely to wet shave with water running (40.9% vs 24.7%; 6.1% vs 15.8%)**	Less likely to shave; but more likely to wet shave with water running (11.8% vs 4.1% don't; 15.7% vs 14.5%)**	Less likely to shave; more likely wet shave without water running (11.7% vs 3.8% don't; 55.8% vs 50.7)**
	Legs		Less likely to shave (12.1% vs 14.9%)*	More likely to shave overall (22.2% vs 13.1% do), particularly by wet shaving with or without water running (5.6% vs 0.6%; 5.6% vs 1.4%)***			
	Underarms	More likely to not shave; less likely to wet shave with water running (83.5% vs 77.2% don't; 2.6% vs 5.7%)**	Less likely to wet shave with water running; more likely with it running (0.0% vs 1.0%; 2.4% vs 0.3%)*	More likely to shave overall (40.7% vs 17.1% do), no strong relative preference for method***		Less likely to shave; but more likely to wet shave with water running; less likely other ways (86.3% vs 79.5%; 11.8% vs 4.1%)*	
	Bikini line		Less likely to wet	Slightly more likely			

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
			shave with water running; more likely with it running (0.0% vs 1.0%; 2.4% vs 0.3%)*	to shave overall (22.8% vs 20.5% do), no significant preference for method*			
	Head	More likely to not shave (89.6% vs 86.0% don't)**	More likely to dry shave or wet shave, without or with water running (3.7% vs 2.6%; 1.2% vs 0.4%; 3.0% vs 0.6%)*				
	Other parts of the body	More likely to not shave (87.8% vs 81.8% don't)**		More likely to shave overall (24.8% vs 14.7% do), particularly by wet shaving with or without water running (5.55 vs 0.5%; 6.4% vs 2.1%)***		Less likely to shave (88.2% vs 83.9% don't)***	
How do you shave your...? Women	Face	More likely to not shave (87.8% vs 81.8% don't)**	More likely to wet shave without water running (8.6% vs 3.3%)*	More likely to shave overall (28.3% vs 23.8% do), no relative preference for method**			
	Legs		Less likely to not shave; more likely to dry shave or wet shave, without or with water running (15.7% vs 30.3% don't; 5.2% vs 2.8%; 27.0% vs 20.8%; 25.2% vs	More likely to shave overall (80.3% vs 69.7% do), particularly by wet shaving with water running (21.1% vs 14.3%)*	Less likely to shave (52.6% vs 25.5% don't)***	Less likely to shave; but more likely to wet shave without water running (38.6% vs 27.5% don't; 30.0% vs 20.9%)*	More likely to wet shave without water running (32.5% vs 19.8%)*

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	Out and about washing	Attentive cleaning	Low frequency showering	Low frequency bathing	High frequency bathing
			14.0%)**				
	Underarms	More likely to not shave; less likely to wet shave with water not running (29.5% vs 25.5% don't; 16.1% vs 26.2%)*	Less likely to not shave; more likely to dry shave or wet shave, without or with water running (15.5% vs 28.7% don't; 6.0% vs 3.1%; 28.4% vs 21.7%; 27.6% vs 15.0%)***	More likely to shave overall (84.2% vs 70.8% do), particularly by wet shaving with water running or with depilatory cream/wax (24.3% vs 15.1%; 11.8% vs 8.0%)**	Less likely to shave (50.0% vs 24.4% don't)***	Less likely to shave; but more likely to wet shave without water running; less likely other ways (40.6% vs 25.8% don't; 27.5% vs 22.1%)*	More likely to wet shave without water running; less likely wet shave with running water (36.1% vs 20.4%; 8.2% vs 17.9%)***
	Bikini line			More likely to shave overall (77.0% vs 60.5% do), particularly by wet shaving without or with water running or with depilatory cream/wax (21.1% vs 13.8%; 18.4% vs 10.2%; 13.8% vs 8.5%)***	Less likely to shave (60.4% vs 33.9% don't)***	Less likely to shave; particularly less likely to wet shave with water running (59.4% vs 34.9% don't; 1.4% vs 12.5%)**	More likely to shave; more likely wet shave without water running; less likely wet shave with water running (69.4% vs 62.4% do; 25.8% vs 13.3%; 4.8% vs 12.8%)***
	Head			Slightly more likely to shave overall (26.3% vs 23.8% do), particularly by wet shaving with water running (3.9% vs 1.3%)*			
	Other parts of the body			More likely to shave overall (36.8% vs 29.9% do), particularly by wet shaving without, or with water running, or			

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
				with depilatory cream/wax*			
When do you brush you teeth?		More likely morning and night (88.7% vs 79.9%)***	Minor statistically significant differences**		More likely to brush just once a day, less likely more than once, more likely to have dentures (15.0% vs 7.2%; 81.7% vs 91.7%; 1.9% vs. 0.9%)**	Less likely twice a day, morning and night; more likely just in morning or just at night (75.2% vs 83.9%; 14.0% vs 7.4%)*	
Mostly, where do you brush your teeth?			Less likely at the sink with a cup of water (1.8% vs 6.8%)***		More likely to brush at the sink without the tap running or with a cup of water, less likely with it running (61.2% vs 67.1%; 9.7% vs 5.6%; 21.7% vs 29.6%)*	More likely at sink without tap running; or with a cup of water; less likely at the sink with the tap running (70.1% vs 61.3%; 12.0% vs 5.6%; 17.1% vs 29.6%)**	More likely to brush at the sink with the tap running, less likely withour it running (38.6% vs 27.5%; 53.3% vs 63.0%)**
Do you have at least one of...	Shower (ex power shower)	More likely (77.0% vs 69.1%)***	More likely (80.8% vs 70.4%)***	More likely (83.5% vs 70.1%)***		Less likely (60.3% vs 25.6% do not)***	Less likely (56.2% vs 24.4% do not)***
	Power shower	More likely (31.2% vs 27.5%)*	More likely (35.9% vs 27.5%)**	More likely (35.0% vs 27.8%)*		Less likely (87.5% vs 70.0% do not)***	Less likely (87.9% vs 69.1% do not)***
	Bath			More likely to have two or more (10.0% vs 4.2%)**	Less likely (82.0% vs 93.8%)***		
	Hydrotherapy bath or spa						
	Jacuzzi or bath						
Individual level							
Age band			More likely younger (47.1% vs 30.1% are 34 or below; 14.4% vs	Likely to be younger (38.8% vs 31.7% are 16-34; 10.2% vs 20.3% are	More likely aged 45+ (75.8% vs 45.0%), including 75+ (26.6% vs	More likely aged 65+ (34.2% vs 17.7%), including 75+ (21.7% vs	

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
		35.5% are 55+)***	65+)***	6.8%)***	8.2%)***	
Gender		More likely male (58.7% vs 47.5%)***	More likely to be female (58.2% vs 49.0%)**			More likely to be female (61.5% vs 49.4%)**
Are they *non*-religious (measured as self-reporting to be of no religion)?						
In full time work?	More likely (42.7% vs 35.7%)**	More likely (44.5% vs 37.2%)*		Less likely (25.1% vs 40.2%)***	Less likely (23.3% vs 39.4%)***	
Unemployed?	Less likely (3.4% vs 5.9%)*				More likely (9.2% vs 4.6%)*	More likely (8.0% vs 4.6%)*
Environmental values: would like to do more to help the environment		More likely (47.3% vs 32.6% would like to do a bit or a lot more for the environment)***		Less likely (71.2% vs 64.2% are happy with what they do; 2.9% vs 7.4% would like to do a lot more)**	Less likely (75.4% vs 64.4% are happy with what they do at the moment)**	
Household level						
Number of children?			More likely to have children (38.1% vs 30.7% do), especially 2+ (24.6% vs 16.2%)***	Less likely to have children (79.7% vs 66.7% have none)***		
Couple (as opposed to single)?	More likely (61.7% vs 56.0%)*				Less likely (44.2% vs 59.1%)**	
Retired household?		Less likely (7.8% vs 20.6%)***	Less likely (8.4% vs 20.3%)***	More likely (38.2% vs 16.0%)***	More likely (35.0% vs 17.4%)***	
Household size		Less likely alone, more likely 3+ (10.0% vs 19.9%; 57.7% vs 50.0%)***	More likely a large household (4+) (46.6% vs 29.6% are)***	More likely one or two persons (62.8% vs 47.0%)***	More likely one, or two, person household; less likely more than two (31.7% vs 17.4%; 35.0% vs 30.1%; 33.3% vs 52.5%)***	
Relative deprivation - higher value = more deprived	Likely to be more affluent**				Likely to be less affluent***	Likely to be less affluent**

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Simple daily showering	**Out and about washing**	**Attentive cleaning**	**Low frequency showering**	**Low frequency bathing**	**High frequency bathing**
Long term health problems or incapacities in household	Less likely (10.6% vs 14.6%)**	Less likely (9.0% vs 13.9%)*	Less likely (5.1% vs 14.5% do)***	More likely (28.6% vs 11.1%)***	More likely (23.3% vs 12.4%)***	
Home ownership status	More likely to own outright; less likely to be renting (34.6% vs 31.3%; 31.8% vs 34.8%)*	More likely to own with a mortgage; less likely to own outright (40.8% vs 28.2%; 23.8% vs 34.1%)***		More likely to own outright; less likely to rent (47.2% vs 30.5%; 22.2% vs 35.2%)***	More likely to rent; less likely to own with a mortgage (48.3% vs 32.6%; 15.0% vs 31.3%)***	More likely to rent, less likely to own, with a mortgage or outright (47.5% vs 32.0%; 49.5% vs 64.3%)***
Type of property (detached, semi, etc)					More likely terraced or flat; less likely detached or semi-detached (37.2% vs 27.8%; 20.7% vs 13.4%; 12.4% vs 19.3%; 25.6% vs 36.4%)*	
How many rooms do you have available?		Statistically significant differences but no clear pattern***			Likely to have fewer rooms (mean 6.1 vs 6.8)***	
Does your home have a water meter?	More likely (49.5% vs 43.4%)*		Less likely (36.9% vs 47.2%)**	More likely (57.2% vs 44.0%)***		Less likely (35.8% vs 46.9%)**
When/why was your water meter fitted? (for those with a water meter)		Less likely fitted voluntarily at their request; more likely prior to their arrival, or don't know (19.8% vs 31.2%; 56.2% vs 50.9%; 19.8% vs 10.5%)*	Less likely fitted voluntarily at their request; more likely compulsorily (20.7% vs 31.0%; 14.9% vs 5.9%)*	More likely fitted voluntarily at their request, or compulsorily; less likely not to know (37.5% vs 28.4%; 10.7% vs 6.2%; 4.5% vs 13.0%)*		
Do you plan or expect to have a water meter fitted in your home? (for those without a water meter)	More likely in next 1-5 years (3.3% vs 0.5%)*					

Laundry practice cluster results

Table 31 Correlations between variants of laundry practice and other variables
Statistically significant at: * 5% level; ** 1% level; *** 0.1% level

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple home laundry	**On-demand home laundry**	**Simple outsourcing**	**Attentive clean laundry**	**On-demand outsourcing**	**The hand washing**
Practices							
Frequency of washing clothes and linen					Higher than average (mean score 0.64 vs 0.58)**		
Handwashing		Less than average (76.0% vs 64.7% never handwash)***		Less than average (71.7% vs 67.4% never handwash)*		More likely to occasionally handwash rather than never or quite often*	More than average***
When do you change your clothes?	Wear same throughout the day always				Less likely (42.0% vs 50.2%)*		Less likely (34.2% vs 49.9%)**
	Change on working days, but not when not working			More likely (33.2% vs 25.6%)*	More likely (32.4% vs 25.8%)*	Less likely (19.1% vs 27.3%)*	
	Change on days not working, but not when I am working						
	Change during day to suit what I'm doing				Less likely (25.6% vs 34.0%)*		
	When I get into the house or before I leave the house			Less likely (6.3% vs 11.3%)*			
When do you wash your clothes?	All the time	More likely (17.7% vs 13.8%)*				Less likely (7.9% vs 15.6%)*	
	Weekday daytime	Less likely (15.7% vs 24.3%)***				More likely (28.5% vs 21.3%)*	
	Weekday evenings						More likely (29.1% vs 18.7%)*
	At the weekend					More likely (36.2% vs 27.8%)*	
	On the days when I am not in work						

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple home laundry	**On-demand home laundry**	**Simple outsourcing**	**Attentive clean laundry**	**On-demand outsourcing**	**The hand washing**
	Whenever I have the time	Less likely (21.3% vs 27.0%)*	More likely (31.7% vs 24.4%)*	More likely (31.8% vs 24.5%)*			
	Overnight to use cheap electricity	Less likely (1.2% vs 3.3%)*	More likely (5.3% vs 2.3%)**				
	When the pile is big enough	More likely (25.2% vs 15.9%)***				Less likely (10.6% vs 19.3%)**	
	When I run out of clothes						More likely (7.6% vs 1.3%)***
	When I have space to dry it		More likely (1.6% vs 0.5%)*				
	I do more washing when it's sunny						
	I do more washing when it's warm						
	I do more washing when it's windy			More likely (2.2% vs 0.5%)**			
Why do you wash your clothes?	Appearances					Less likely (47.7% vs 56.8%)*	
	Cleanliness			More likely important (important or stongly important for 72.6% vs 61.6%)**			More likely important (strongly important for 29.1% vs 19.4%)*
	Habit						
Why do you hand wash?	To preserve or protect clothes/items from damage	More likely (72.1% vs 61.4%)*					
	When the label on an item says it should only be handwashed	Less likely (28.1% vs 43.9%)***		More likely (54.0% vs 38.9%)*			More likely (53.2% vs 38.4%)*
	Because its quicker and more convenient						More likely (17.7% vs 8.5%)*
	Because the clothes/items are particularly dirty or stained						
	When I don't have enough clothes for a full load						

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Simple home laundry	**On-demand home laundry**	**Simple outsourcing**	**Attentive clean laundry**	**On-demand outsourcing**	**The hand washing**
	Don't own a washing machine	Less likely (0.0% vs 3.2%)					More likely (8.9% vs 1.4%)***
Wash combined (as opposed to separate or a mix of combined and separate)?		More likely (92.8% vs 85.4%)**	Less likely (78.8% vs 88.7%)***				More likely to wash only some separately (17.6% vs 8.5%)**
Washing machine frequency of use per person			Less frequent (mean 0.29 vs 0.33)**	More frequent (mean 0.35 vs 0.32)*	More frequent (mean 0.35 vs 0.32)**		
Outsourced services: Do you ever use...? (These are used in defining cluster dimensions)	A launderette	Less likely (0.0% vs 12.8%)***	Less likely (0.0% vs 10.6%)***	More likely (26.5% vs 6.7%)***	Less likely (3.2% vs 10.0%)**	More likely (31.1% vs 7.1%)***	
	A dry cleaner	Less likely (0.0% vs 41.9%)***	Less likely (0.0% vs 34.8%)***	More likely (91.5% vs 21.4%)***	More likely (37.4% vs 29.1%)*	More likely (82.1% vs 25.3%)***	
	A laundry service (door to door pick up and delivery, or drop off and pick up yourself)	Less likely (0.0% vs 1.4%)**		More likely (2.2% vs 0.8%)*		More likely (4.0% vs 0.7%)***	More likely (3.8% vs 0.9%)*
	A nappy washing service			More likely (0.9% vs 0.1%)**			
	None of the above	More likely (100.0% vs 52.3%)***	More likely (100.0% vs 60.3%)***	Less likely (0.0% vs 75.0%)***		Less likely (0.0% vs 71.8%)***	Less likely (51.9% vs 66.4%)**
Clothes washing frequency					More frequent**		
Individual level							
Age band		More likely younger (e.g. 40.8% vs 29.6% are 34 or below)***					
Gender							
Are they *non*-religious (measured as self-reporting to be of no religion)?		More likely (33.3% vs 27.3%)*					
In full time work?							Less likely (17.9% vs 39.3%)***
Unemployed?				Less likely (1.8% vs 5.4%)*			
Environmental values: would like to do more to help the environment			Less likely (e.g. 69.0% vs 64.5% are	More likely (e.g. 59.7% vs 65.9% are			

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Simple home laundry	On-demand home laundry	Simple outsourcing	Attentive clean laundry	On-demand outsourcing	The hand washing
		happy with what they do at the moment; 2.9% vs 7.5% would like to do a lot more)*	happy with what they do at the moment; 14.5% vs 5.8% would like to do a lot more)**			
Household level						
Number of children?	More likely to have dependent children (36.9% vs 29.8% do)**			More likely to have dependent children (38.1% vs 30.9% do)*		More likely to have children (43.7% vs 31.2%)*
Couple (as opposed to single)?		Less likely (49.6% vs 59.5%)**	More likely (67.6% vs 56.8%)**			
Retired household?						
Household size	More likely larger household (56.9% vs 49.0% have more than two household members)**	More likely to live alone (24.9% vs 17.3%)**			More likely to live alone (27.0% vs 17.6%)**	More likely to be two in the home (43.6% vs 29.8%), less likely to be alone (6.4% vs 18.9%), equally likey to be more than two (50.0% vs 51.3%)*
Relative deprivation - higher value = more deprived	Likely to be less affluent*	Likely to be less affluent*	Likely to be more affluent***			
Long term health problems or incapacities in household			Less likely (9.0% vs 13.7%)*			
Home ownership status		Less likely to own outright, or with a mortgage; more likely to rent (24.8% vs 33.8%; 17.5% vs 32.2%; 54.1% vs 30.5%)***	More likely to own with a mortgage; less likely to rent (43.5% vs 28.3%; 17.9% vs 35.9%)***			
Type of property (detached, semi, etc)		Less likely detached, or semi-detached; more			Less likely semi-detached; more likely terraced, or	

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Simple home laundry	On-demand home laundry	Simple outsourcing	Attentive clean laundry	On-demand outsourcing	The hand washing
		likely flats or tenement (13.4% vs 19.6%; 29.1% vs 36.8%; 25.5% vs 12.1%)***			flats or tenement (24.3% vs 36.8%; 32.9% vs 28.0%; 19.7% vs 13.4%)*	
How many rooms do you have available?	More likely more rooms (mean 6.9 vs 6.7)**	More likely fewer rooms (mean 6.1 vs 6.8)***	More likely more rooms (mean 7.3 vs 6.7)***			
Does your home have a water meter?	More likely (51.0% vs 43.6%)**				Less likely (29.4% vs 47.2%)***	
When/why was your water meter fitted? (for those with a water meter)						
Do you plan or expect to have a water meter fitted in your home? (for those without a water meter)						More likely, but unclear when (23.7% vs 9.6% have plans to, but most of this group don't know when)***

Gardening practice cluster results

Table 32 Correlations between variants of garden practice and other variables
Statistically significant at: * 5% level; ** 1% level; *** 0.1% level

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
Practices - underlying variables for the clustering dimensions						
Frequency						
Do you water your garden plants, lawn or fruit and vegetables? 0 indicates no; 1 indicates yes	Does water (top frequency score)***	Does water (top frequency score)***	Does water (top frequency score)***	Does not water (bottom frequency score)***	Does water (top frequency score)***	Does not water (bottom frequency score)***

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	**Casual gardening**	**Green fingered gardening**	**Hands-off gardening**	**High tech gardening**	**Nothing to water**
Diversity/ complexity							
Number of factors which influence the timing of watering: (top coded) 0 indicates none; 1 indicates 3 or more		Middle to high number of factors affect timing of watering (moderate to high diversity score) (on average higher)*	Middle to high number of factors affect timing of watering (moderate to high complexity score) (on average lower)***	Middle to high number of factors affect timing of watering (moderate to high complexity score) (no different to average)	-	Middle to high number of factors affect timing of watering (moderate to high complexity score) (no different to average)	-
Number of factors which influence the timing of watering: (NOT top coded)		Between 1 and 3, usually 1. Higher than average (58.0% vs 66.5% have only 1 criterion)*	Between 1 and 6, usually 1. Lower than average (71.2% vs 61.5% have 1 criterion)***	Between 1 and 3, usually 1. Not different to average	-	Between 1 and 6, usually 1. Higher than average (62.0% vs 67.3% have 1 criterion)*	-
When do you water your outdoor plants, lawn and fruit and vegetables?	Not water - wait for rain						
	Water on a regular schedule				-		-
	Water when look wilted	More likely (46.3% vs 32.2%)*			-		-
	Water when soil looks dry				-		-
	Water when hasn't rained for a while				-		-
	Water when has rained but not enough				-		-
	Water when warm			Less likely (1.0% vs 6.2%)*	-	More likely (8.2% vs 4.2%)*	-
	Water when remember				-		-
	Water when asked/told				-		-
	Don't know				-		-
Technology							
Water using technology approximately rated based on relative potential water flow rate (average rating of the technology used on the lawn, garden plants, and fruit and veg)		Moderate to low technology (lower than average)***	Low technology use (97.2% vs 30.4% use jug or watering can)***	Usually low technology use in watering (usually low technology score, but full	-	Moderate to high technology used in watering - hosepipes with triggers and	-

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Amateur enthusiastic gardening	**Casual gardening**	**Green fingered gardening**	**Hands-off gardening**	**High tech gardening**	**Nothing to water**
			range present) (84.8% vs 53.7% use jug or watering can)***		sprinklers, up to automatic irrigation systems (moderate to high technology score) (higher than average)***	
Water using technology approximately rated for garden plants	Moderate to low technology (76.5% vs 58.8% use jug or watering can)***	Low technology (99.0% vs 33.9% use jug or watering can)***	More likely low technology but full range present (86.2% vs 57.2% use jug or watering can)***	-	Usually moderate technology but full range present (86.4% use hosepipes with or without triggers)***	-
Water using technology approximately rated for lawn		Low technology (93.7% vs 25.2% use jug or watering can)***	Low to moderate technology (hose pipe) (91.9% vs 39.9%% use jug or watering can)**	-	Usually moderate technology but full range present (96.6% use hosepipes with or without triggers or sprinklers)***	-
Water using technology approximately rated for fruit and veg	Moderate to low technology (87.5% vs 57.6% use jug or watering can)***	Low technology (100.0% vs 42.3% use jug or watering can)***	Low to moderate technology (sprinkler) (90.0% vs 56.1% use jug or watering can)***	-	Usually moderate technology but full range present (81.0% use hosepipes with or without triggers)***	-
Efficiency of home mains water use						
Efficiency of home mains water use (average rating of the water source used on the lawn, garden plants, and fruit and veg): 0 indicates mains water use; 0.5 indicates mix water butt/mains; 1 indicates water butt or recycled	Mix of water butt and mains water (moderate efficiency scores)***	Mains water (99.7% vs 55.0% use only mains) (low efficiency scores)***	Almost always water butt or recycled water (high efficiency score) (84.0% vs 0.0% use all water butt/recycled)***	-	Almost always mains water (usually low efficiency scores) (90.7% vs 63.9% use all mains water)***	-

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	**Casual gardening**	**Green fingered gardening**	**Hands-off gardening**	**High tech gardening**	**Nothing to water**
Efficiency of home mains water use for garden plants		More likely moderate efficiency, less likely low (81.2% vs 3.4%; 5.0% vs 82.3%)***	Low efficiency - mains water used (by 99.7% vs 56.2%)***	Almost always water butt or recycled water (by 98.9% vs 2.1%)***	-	Almost always mains water (used by 91.1% vs 65.0%)***	-
Efficiency of home mains water use for lawn		More likely moderate efficiency, less likely low (58.6% vs 1.8%; 27.6% vs 484.6%)***	Low efficiency - mains water used (by 100.0% vs 69.8%)***	Always water butt or recycled water (by 100.0% vs 2.2%)***	-	Almost always mains water (used by 95.9% vs 64.0%)***	-
Efficiency of home mains water use for fruit and veg		More likely moderate efficiency; less likely low or high (75.0% vs 2.3%; 19.6% vs 79.9%; 5.4% vs 17.8%)***	Low efficiency - mains water used (by 100.0% vs 58.2%)***	Almost always water butt or recycled water (by 98.6% vs 0.8%)***	-	Almost always mains water (used by 95.2% vs 57.9%)***	-
How do you water your garden plants?	Garden plants: jug or other small container		More likely (17.8% vs 4.4%)***	Less likely (4.0% vs 10.7%)*	-	Less likely (4.3% vs 13.0%)***	-
	Garden plants: watering can or bucket	Less likely (29.6% vs 52.6%)***	More likely (81.9% vs 27.9%)***	Less likely (26.5% vs 53.5%)***	-	Less likely (28.0% vs 62.6%)***	-
	Garden plants: hosepipe without a trigger gun	Less likely (3.7% vs 20.4%)***	Less likely (0.3% vs 31.4%)***	Less likely (6.1% vs 20.4%)***	-	More likely (48.4% vs 2.0%)***	-
	Garden plants: hosepipe with a trigger gun		Less likely (0.6% vs 30.1%)***	Less likely (7.1% vs 19.5%)**	-	More likely (41.6% vs 4.8%)***	-
	Garden plants: sprinkler		Less likely (0.0% vs 5.7%)***		-	More likely (7.9% vs 0.6%)***	-
	Garden plants: seep hoses				-	More likely (1.4% vs 0.2%)*	-
	Garden plants: an automatic irrigation or reticulation system, timed sprinklers,		Less likely (0.0% vs 1.3%)*		-	More likely (2.2% vs 0.2%)**	-
	Garden plants: there is always		Less likely (0.3% vs	More likely	-	Less likely (1.1% vs	-

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
	enough water in the water butt - i do not need to		19.6%)***	(77.8%vs 2.1%)***		17.4%)***	
	Garden plants: there is not always enough water in the water butt - sometimes we	More likely (80.2% vs 4.0%)***	Less likely (0.3% vs 20.0%)***		-	Less likely (7.6% vs 14.2%)**	-
	Garden plants: by hand (in buckets, bowls etc)		Less likely (0.0% vs 4.4%)***	More likely (16.3% vs 0.6%)***	-	Less likely (0.0% vs 4.0%)***	-
	Garden plants: a proper grey or black water recycling system			More likely (4.0% vs 0.1%)***	-		-
	Garden plants: other				-		-
	Garden plants: don't know				-		-
How do you water your lawn?	Lawn: jug or other small container		More likely (5.0% vs 0.4%)***		-	Less likely (0.4% vs 3.6%)**	-
	Lawn: watering can or bucket	Less likely (3.7% vs 15.0%)**	More likely (23.1% vs 7.4%)***	Less likely (6.1% vs 15.1%)*	-	Less likely (9.3% vs 16.4%)**	-
	Lawn: hosepipe without a trigger gun	Less likely (3.7% vs 10.6%)*	Less likely (0.6% vs 16.1%)***	Less likely (1.0% vs 11.2%)**	-	More likely (25.4% vs 1.2%)***	-
	Lawn: hosepipe with a trigger gun		Less likely (0.9% vs 13.1%)***	Less likely (2.0% vs 9.0%)*	-	More lilkey (19.0% vs 2.0%)***	-
	Lawn: sprinkler		Less likely (0.3% vs 7.2%)***	Less likely (0.0% vs 5.0%)*	-	More likely (10.8% vs 0.8%)***	-
	Lawn: seep hoses				-		-
	Lawn: an automatic irrigation or reticulation system, timed sprinklers,				-		-
	Lawn: there is always enough water in the water butt - i do not need to		Less likely (0.0% vs 6.8%)***	More likely (25.3% vs 0.9%)***	-	Less likely (0.4% vs 6.0%)***	-
	Lawn: there is not always enough water in the water butt - sometimes we	More likely (20.7% vs 1.0%)***	Less likely (0.0% vs 5.2%)***		-		-
	Lawn: by hand (in buckets, bowls etc)		Less likely (0.0% vs 2.8%)**	More likely (12.1% vs 0.1%)***	-	Less likely (0.4% vs 2.6%)*	-

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
	Lawn: a proper grey or black water recycling system				-		-
	Lawn: other				-		-
	Lawn: don't know		More likely (63.9%vs 47.7%)***		-	Less likely (43.0% vs 60.7%)***	-
How do you water your fruit and veg?	Fruit and veg: jug or other small container		More likely (6.9% vs 1.3%)***		-	Less likely (1.1% vs 5.0%)**	-
	Fruit and veg: watering can or bucket		More likely (39.7% vs 15.9%)***	Less likely (12.2% vs 27.6%)**	-	Less likely (15.4% vs 30.4%)***	-
	Fruit and veg: hosepipe without a trigger gun	Less likely (0.0% vs 10.5%)**	Less likely (0.0% vs 15.9%)***	Less likely (2.0% vs 10.4%)**	-	More likely (25.4% vs 0.4%)***	-
	Fruit and veg: hosepipe with a trigger gun		Less likely (0.0% vs 18.1%)***	Less likely (4.1% vs 11.6%)*	-	More likely (25.9% vs 2.0%)***	-
	Fruit and veg: sprinkler		Less likely (0.0% vs 3.5%)***		-	More likely (5.4% vs 0.2%)***	-
	Fruit and veg: seep hoses				-		-
	Fruit and veg: an automatic irrigation or reticulation system, timed sprinklers,				-	More likely (1.1% vs 0.0%)*	-
	Fruit and veg: there is always enough water in the water butt - i do not need to		Less likely (0.0% vs 12.6%)***	More likely (54.5% vs 0.6%)***	-	Less likely (0.4% vs 11.6%)***	-
	Fruit and veg: there is not always enough water in the water butt - sometimes we	More likely (51.9% vs 1.4%)***	Less likely (0.0% vs 11.4%)***	Less likely (2.0% vs 7.4%)*	-	Less likely (2.9% vs 8.8%)**	-
	Fruit and veg: by hand (in buckets, bowls etc)		Less likely (0.0% vs 3.3%)**	More likely (14.3% vs 0.1%)***	-	Less likely (0.0% vs 3.0%)**	-
	Fruit and veg: a proper grey or black water recycling system				-		-
	Fruit and veg: other				-		-
	Fruit and veg: don't know	Less likely (26.8% vs 41.1%)*	More likely (49.7% vs 32.5%)***	Less likely (28.6% vs 41.2%)*	-		-

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
Practices - practice variables *not* used for the clustering dimensions							
Does you home have...?	Back garden	More likely (100% vs 85.4%)***	More likely (96.9% vs 83.7%)***	More likely (98.0% vs 85.3%)***	More likely (96.8% vs 83.8%)***	More likely (97.8% vs 83.9%)***	Less likely (67.3% vs 96.9%)***
	Front garden (including gardens, hard standing and parking areas)	More likely (93.8% vs 75.4%)***	More likely (85.0% vs 74.3%)***	More likely (91.9% vs 75.3%)***	More likely (87.9% vs 73.8%)***	More likely (92.1% vs 73.3%)***	Less likely (55.5% vs 88.3%)***
	Patio or smaller yard	More likely (55.6% vs 28.0%)***	More likely (39.1% vs 27.1%)***	More likely (45.5% vs 28.3%)***	More likely (34.4% vs 28.2%)*	More likely (41.6% vs 27.0%)***	Less likely (12.4% vs 39.1%)***
	Balcony				Less likely (0.3% vs 3.4%)**		More likely (4.2% vs 1.9%)**
	Decking	More likely (14.8% vs 7.2%)*			More likely (13.7% vs 6.2%)***		Less likely (3.0% vs 10.2%)***
	None of the above	Less likely (0.0% vs 10.1%)**	Less likely (0.0% vs 11.7%)***	Less likely (0.0% vs 10.2%)***	Less likely (0.3% vs 11.6%)***	Less likely (0.7% vs 11.3%)***	More likely (25.3% vs 0.6%)***
Do you have...?	outdoor tap	More likely (90.1% vs 58.3%)***		More likely (76.8% vs 58.7%)***		More likely (89.6% vs 54.2%)***	Less likely (38.0% vs 72.2%)***
	hosepipe	More likely (81.7% vs 53.3%)***		More likely (68.7% vs 53.8%)**		More likely (92.8% vs 47.6%)***	Less likely (30.1% vs 68.8%)***
	high pressure hose or jet hose	More likely (22.2% vs 8.7%)***				More likely (16.1% vs 8.0%)***	Less likely (5.0% vs 11.7%)***
	swimming pool (permanent)						More likely (0.8% vs 0.4%)*
	swimming pool (temporary)		Less likely (0.0% vs 1.1%)*		More likely (1.9% vs 0.7%)*		
	jacuzzi or spa (including jacuzzi baths and hot tubs)					More likely (3.2% vs 0.5%)***	
	garden pond	More likely (21.0% vs 7.0%)***		More likely (15.2% vs 7.2%)**		More likely (13.6% vs 6.5%)***	Less likely (2.4% vs 10.6%)***
	garden water feature (eg. fountain etc)	More likely (19.5% vs 4.0%)***		More likely (11.1% vs 4.3%)***		More likely (8.3% vs 4.0%)***	Less likely (0.6% vs 7.0%)***
	children's outdoor water toys (eg. paddling pools, water slides, water guns etc.)			More likely (9.2% vs 5.5%)*			Less likely (3.5% vs 6.9%)***
	water in your garden for birds	More likely (28.0% vs 12.4%)***		More likely (34.3% vs 11.9%)***		More likely (25.0% vs 11.0%)***	Less likely (2.3% vs 19.4%)***

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
	or other animals						
	automatic reticulation (garden irrigation) or garden sprinkler	More likely (6.1% vs 1.4%)**				More likely (5.0% vs 0.9%)***	Less likely (0.3% vs 2.3%)***
Number of different (non car park) uses to which garden is put (not top coded)		Higher (mean 2.3 vs 1.3, 1.2% vs 26.7% report none)***	Higher (mean 1.8 vs 1.3; 4.0% vs 30.2% report none)***	Higher (mean 2.1 vs 1.3; 4.1% vs 26.8% report none)***	Higher (mean 1.5 vs 1.3; 9.2% vs 29.0% report none)***	Higher (mean 2.2 vs 1.2; 1.4% vs 30.0% report none)***	Lower (mean 0.5 vs 1.9; 59.4% vs 6.0% report none)***
Would you describe your outdoor space as...?	A playground for children						
	A place to grow food, fruit and vegetables	More likely (42.0% vs 21.3%)***		More likely (50.5% vs 20.4%)***		More likely (40.4% vs 18.5%)***	Less likely (1.9% vs 30.6%)***
	A place for flowers and plants	More likely (90.1% vs 55.7%)***	More likely (81.1% vs 51.6%)***	More likely (80.4% vs 56.0%)***	More likely (68.7% vs 54.7%)***	More likely (84.8% vs 51.7%)***	Less likely (8.4% vs 77.7%)***
	An outdoor living area/outdoor room	More likely (48.8% vs 34.7%)**			Less likely (27.2% vs 37.5%)***	More likely (42.8% vs 33.9%)**	
	A place for birds and other wild animals	More likely (34.1% vs 13.9%)***		More likely (27.6% vs 14.1%)***		More likely (26.7% vs 12.4%)***	Less likely (3.4% vs 19.6%)***
	A place to keep pets or other animals					More likely (10.5% vs 4.2%)***	Less likely (0.9% vs 7.3%)***
	Still being developed				More likely (3.8% vs 1.6%)*	Less likely (0.4% vs 2.4%)*	
	A car parking space		Less likely (16.1% vs 24.0%)**			More likely (30.7% vs 20.7%)***	
	No clear used for anything	Less likely (1.2% vs 11.4%)**	Less likely (1.6% vs 13.1%)***	Less likely (1.0% vs 11.4%)**	Less likely (7.1% vs 11.7%)*	Less likely (0.4% vs 13.0%)***	More likely (28.8% vs 3.4%)***
	Don't know						More likely (1.9% vs 0.2%)***
Do you do any of these for spring and summer months...?	Clean the outside windows of your house, conservatory or greenhouse				Less likely (31.1% vs 37.2%)*		
	Hose walls, driveways, paths, patios or pavements					More likely (14.7% vs 4.7%)***	Less likely (4.0% vs 7.5%)**
	Pressure hose walls, driveways, paths, patios or pavements	More likely (8.5% vs 3.8%)*				More likely (10.1% vs 2.7%)***	Less likely (1.2% vs 5.2%)***
	Wash cushions for outdoor						

Dimension or type of factor; variable/survey question, and response options for multiple response questions		Cluster					
		Amateur enthusiastic gardening	**Casual gardening**	**Green fingered gardening**	**Hands-off gardening**	**High tech gardening**	**Nothing to water**
	furniture						
	Wash the garden furniture itself (seats, benches, tables and loungers, for example)	More likely (13.6% vs 7.3%)*	More likely (10.6% vs 6.9%)*			More likely (14.8% vs 6.1%)***	Less likely (2.4% vs 9.9%)***
	Plant annuals / bedding plants	More likely (42.0% vs 16.8%)***	More likely (25.9% vs 16.1%)***	More likely (26.3% vs 17.5%)*		More likely (33.9% vs 14.9%)***	Less likely (0.8% vs 25.6%)***
	Tidy up the garden		More likely (62.5% vs 54.6%)*		More likely (62.5% vs 54.7%)*	More likely (67.9% vs 53.7%)***	Less likely (40.6% vs 62.9%)***
	Don't know	Less likely (12.3% vs 24.3%)*				Less likely (13.0% vs 25.9%)***	More likely (35.0% vs 18.8%)***
Individual level							
Age band		More likely older (53.8% vs 31.2% are aged 55+, 11.3% vs 33.8% are 34 or under)***	Less likely younger (26.4% vs 34.1% are 34 or below)*	More likely older (42.1% vs 17.5% are 65+; 9.5% vs 34.1% are 34 or below)***		More likely older (46.2% vs 29.7% are 55+; 21.6% vs 34.9% are 34 or below)***	More likely younger (44.6% vs 25.8% are 34 or under; 20.0% vs 39.4% are 55+)***
Gender				More likely female (64.6% vs 49.9%)**			More likely male (52.3% vs 47.5%)*
Are they *non*-religious (measured as self-reporting to be of no religion)?							
In full time work?				Less likely (25.5% vs 39.1%)**			More likely (44.2% vs 34.9%)***
Unemployed?			Less likely (1.9% vs 5.7%)**				More likely (8.2% vs 3.1%)***
Environmental values: would like to do more to help the environment					More likely happy with what they do (75.6% vs 62.9% are)***	More likely to want to do more (56.0% vs 66.8% are happy with what they do)***	
Household level							
Number of children?		More likely none (76.8% vs 67.8%)**		More likely none (80.8% vs 67.5%)*		More likely none (77.3% vs 66.6%)***	More likely to have (37.1% vs 28.7% do)***
Couple (as opposed to single)?		More likely (80.5% vs 57.1%)***		More likely (70.4% vs 57.4%)*	Less likely (50.0% vs 59.9%)**	More likely (70.3% vs 55.9%)***	Less likely (51.2% vs 62.1%)***

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
Retired household?	More likely (32.9% vs 17.9%)***	More likely (22.5% vs 17.7%)*	More likely (39.8% vs 17.3%)***		More likely (22.9% vs 17.8%)*	Less likely (9.1% vs 24.1%)***
Household size	More likely two (41.5% vs 29.9%)**		More likely 1 or 2 people (67.7% vs 47.6%)**			
Relative deprivation - higher value = more deprived	Likely more affluent***	Likely more affluent *	Likely more affluent***		Likely more affluent***	More likely less affluent***
Long term health problems or incapacities in household						
Home ownership status	More likely to own outright, or with a mortgage; less likely to rent (47.6% vs 31.8%; 41.5% vs 29.7%; 11.0% vs 34.8%)***	More likely to own outright, or with a mortgage; less likely to rent (35.6% vs 31.8%; 39.7% vs 28.2%; 22.8% vs 36.1%)***	More likely to own outright; less likely to rent (56.6% vs 31.3%; 15.2% vs 34.8%)***		More likely to own outright, or with a mortgage; less likely to rent (49.8% vs 29.3%; 36.9% vs 28.9%; 10.8% vs 37.9%)***	Less likely to own outright, or with a mortgage; more likely to rent (17.7% vs 41.0%; 22.1% vs 34.9%; 54.5% vs 21.6%)***
Type of property (detached, semi, etc)	More likely detached, or semi-detached; less likely terrace or flat (36.6% vs 17.9%; 47.6% vs 35.2%; 13.4% vs 29.2%; 1.2% vs 14.5%)***	More likely detached, or semi-detached; less likely flat (21.9% vs 18.1%; 39.7% vs 34.8%; 6.9% vs 15.5%)**	More likely detached, or semi-detached; less likely terrace or flat (33.0% vs 17.9%; 44.0% vs 35.2%; 16.0% vs 29.2%; 6.0% vs 14.4%)***	More likely semi-detached or terraced; less likely flats or detached (43.5% vs 34.0%; 33.7% vs 27.4%; 6.0% vs 15.6%; 15.9% vs 19.4%)***	More likely detached, or semi-detached; less likely terrace or flat (28.7% vs 17.0%; 47.0% vs 33.7%; 21.9% vs 29.7%; 1.4% vs 16.2%)***	Less likely detached, or semi-detached; more likely flats or tenements, or terraced (9.7% vs 24.0%; 23.2% vs 43.0%; 29.2% vs 5.1%; 31.8% vs 26.5%)***
How many rooms do you have available?	More likely larger (mean 7.3 vs 6.7)**	More likely larger (mean 7.0 vs 6.7)**	More likely larger (mean 7.3 vs 6.7)**		More likely larger (mean 7.9 vs 6.5)***	More likely smaller (mean 6.1 vs 7.1)***
Does your home have a water meter?			More likely (60.8% vs 44.7%)**	Less likely (39.6% vs 47.0%)*		
When/why was your water meter fitted? (for those with a water meter)	More likely fitted at own request, less likely other options (55.8% vs 29.1%)**		More likely fitted at own request (42.4% vs 28.7%)*		More likely compulsorily fitted; less likely other options (13.9% vs	Less likely fitted at own request, or compulsorily; more likely prior to their

Dimension or type of factor; variable/survey question, and response options for multiple response questions	Cluster					
	Amateur enthusiastic gardening	Casual gardening	Green fingered gardening	Hands-off gardening	High tech gardening	Nothing to water
					5.5%)*	moving in or don't know (19.6% vs 34.9%; 1.6% vs 9.6%; 78.8% vs 55.5%)***
Do you plan or expect to have a water meter fitted in your home? (for those without a water meter)			More likely (34.2% vs 9.2% are planning to)***			Less likely (85.5% vs 77.2% have no plans)***

References

Aldenderfer, M. S. R., & Blashfield, R. K. (1984). *Cluster Analysis*. London: Sage Publications.

Allon, F., & Sofoulis, Z. (2006). Everyday Water: cultures in transition. *Australian Geographer, 37*(1), 45-55.

Alvesson, H. M., & Sköldberg, K. (2009). *Reflexive methodology: New vistas for qualitative research*. London: Sage.

Blaikie, N. W. H. (1991). A critique of the use of triangulation in social research. *Quality & Quantity, 25*(2), 115-136.

BMG Research. (2011). *Lancaster ARCC Water Survey [Technical Report]*. Birmingham: BMG Research.

Boroughs, M., Cafri, G., & Thompson, J. K. (2005). Male Body Depilation: Prevalence and Associated Features of Body Hair Removal. *Sex Roles, 52*(9), 637-644.

Browne, A. L., Medd, W., & Anderson, B. (2013). Developing Novel Approaches to Tracking Domestic Water Demand Under Uncertainty—A Reflection on the "Up Scaling" of Social Science Approaches in the United Kingdom. *Water Resources Management, 27*(4), 1013-1035.

Browne, A. L., Medd, W., Pullinger, M., & Anderson, B. (in press 2013). Distributed demand and the sociology of water efficiency In J. Balnave (Ed.), *Water efficiency in the built environment: A review of theory and practice*. UK: University of Brighton

Browne, A. L., Pullinger, M., Anderson, B., & Medd, W. (2013). *Patterns of Water: Resource Pack*. Lancaster, United Kingdom: Lancaster University

Burns, R. P., & Burns, R. (2008). *Business research methods and statistics using SPSS*. London: Sage.

Chappells, H., Medd, W., & Shove, E. (2011). Disruption and change: drought and the inconspicuous dynamics of garden lives. *Social & Cultural Geography, 12*(7), 701-715.

Collier, A., Cotterill, A., Everett, T., Muckle, R., Pike, T., & Vanstone, A. (2010). *Understanding and influencing behaviours: A review of social research, economics and policy making in DEFRA*. London: DEFRA.

Critchley, R., & Phipps, D. (2007). *Water and energy efficient showers: Project report*. UK.

DEFRA. (2008a). *A framework for pro-environmental behaviours [report]*. London: DEFRA (Department for Environment Food and Rural Affairs)

DEFRA. (2008b). *Future Water The Government's water strategy for England*
Norwich: HM Government and DEFRA/Department of Environment, Food and Rural Affairs.

Doyle, R., & Davies, A. (2012). *Transition framework: Towards future practices of sustainable washing [Consensus Report].* . Dublin: Trinity College Dublin.

Drinking Water Inspectorate. (2010). What do I do if my water has an objectionable smell or taste? In D. W. Inspectorate (Ed.). London

Environment Agency. (2009). *Water for people and the environment: Water resources strategy for England and Wales*. Bristol, UK: Environment Agency.

Eshghi, A., Haughton, D., Legrand, P., Skaletsky, M., & Woolford, S. (2011). Identifying groups: A comparison of methodologies. *Journal of Data Science, 9*, 271-291.

Geels, F. (2005). Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850–1930)—a case study in multi-level perspective. *Technology in Society 27*, 363–397.

Gram-Hanssen, K. (2007). Teenage consumption of cleanliness: how to make it sustainable? *Sustainability: Science, Practice, & Policy, 3*(2).

Halkier, B., Katz-Gerro, T., & Marteens, L. (2011). Applying practice theory to the study of consumption: Theoretical and methodological considerations. *Journal of Consumer Culture, 11*, 3-13.

Hand, M., Shove, E., & Southerton, D. (2005). Explaining Showering: a Discussion of the Material, Conventional, and Temporal Dimensions of Practice. *Sociological Research Online, 10*(2).

Hartmann, A. A. (1979). Daily bath and its effect on the normal skin flora: quantitative and qualitative investigations of the aerobic skin flora. *Archives of Dermatological Research, 265*, 153-164.

Hitchings, R. (2012). People can talk about their practices. *Area, 44*(1), 61-67.

Horne, R., Maller, C., & Lane, R. (2011). Remaking home: The reuse of goods and materials in Australian households. In R. Lane & A. Gorman-Murray (Eds.), *Material geographies of household sustainability* (pp. 89-111). UK: Ashgate.

Ipsos Mori. (2007). *Public acceptability of water efficiency scenarios [Report prepared for the Environment Agency]*. London.

Jack, T. (2012). *Nobody was dirty: Intervening in inconspicuous consumption of laundry routines*. Paper presented at the 15th European Roundtable on Sustainable Consumption and Production (ERSCP), May 2-4 2012.

Kelly, J. G. (2003). Science and community psychology: Social norms for pluralistic inquiry. *American Journal of Community Psychology, 31*, 213-217.

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? [doi: 10.1080/13504620220145401]. *Environmental Education Research, 8*(3), 239-260.

Kuijer, L., & De Jong, A. (2011). *Practice theory and human-centered design: A sustainable bathing example.* Paper presented at the Nordes 2011, School of Art and Design, Aalto University, Helsinki, Finland.

Kuijer, L., & De Jong, A. (2012). Identifying opportunities for reduced household resource consumption: Exploring practices of thermal comfort. *Journal of Design Research, 10*(1/2), 67-85.

Kuijer, L., McHardy, J., & Scott, K. (2010). *The challenge of the bucket wash: Creating desirable sustainable practices.* Paper presented at the 7th International Conference on Design & Emotion, IIT Institute of Design, Chicago.

Larson, E. (2001). Hygiene of the skin: When is clean too clean? *Emering Infectious Diseases, 7*(2), 225-230.

Leonard, S. T., & Droege, M. (2008). The uses and benefits of cluster analysis in pharmacy research. *Research in Social and Administrative Pharmacy, 4*, 1-11.

Market Transformation Programme. (2008). *BNW16: A comparison of manual washing-up with a domestic dishwasher. Version 2.5. Retrieved 14th Sept 2012 from www.efficient-products.defra.gov.uk/spm/download/document/id/598*. UK: Market Transformation Programme. .

McDonald, A. T., Butler, D., & Ridgewell, C. (2011). Water demand: Estimation, forecasting and management In D. A. Savic & J. K. Banyard (Eds.), *Water distribution systems* (pp. 49-71). London: ICE Publishing.

Medd, W., & Chappells, H. (2008). *Drought and demand in 2006: Consumers, water companies and regulators [Final Report]*. Lancaster, UK: Lancaster University

Medd, W., & Shove, E. (2006). *The sociology of water use*. Lancaster, UK: Lancaster University

Onwuegbuzie, A. J., & Leech, N. L. (2005). On Becoming a Pragmatic Researcher: The Importance of Combining Quantitative and Qualitative Research Methodologies. [doi: 10.1080/13645570500402447]. *International Journal of Social Research Methodology, 8*(5), 375-387.

Park, A., Clery, E., Curtice, J., Phillips, M., & Utting, D. (Eds.). (2012). *British Social Attitudes 28*. London: Sage.

Parker, J. M., & Wilby, R. L. (2013). Quantifying household water demand: A review of theory and practice in the UK. *Water Resources Management, 27*(4).

Pink, S. (2012). *Situating everyday life: Practices and places*. UK: Sage.

Pompper, D. (2010). Masculinities, the Metrosexual, and Media Images: Across Dimensions of Age and Ethnicity. *Sex Roles, 63*(9), 682-696.

Poon, J. P. H. (2005). Quantitative methods: not positively positivist *Progress in Human Geography, 29*(6), 766-772.

Quitzau, M.-B., & Ropke, I. (2009). Bathroom transformation: From hygine to well-being? *Home Cultures, 6*(3), 219-242.

Retallack, G. B. (1999). Razors, shaving and gender construction: An inquiry into the material culture of shaving *Material History Review, 49*, 4-19.

Rogers, H. R. (2001). *Factors causing off-taste in waters, and methods, and practices for the removal of off-taste and its causes [Report No. DETR/DWI 5008/1]*. Buckinghamshire, UK: WRc Plc.

Russell, S., & Fielding, K. (2010). Water demand management research: A psychological perspective. *Water Resources Research, 46*, -.

Russell, S., Lux, C., & Hampton, G. (2009). Beyond "information": Integrating consultation and education for water recycling initiatives. *Society & Natural Resources, 22*(1), 56-65.

Schatzki, T. R., Knorr-Cetina, K., & von Savigny, E. (Eds.). (2001). *The practice turn in contemporary theory*. London: Routledge.

Scott, K., Bakker, C., & Quist, J. (2012). Designing change by living change. *Design Studies, 33*(3), 279-297.

Sharp, L., McDonald, A. T., Sim, P., Knamiller, C., Sefton, C., & Wong, S. (2011). Positivism, post-positivism and domestic water demand: Interrelating science across the paradigmatic divide. *Transactions of the Institute of British Geographers, 36*(4), 501-515.

Shove, E. (2003). *Comfort, cleanliness and convenience*. Oxford, UK: Berg.

Shove, E. (2010). Beyond the ABC: Climate change policy and theories of social change. *Environment and Planning A, 42*, 1273 - 1285.

Shove, E. (2011). On the difference between chalk and cheese-a response to Whitmarsh et al's comments on "Beyond the ABC: climate change policy and theories of social change". *Environment and Planning A, 43*(2), 262-264.

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes*. London: Sage.

Shugart, H. (2008). Managing Masculinities: The Metrosexual Moment. [doi: 10.1080/14791420802206833]. *Communication and Critical/Cultural Studies, 5*(3), 280-300.

Sofoulis, Z. (2005). Big water, everday water: A sociotechnical perspective. *Continuum: Journal of Media and Cultural Studies, 19*(4), 445-463.

Sofoulis, Z. (2011a). *Cross-connections: linking urban water managers with humanities, arts and social science researchers [Waterlines report No. 60 October 2011]*. Canberra: National Water Commission, Australian Government

Sofoulis, Z. (2011b). Skirting complexity: The retarding quest for the average water user. *Continuum: Journal of Media and Cultural Studies, 25*(6), 795-810.

Strang, V. (2004). *The meaning of water*. Oxford, UK: Berg.

Strengers, Y. (2011). Negotiating everyday life: The role of energy and water consumption feedback. *Journal of Consumer Culture, 11*(19), 319-338.

Strengers, Y., & Maller, C. J. (2012). Materialising energy and water resources in everyday practices: insights for securing supply systems. *Global Environmental Change, online first/in press* http://dx.doi.org/10.1016/j.gloenvcha.2012.04.004.

Syme, G. J., Nancarrow, B. E., & Seligman, C. (2000). The Evaluation of Information Campaigns to Promote Voluntary Household Water Conservation. *Evaluation Review, 24*, 539-578.

Tan, P. N., Steinbach, M., & Kumar, V. (2006). *Introduction to data mining*. Boston: Pearson Addison Wesley.

Taylor, V., & Trentmann, F. (2011). Liquid politics: Water and the politics of everyday life in the modern cityy. . *Past and Present, 211*, 199-241.

Trentmann, F., & Taylor, V. (2006). From users to consumers: Water politics in nineteenth-century London. In F. Trentmann (Ed.), *The making of the consumer: Knowledge, power and identity in the modern world* (pp. 53-79). Oxford, UK: Berg.

Uprichard, E., Burrows, R., & Byrne, D. (2008). SPSS as an 'inscription device': from causality to description? *The Sociological Review, 56*(4), 606-622.

Walker, G. (2009a). *Evaluation of the water saving potential of social housing stock in the Greater London Area*. London: The Waterwise Project.

Walker, G. (2009b). *A Review: The Water and Energy Implications of Bathing and Showering Behaviours and Technologies*. London: Waterwise

Warde, A. (2005). Consumption and Theories of Practice. *Journal of Consumer Culture, 5*, 131-153.

Warde, A., Cheng, S.-L., Olsen, W., & Southerton, D. (2007). Changes in the Practice of Eating: A Comparative Analysis of Time-Use. *Acta Sociologica, 50*(4), 363-385.

Warde, A., & Martens, L. (2000). *Eating out: Social differentiation, consumption and pleasure*. Cambridge University Press: Cambridge.

Warde, A., & Southerton, D. (Eds.). (2012). *'The habits of consumption'. COLLeGIUM of Studies Across Disciplines in the Humanities and Social Sciences, Volume 12 [Open Access Ebook from http://www.helsinki.fi/collegium/e-series/volumes/volume_12/index.htm]*. .

Waterwise. (2011). *Exploring the potential for smarter demand management: Forecasting and targeted interventions [Discussion Paper for WWF's Itchen Initiative]*. London: Waterwise.

Waterwise. (2012). Water efficient car washing: hose vs. bucket. Retrieved 14th Sept from http://www.waterwise.org.uk/news.php/24/water-efficient-car-washing-hose-vs.-bucket.