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Dirtying Linen: Re-evaluating the sustainability of domestic laundry

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ABSTRACT

In tackling and negotiating responsibility for anthropogenic climate change, governments and businesses are increasingly concerned with shaping ‘consumer behaviour’, understood broadly as the ways in which people acquire, appropriate and appreciate goods and services. One intervention considered successful in this respect has been that of encouraging the low-temperature washing of laundry in the UK in the last decade. This paper draws on data from a quantitative survey of laundry practices conducted in Britain in 2013 ($N=1502$) in order to situate the intervention, and the phenomenon of low-temperature washing, in its wider socio-cultural context. Our starting point is that laundry habits are a useful example of a household practice in which changes in consumer behaviour have occurred, yet which continue to be increasingly environmentally problematic. Our analysis examines the use of washing machines and the temperature at which people do their laundry in detail; however, it also explores the broader processes through which clothing and other items become designated ‘dirty’ and go on to become ‘clean’. We argue that, in contrast to the well-documented hegemonic position of the washing machine in UK homes, there is much diversity in how households organize the other tasks involved in doing laundry, particularly in separating, sorting and drying, with important implications for energy use. To conclude, we reconsider low-temperature washing as an intervention, and outline some policy implications of a more thorough understanding of how laundry, and domestic consumption more generally, is currently handled in the UK. © 2016 The Authors. *Environmental Policy and Governance* published by ERP Environment and John Wiley & Sons Ltd

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Introduction

DOMESTIC LAUNDRY – THE TASK OF GETTING ‘DIRTY’ CLOTHING AND OTHER ITEMS CLEAN AGAIN AND READY FOR USE – IS a taken for granted yet fundamental feature of everyday life (Pink, 2012); it also carries significant environmental burdens. Laundry’s environmental impacts result from machine, fabric and detergent production and disposal, water use, distribution and discharge, and domestic energy use (for washing, drying and ironing). Environmental impacts occur throughout the lifecycle of laundry products and devices; however, the

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'use phase' (household consumption) is an environmental hot spot (see Madsen *et al.*, 2007; Wrap, 2012). Accordingly, measures have been taken to improve the energy and water efficiency of washing machines, and to improve the environmental performance of detergents and other laundry products, such that the impacts of households washing their clothes are reduced. These technological innovations have gone hand in hand with measures that actively seek to change the ways in which households do their laundry. This can be cast against the more general trend for governments and businesses to respond to the challenges of anthropogenic climate change by developing interventions in the processes through which ordinary people acquire, appropriate and appreciate goods and services. One initiative considered successful in this respect has been the effort – led by Proctor and Gamble's UK 'Turn to 30' campaign in 2006, alongside similar initiatives across Europe – to reduce the temperature at which households do their laundry.¹ This intervention, its ostensible success and its limitations are the entry point for this paper.

The context is one of increasing policy attention to household consumption of resources. Currently, around 12% of total household electricity consumption and 13% of domestic water consumption in the UK can be attributed to domestic laundry (Intertek, 2012; Waterwise, 2012). Since the mid-1980s the energy consumed by washing machines has declined substantially for the average household (from 268 kWh to 166 kWh, see Shove, 2003; EST–DECC–DEFRA, 2012).² Although this gives rise to a degree of optimism, it is important to recognize that the overall energy associated with washing and drying clothes in UK homes continues to rise, and at 1.0 million tonnes of oil equivalent has grown by over 100% between 1970 and 2012 (see Figure 1). While we take the UK for our analysis, the scale of the policy problem is clearly global.³ Domestic laundry has been the subject of multiple initiatives, guidelines and interventions; its escalating environmental costs recommend it as an illustrative case study of the difficulties inherent in changing consumer habits towards a more sustainable direction.

The reasons for the continued rise in energy used are fourfold, and result from changes in wash frequency or 'periodicity', the spread and use of new technology, and broader social and socio-technical shifts. First, rises in household numbers in the UK (from 24.4 million in 2000 to 26.3 million in 2010, DECC, 2013) mean there are more people doing the laundry, and the decreasing size of households mean there are more laundry loads *per person* (EST–DECC–DEFRA, 2012). Second, and relatedly, there have been continued rises in the average number of yearly washing machine cycles *per household* (most recently from 274 to 284 between 1998 and 2012, see DEFRA, 2009; EST–DECC–DEFRA, 2012), suggesting that households are 'doing the laundry' more often. Third, and relatedly, the number of tumble dryers in the UK continues to grow (from 8.5 million to 12.3 million between 2000 and 2010, DECC, 2013, Table 3.12), as has the number of washer-dryers, and in households with tumble dryers 81% of washing machine loads are followed by a drying cycle (EST–DECC–DEFRA, 2012⁴). Fourth, the use of launderettes, with effectively greater economies of scale, has decreased significantly from its peak in 1975 (Watson, 2014). Cast against the optimism generated by looking at improvements in washing machine efficiency and changes in their use in isolation, these observations stress the importance of acknowledging counter-trends elsewhere in the collective performance of laundry practices (see Evans *et al.*, 2012, for a parallel discussion of energy saving light bulbs versus the environmental impacts of lighting practices). Policy must avoid a myopic focus on particular technologies or isolated behaviours in order to succeed in reducing the resource intensity of domestic practices.

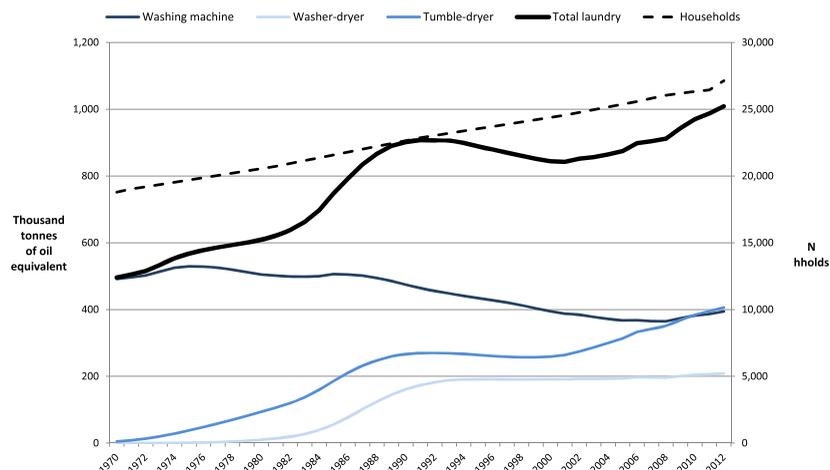
This paper offers a holistic account of laundry practices to evaluate low-temperature washing as an intervention in consumer behaviour, and develop more ambitious approaches to reducing the resource intensity of domestic consumption. It begins by reviewing literature about domestic laundry and outlining some insights from theories of practice. This is followed by a review of the empirical data, drawn from a quantitative survey questionnaire of laundry practices conducted in Britain in 2013. The fourth section presents data on washing machine use and discussion of wash temperatures. The next section explores the trajectories that clothing and other items follow as they become 'dirty' and go on to become 'clean' or laundered. The sixth section contrasts the apparent hegemony

¹The heating of water is widely recognized as the most energy intensive process taking place in washing machines. The US Environmental Protection Agency claims it accounts for 90% of the electricity used (EPA, 2012).

²Although environmental costs can be measured in terms of carbon emissions, water use, pollution, biodiversity and other indicators, we primarily consider energy use, closely linked to carbon emissions in the current energy regime.

³Rates of possession of washing machines and tumble dryers are lower in much of the developing world, but are increasing faster (Euromonitor (2014) estimates washing machine possession rates at 67% of the world's households in 2014 and growing by approximately one percentage point yearly). This, coupled with rising household numbers across most national contexts, suggests that the escalating resource use of domestic laundry will continue.

⁴Clothes drying is more energy intensive than washing in the consumption phase of clothing (Madsen *et al.*, 2007).



Source: Authors' elaboration based on DECC, 2013, Table 3.10.

Figure 1. Energy used in domestic laundering 1970–2012

of the washing machine flagged by prior studies, with the diversity that our data reveal in relation to the broader tasks and activities – specifically drying – that together configure household laundry practices. The seventh section concludes by expanding on the policy implications beyond the intervention of low-temperature washing, and broader theoretical contributions of our analysis.

Analysing Laundry: Social Reproduction, Domestic Practice and the Environment

The extant social scientific literature on domestic laundry is sparse and somewhat fragmented; nonetheless, it has something of a history. Much work has emphasized the importance of cultural conventions in defining the problems that doing the laundry purportedly resolves. Mary Douglas, for example, argued that cleanliness is principally a matter of maintaining social order through particular rituals. She explains: 'Shoes are not dirty in themselves, but it is dirty to place them on the dining-table; food is not dirty in itself, but it is dirty to leave cooking utensils in the bedroom, or food bespattered on clothing' (1970, pp. 48, 35–36). Accordingly, as the nature of clothing has changed with the development of cotton and synthetic fibres, so too have attitudes towards and definitions of dirt, and the manner with which suitable cleanliness is achieved (Campkin and Cox, 2007; Shove, 2003; Vigarello, 1988). Where clothing previously was at different times cleaned through brushing, boiling, soaking or beating, then dried by wringing between cylinders or hanging, the typical arrangement in Western contexts now is to rotate garments in soapy water at around 40 °C and spin them dry using hot air. Cultural conventions shift alongside such changes in the way that laundry is handled.

Household divisions of labour, gender and family roles have apportioned responsibilities for maintaining standards of moral decency and cleanliness, suggesting that tasks such as doing the laundry are part of changing household relations. French sociologist Jean-Claude Kaufmann's (1998) *Dirty Linen: Couples and their Laundry* argues that heterosexual relationships, gender roles and 'the conjugal' are manufactured through domestic habits and routines around laundry. Ruth Schwartz Cowan (1983) notes that the ideology of the 'housewife' and the gendered distribution of domestic labour was partially a result of the decline of paid domestic workers and the availability of new technologies for replacing them. Most researchers find reductions in housework since the 1960s and a slow trend towards greater gender balance (e.g. Kan *et al.*, 2011). As Kaufmann and others note, the history of doing the laundry is singularly bound up with the changing position of women in society. Domestic laundry has often figured as a lens through which changes in households and domesticity are refracted (Watson, 2014).

Recently, reflecting environmental concerns, analysis of laundry has formed part of investigations of household energy (e.g. Hackett and Lutzenhiser, 1991; Shove, 2003; Wilhite, 2005) and water use (Browne *et al.*, 2013). A central insight has been that one cannot explain patterns of resource use by focusing directly on the resources. Hal Wilhite explains: 'people do not consume energy per se, but rather the things energy makes possible, such as light, clean

clothes, travel, refrigeration and so on' (2005, p. 2). Against this backdrop, Shove (2003) and Gram-Hanssen (2007), have conducted qualitative studies of laundry that illustrate its basis in routine domestic practices. Quantitative studies in a similar vein, and with a range of data, have explored laundry in particular depth in terms of washing machine operations and frequency of use prior to cleaning in Norway, the Netherlands, Spain, Greece and Australia (Arild *et al.*, 2003; Jack, 2013; Laitala *et al.*, 2012). Following Shove (2003), much has been made of the centrality or 'monoculture' of the washing machine as an environmental 'hot spot'. The detailed qualitative studies of Sarah Pink (2012) and Pink with her colleagues (2013), though methodologically similar, understand laundry in sensory, affective and spatial terms, as a practice that 'participate[s] in the constitution of the multi-sensory home' (2012, p. 70). The environmentally motivated analysis of energy use is arguably most effective when alert to the dynamics of the domains of social activity in which it is embedded.

Generalizing across these clusters of research, it is clear that doing the laundry is both composite – made up of a series of activities including clothes storage, wearing or use, washing, drying and ironing – and enmeshed in a series of broader relations, cultural norms and material exigencies. In recognizing these interdependencies, social scientific approaches to practices are becoming prominent. Theories of practice (see introduction to this special issue), which decentre individuals and structures by posing practices as the pivotal units of analysis, offer various methodological insights. Theodore Schatzki (1997) proposes viewing social life as a 'nexus of practices'. This suggests that laundry, echoing arguments from many of the above authors, is held in place – and co-constitutive – of broader practices of domestic household routines, relations of reproductive labour and of family, the social scenarios in which clothing is required to be maintained in particular ways, and broader encompassing cultural associations around cleanliness. Following prior work on domestic practices we understand resource consumption as best understood in the context of unfolding social activity, as part of or a 'moment in' practices (Warde, 2005, 2013). In doing so, we also consider practices themselves as compounds of various differentiated tasks and processes (for a similar discussion of food waste, see Southerton and Yates, 2015). This entails a series of methodological shifts in stance (see Nicolini, 2012): abstracting from the technology of the washing machine to both *zoom out* – to view 'doing the laundry' as a repertoire of processes interconnected with the life of the household – and *zoom in* – to domestic performances of the tasks that make up the wider practice: in this case the sorting, separating, pooling, washing and drying of clothes.

In sum, laundry and its environmental implications are only partially dependent on washing machines and detergent technologies – to date the biggest focus of academic and policy attention. They are also a function of the *practices of laundry itself*: the deterioration of fabrics to a state where they are designated as dirty, their transformation into a new state of fleeting cleanliness, and the skills, materialities and competences associated with these practices (Shove *et al.*, 2012). Our questionnaire proceeded from the assumption, therefore, that the use of clothing and other washable fabric items, as well as a set of potentially highly mutable associations about cleanliness and dirt, are essential aspects of 'doing the laundry'. The structure of the survey reflects these concerns and the tension between ways of using washing machines, on the one hand, and a wider set of often overlooked processes, which produce, in historically unprecedented quantities, the problem the washing machine is purportedly designed to fix: that of the dirty linen.

Methods

An online questionnaire was administered to panel members (1502 UK adult residents) of a supermarket loyalty card scheme in February 2013. The questionnaire, which took around 20 minutes to complete, requested information about how households carry out their laundry in terms of what equipment and products were owned, how they were used, how respondents organized and distributed the various tasks associated with laundering, timings and questions around respondents' associations with dirt and cleanliness. We sought to differentiate between different types of laundry (in terms of clothing and other classifications), following findings from other studies that suggest differences across households in the extent to which forms of 'dirt' are evaluated (Pink, 2012). The survey was part of a wider project about innovations with potential ecological benefits and their relation with consumer practices or 'behaviour', which in this case study focused on the innovation and marketing of detergent for use at low temperatures, and an apparently successful campaign from 2006 to reduce the overall temperatures at which UK

households do their laundry. Consequently, the survey sought to explore the theme of temperature and low-temperature washing in additional detail. In this respect it was an attempt to operationalize and address, using quantitative data, what Warde (2005) suggests are the fundamental research questions of practice theory: ‘Why do people do what they do?’, and ‘how do they do those things in the way that they do?’.

Socio-demographic and economic variables were also requested from respondents and preliminary analysis surveyed differences across social position, examining age categories, household structure, education, employment status and to a lesser extent occupational class data (unevenly collected) and marital status. Table 1 presents our data alongside UK national statistics where modes of measurement used were comparable (ONS, 2011, 2012). Our data, while balanced reasonably well across gender and age, sampled a set of people who are better educated, less likely to be living with dependent children, disproportionately white British and more likely to be homeowners. Surveys of such panels are not based on a random sample, so may also be biased towards those who shop more frequently in supermarkets, and possibly those with more free time. Notwithstanding these limitations, which should be borne in mind in any interpretation, our data build on existing qualitative studies, being large, recent, unusually detailed and attending to a significant range of types of respondent and household.

Washing Machines and Temperature

At the core of this paper is a challenge to researchers and policy-makers to look beyond the washing machine in order to understand domestic laundry practices and their environmental impacts. However we do not dispute that the

	UK %	Sample %
Gender		
Female	51.4	52.7
Male	48.6	47.3
Age group		
18–29	18.0	16.2
30–39	17.0	14.9
40–49	19.4	23.0
50–59	15.9	17.4
60+	29.6	28.4
Employment		
Working	58.5	65.5
Not in work	41.5	34.5
Household structure		
Solos	12.3	17.0
Lone parent with dep. children	8.6	2.0
Adult only	40.6	55.2
>1 adult with dep. children	38.4	25.8
Marital status		
Single never married	24.3	17.0
Married/cohabiting	61.5	72.8
Divorced/separated	7.8	7.9
Widowed	6.4	2.3

Table 1. Sample compared with UK population

Sources: Labour Force Survey, Census, Office for National Statistics. Household structure: adult only households collate couples with other arrangements, mixed adults and children collate nuclear families with multiple families and other arrangements (figures are percentages of adult individuals living in each type of household, not numbers of households), age group percentages disregard children, children defined as dependent children under 18, employment category ‘not in work’ includes retired.

washing machine is a crucial material juncture in the sequence of activities that together configure the practice of 'doing the laundry'. Accordingly, our analysis begins by considering what these data reveal about the use of washing machines and the ways in which households accomplish the task of washing their clothes and other items. As a first step, our sample confirms the assertion that there exists a monoculture of the washing machine (Shove, 2003), insofar as just 1% of our respondents report not having use of a washing machine or washer-dryer in their household. Further, the most common estimates of frequency of washing machine use are three to four times per week (38%), followed by once to twice per week (29%) (see Figure 3 below).⁵ Most respondents modified standard wash cycles with pre-washes, pre-soaks, extra spins and various water or energy efficiency options, but only one in 20 varied their settings between washes beyond two or three combinations. The ownership and use of washing machine products (liquid and powder detergents, softeners, stain removers, colour enhancers and so on) shows a similar picture, insofar as people appear to establish a combination of items that they use simultaneously each time that they do the laundry. People normally own a variety of products – an average of 2.9 per person, and 71% said that they use the same products or combination of products every time they do the laundry. Use of laundry products varied according to particular items and particular states of dirtiness, rather than demands of machine settings, household members or wash temperature.

In analysing wash temperature, our sample principally washes at 40 °C. The most common temperature generalizing across categories of clothing is 40 °C (50%), with 30% of washes at 30 °C or less and 15% at 60 °C and over (very close to EST–DECC–DEFRA, 2012, who quote 50%, 26% and 15% for the same temperatures). The temperature of 40 °C is also the most commonly used for every category of laundry (for between 45% and 59% of respondents, depending on type), except for 'delicates', which are normally washed cooler (see Figure 2).

There is some variability in what temperature setting is considered appropriate for particular types of laundry, and households separate their washing according to several criteria.⁶ Comparing respondents' habits across different types of laundry, however, there is consensus over which categories should be washed at higher temperatures. For example, 'particularly dirty items' are 77 times more likely to be washed at a higher temperature than day-to-day clothing than vice versa, suggesting associations between the application of heat and the removal of dirt, yet there remains a majority of 54% who wash them at the same temperature. Similarly, whites and colours are generally washed at the same temperature (64% of respondents), but 35% wash their whites hotter. From a slightly different angle, synthetics and 'delicates' are generally washed at the same temperature (again, 64% of respondents) but 34% wash synthetics warmer and just 2% wash 'delicates' warmer. In the latter cases, we would presume that those who wash their 'delicates' and 'coloureds' at lower temperatures do so in accordance with considerations of care, insofar as heat might be associated with clothing damage.

It should be noted that the trend towards lower temperature washing pre-dated campaigns urging people to wash at lower temperatures by decades (DEFRA, 2000, cited by EST–DECC–DEFRA, 2012; Shove, 2003).⁷ Nonetheless, campaigns are known to respondents and appear reasonably supported. Differences in reported wash temperatures over time are also suggestive of how they might have contributed towards shifts in discrete elements of laundry practices. Three-quarters of respondents (76%) have heard of the campaigns, 73% agree that washing at lower temperatures is better for the environment and 67% agree that the approach saves money. Only 26% say that laundry is not as clean when washed at lower temperatures. For all age cohorts (between 27% and 37% depending on the type of item in question) respondents reported washing at a lower temperature than was the case 5–10 years earlier. Compared to the rest of the population around 10% more of respondents in the 18–29 age group report washing nearly every type of laundry at 30 °C or less.⁸ This is not a linear relationship where likelihood of washing at lower temperatures declines with age, as there were few or no differences between those aged 30–39 and the oldest age cohorts. One interpretation might be that campaigns reached the youngest cohort at a moment of

⁵Scaled up to the year, these estimations would fall under DEFRA's reported 284 cycles per average household (EST–DECC–DEFRA, 2012). We interpret this as a feature of our sample's disproportionately small households and possible under-reporting.

⁶Only 10% do not separate their washing. A quarter separate by only colour, 4% separate only by item type and 1% each by fabric or 'dirtiness' alone. The remaining 60% separate by two or more criteria.

⁷This research shows declines in washing at high temperatures, particularly washing at 90 °C, which declined from 25% of washes in 1970 to 7% in 1998 to 2% in 2012 (DEFRA, 2000, cited by Shove, 2003, p. 82; EST–DECC–DEFRA, 2012, p. 11). Proctor and Gamble present some data showing increases in 'washing at 30' between 2002 and 2007 and appear to attribute it to their campaign (WBCSD, 2008).

⁸An interesting counter-trend to this pattern is the category of 'delicates', where older groups are progressively more likely to report washing these items at lower temperatures.

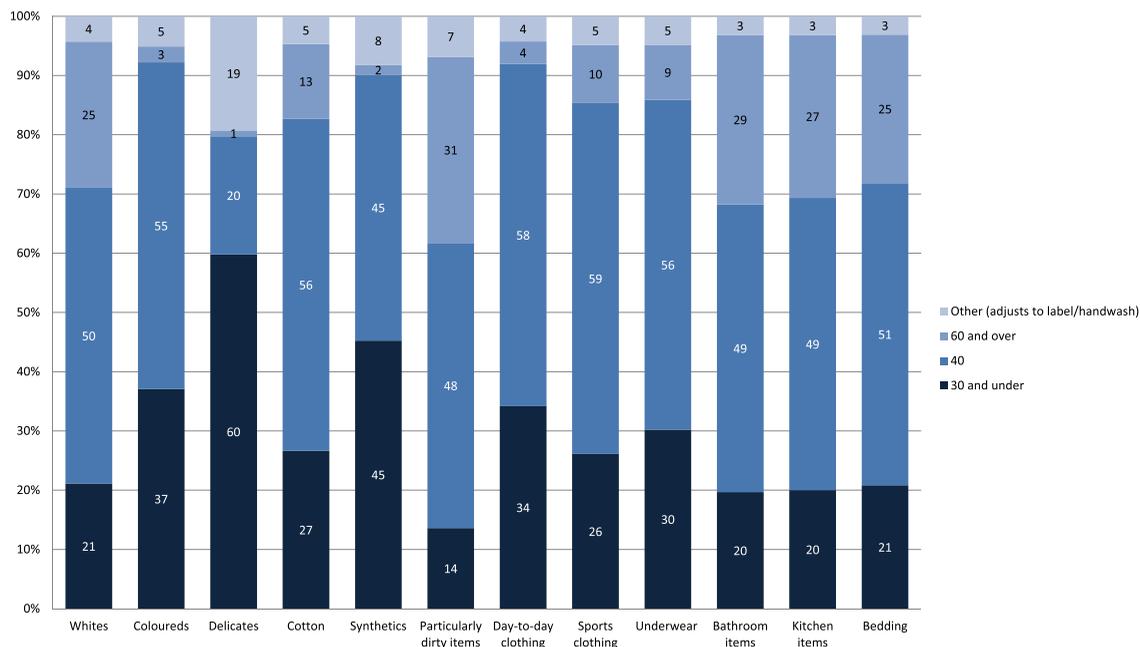


Figure 2. Temperature at which different types of item and clothing are washed (respondents with washing machines or washer-dryers)

transition, as they became independent from the family home and began to configure their own laundry routines (see Plessz *et al.*, 2014, for a parallel discussion of life course turning points and changes in food practices). Younger people are also less likely to distinguish between laundry types, washing apparently contrasting laundry types together at the same, lower, temperature. Dividing the sample by individual characteristics or household structure reveals few other significant differences; variation is much more consistent by the category of laundry being washed than by characteristics of respondents. The underlying competences and conventions around wash temperature appear remarkably evenly shared across social groups. It suggests that widely accepted conventions and competences around using the washing machine are more important than ‘types’ or ‘segments’ of users and their attitudes.

Routes and Routines

Panning out from the use of washing machines, this section begins to consider the broader suite of activities that together form the practice of doing the laundry. Taking cues from Pink (2012), we focus on the different routes or ‘lines’ that laundry practices follow and her suggestion of focusing on the ways in which launderers achieve ‘the most satisfactory multi-sensory transformations of their laundry’ (Pink, 2012, p. 79). Our approach is one of thinking about the trajectories that clothing and other items follow over the course of their cyclical transformation between the states of being ‘dirty’ or ‘clean’, requiring or having been laundered. In order to make sense of these routes, we focus on the timing and routines of doing the laundry. Indeed, the constellation of tasks that compose this process suggests that certain patterns of periodicity and sequencing need to be followed. For example, washing cannot be ironed dirty, nor should too much time elapse between the washing machine finishing its cycle and the drying. Just as variation in washing temperature can be explained through persistent associations, which appear shared across all those respondents who change wash temperature, there are necessary sequences in the multiple tasks of laundry.

Detailed appliance-specific energy use data for the UK (Intertek, 2012) shows that washing machines are used almost exclusively during daytime hours, between 7 am and 11 pm. Peak times are between 8 am and 10 am across all types of household, with smaller secondary peaks between 6 pm and 8 pm in households with dependent children and single pensioner households. The use of tumble dryers varies considerably by household, but in all cases most drying (see later) is done later in the day than washing, between 11 am and 7 pm. Our study gathered data on launderers' perspectives of timing and temporality. We asked respondents 'Which of the following arrangements would describe the times when your household does laundry?' with a multiple response set of prompts covering specific time slots (e.g. 'weekday evenings'), material and spatial triggers (e.g. 'when the pile is big enough') and routines relating to other practices (e.g. 'around the same time as the other household chores'). Given that data already existed for the specific times at which washing was handled, we sought to evaluate the logic underpinning laundry routines. The responses are summarized in Table 2.

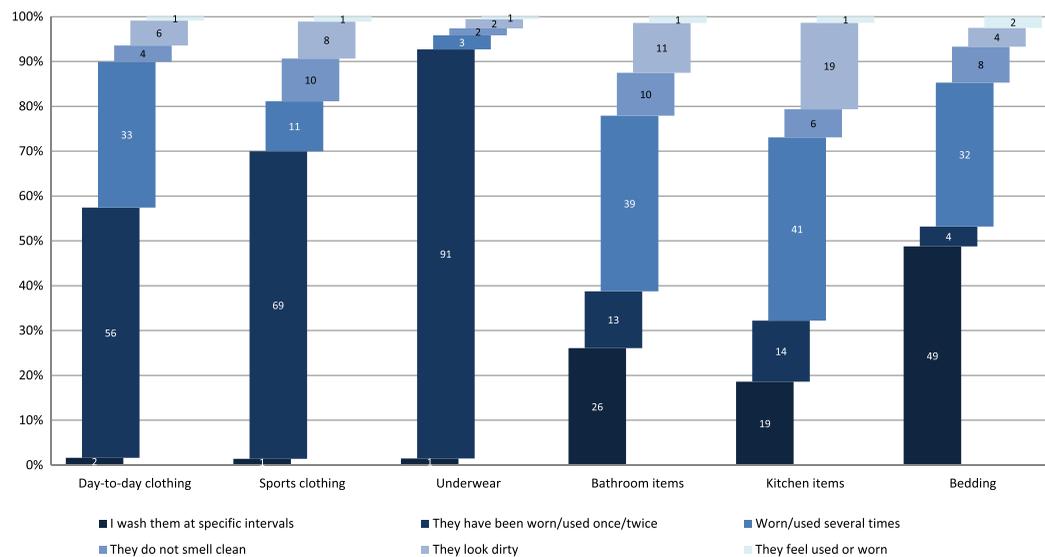
There is a rough temporal preference for mornings and for weekends. A quarter of respondents wash 'whenever I/we have the time', outnumbering those (16%) reporting that washing coincided specifically with other practices ('around the same time as the other household chores') and just 10% reporting that they do it on the days that they are not at work. We find only modest support for the hypotheses, inspired by Shove (2003), that laundry frequency is partially driven by need to clean particular specialized items (15% of respondents) or when respondents 'run out of clothes' (7%). A clear majority (58%) of respondents select 'When the pile is big enough or when the basket/bin is full'. The accumulation of dirty washing rather than the lack of clean items tends to trigger the process of washing laundry. The washing machine is used when there is a supply of 'things that need laundering' whereas demand for (specific) 'things that have been laundered' is less commonly mentioned.

Relatedly, an understanding of the processes through which things become designated as 'dirty' (and thus consigned to the washing basket) is vital to account for the high frequency of washing machine use, another aspect of the temporalities of doing the laundry. Several existing studies have explored how often items are used before washing (Arild *et al.*, 2003; Browne *et al.*, 2013; Laitala *et al.*, 2012; Wrap, 2012). These studies find underwear and socks commonly washed daily, along with t-shirts and shirts, with trousers, jumpers, jackets and non-garments such as bedding washed less frequently. In order to build on these findings, our questionnaire explored the relationship between use and dirt assessment, insofar as it seems reasonable to assume that dirt is neither a fixed and self-evident category (Douglas, 1970), nor a straightforward consequence of use. Accordingly, respondents were asked the 'most important reason' for putting different types of item in the wash. The answer set combined responses based around how much they had been used or worn, with questions about apparent or supposed dirt. For all categories of laundry, the conscious evaluation of dirtiness features far less than factors relating to washing them at specific intervals or washing them after set amounts of wearing/using them (see Figure 3).

When	N	% of sample
'Weekdays during the day'	455	30.3
'Weekday evenings'	313	20.8
'At the weekend'	575	38.3
'On the days when I am/we are not at work'	238	15.8
'Whenever I/we have the time'	385	25.6
'Around the same time as the other household chores'	153	10.2
'Overnight'	220	14.6
'When the pile is big enough or when the basket/bin is full'	869	57.9
'When I/we run out of clothes'	103	6.9
'When I/we have space to dry it'	249	16.6
'When I/we need a particular garment or item to be clean'	229	15.2
Other (please specify)	47	3.1

Table 2. Prompts, triggers and timings: when households do the laundry

Question wording: 'Which of the following arrangements would describe the times when your household does laundry? Please select all that apply'.



Question wording: ‘From this list of clothing and items, please indicate the most important reason that you put them in the wash’.

Figure 3. Reasons why people say they put particular items ‘in the wash’

Breaking this observation down by laundry type, it can be seen that, for underwear and day-to-day clothing, more than 90% of people simply wash them at regular intervals (either ‘They have been worn/used once/twice’ or ‘They have been worn/used several times’). Kitchen items, sports clothing, bathroom items and bedding, on the other hand, are much more frequently put into the wash for reasons of dirt assessment (i.e. ‘They do not smell clean’, ‘They look dirty’ or ‘They feel used or worn’). Of these, the *appearance* of dirt was most commonly mentioned for kitchen items, whereas for sports clothing and bedding concerns about smell were more common. More people evaluate bedding according to its ‘feel’ than for any other type of textile. Underwear, sports clothing and day-to-day clothing are washed most frequently, with a majority using them only once or twice before washing. Non-clothing items are rarely washed after only one or two uses and are also most likely to be evaluated for their dirtiness before washing.

Stepping back from these descriptions, the evidence of sensory dirt assessment playing a role in configuring laundry routes, as per Pink’s 2012 analysis, is interestingly partial. Most items are routinely designated as ‘in need of laundering’ after one or several uses – evaluation of dirt may take place but is probably rendered unnecessary by routine.⁹ The designation of washing as dirty appears predominately non-reflective. However, the sensory transformation of laundry may form part of the cultural logic driving and maintaining certain associations of cleanliness, which determine whether and when items require laundering. To explore this, we used a number of Likert items to elicit respondents’ perceptions of clean laundry. It is illuminating to note that just 88% agree with the statement that clean laundry is ‘no longer dirty’ and just 74% agree that it is ‘free of stains’. Three-quarters of respondents agree with the statement that ‘clean laundry smells like the laundry products used in the wash’. Cleanliness is a set of associations as much as it is the literal removal of tangible dirt, lending support to the emphasis on sensory transformations of laundry in Pink’s analysis. This does not contradict the finding that things become ‘in need of laundering’ principally through routine and habit; it simply confirms that there are particular expectations for things that have been laundered. Indeed, in keeping with the idea that these expectations create ‘more work for mother’ (Cowan, 1983), we can note that the women in our study are significantly more likely to agree that clean laundry should smell of laundry products, just as they are more likely to be responsible for doing the laundry.

⁹See Evans (2014) for a parallel discussion of food being disposed of at routine intervals rather than consciously categorized as ‘waste’.

Extra Tasks and Differentiation

Having developed the idea that doing the laundry involves more than the use of washing machines, this section zooms in on some of the other tasks and activities that configure the trajectories that clothing and other items follow as they become 'dirty' and 'clean'. The ways in which people separate their laundry by temperature were discussed earlier, and, thinking about the environmental impacts of laundering as a whole (beyond the temperature at which things are washed), one possible consequence of high levels of separation might be that households experience difficulties in filling machines with particular types of laundry.¹⁰

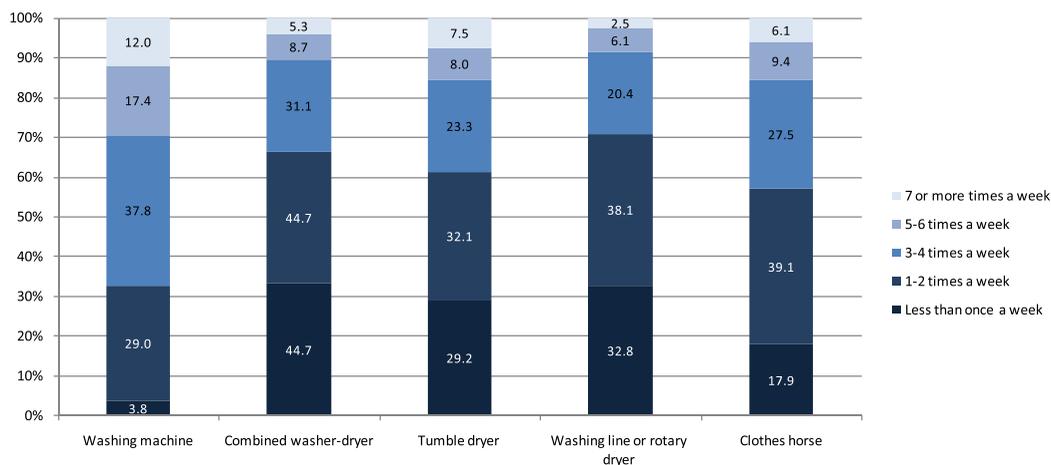
The process of sorting and separating is strongly related to how households are organized and domestic work is divided. Of those respondents who do not live alone, 83% report that their household does their laundry together. This implies that a process of collecting each individual's 'dirty linen' and then re-dividing it along new lines takes place in most households. Conversely, people who live alone are over twice as likely to not separate by any criteria than multiple-person households. Similarly, households where individuals do all their own washing individually (3% of respondents) are more than twice as likely to report not separating by any criteria. Less pooling seems to lead to less separating. The efficiencies of scale lost through individual usage of washing machines are partially offset by the greater likelihood of not separating items and thus reducing the incidence of washing smaller loads with greater regularity. Breaking the task of doing the laundry down into its constituent activities reveals further insights into the organization of domestic life. For example, it is often assumed that that one person in a household is mainly responsible for doing the laundry (see, e.g., Arild *et al.*, 2003), however our data reveal a more nuanced picture, in which some tasks are heavily gendered (such as ironing, where 68% of household-sharing women handle it all themselves compared with 26% of men) whereas others are more likely to be distributed or delegated (tasks such as separating, drying and putting dry items away).

The task of getting wet laundry dry again is of particular significance – accounting for around half of the energy expended in the consumption phase (Madsen *et al.*, 2007). In contrast to the omnipresence of washing machines, our sample suggests plurality and differentiation in drying infrastructures and arrangements (for more on drying see Pink *et al.*, 2013). In contrast to the 99% of respondents who have access to a washing machine, just half of our respondents (51%) have tumble dryers.¹¹ Clothes horses and outdoor washing lines/rotary dryer are more common than tumble dryers, reported by 75% and 76% of the sample respectively. The vast majority (94%) of tumble-dryer owners retain alternative means of drying: 84% have outdoor drying facilities, 72% own a clothes horse for indoor use and 62% have both. Only 18% of the sample relies on one drying method, and among them the indoor clothes horse is the most common. Asking about 'other arrangements for drying' elicited 176 responses, where the panel mentioned the use of radiators, airing cupboards, 'Victorian-style' rope-and-pulley devices and dehumidifiers, and described arrangements contingent on weather and the items being washed. Given the plurality of drying methods within households, it is important to consider the extent to which different options are actually used by households (see Figure 4). In contrast to the frequent usage of washing machines (see earlier), the majority of respondents report using each type of drying method twice a week or less. This is to be expected given the mix of methods available to households. Locating this observation in relation to prior studies is revealing. The Consumer Association (1997, cited by DECADE, 1997) report that people often use tumble dryers for small washing loads or for specific items. The proportion of washing to drying cycles of people with both washing machines and tumble dryers varies widely, with many people running more drying cycles than wash cycles, and vice versa, with an average of 0.81 tumble dryer cycles per wash cycle (Intertek, 2012, p. 289). This suggests that in many households not only is laundry separated and sorted for washing, but there may be an additional sorting stage between washing and drying.

It seems reasonable to assume that a number of factors affect how items are dried. For example, it might depend on the weather, and certainly our sample report drying both indoors and outdoors, just as existing studies confirm that tumble dryer use is highly seasonal (DECADE, 1997, p. 89). Equally, it might depend on sensory considerations such

¹⁰In turn, this might result in washing smaller loads with increased frequency – a point that is underscored by accounts of washing machines being used when only partially full (DECADE, 1997).

¹¹These figures map closely onto other estimates (Fawcett *et al.*, 2000, p. 22; DECC, 2013, Table 3.12). The tumble dryer possession rate is among the highest in Europe.



Question wording: 'Please estimate how frequently your household uses the following item(s)...'.

Figure 4. Use of washing and drying infrastructures

as the 'freshness' of line dried clothing or the 'fluffiness' of tumble dried towels. Concerns about aesthetics and social respectability may well come into play, insofar as people may dislike the appearance of washing on the line (or hung indoors in small dwellings) or fear an association with low-status households. Finally, in Shove's account of laundry practices (2003) she suggests that the proliferation of specialized social scenarios and attendant demands for 'appropriate' outfits might be a factor underpinning increased washing frequency. This same imperative might underpin the use of radiators and tumble dryers to ensure that particular items are ready to wear for particular occasions.

Discussion and Conclusion

The preceding sections presented an account of laundry practices to reflect critically on low-temperature washing campaigns, build practically and methodologically on insights from theories of practice, and develop a more ambitious approach to understanding resource-intensive household consumption. Central to this is the move beyond a narrow focus on efficiency of washing machines or a particular aspect of their use. Approaching laundry as a practice not only allows for more thorough sociological engagement with the processes through which clothing and other items become 'dirty' and then 'clean', it also opens up new ways of thinking about the environmental impacts of domestic practices and the possibility of change. Our data are not perfectly representative, so findings should be interpreted with caution; nonetheless, the paper makes a contribution to understandings of the practice of laundry, of domestic resource use and theories of practice, and towards a policy approach that can reverse the trend of the escalating environmental impacts of consumption patterns.

Starting with the optimism that has been generated around improvements in the efficiency and use of washing machines, we highlight the importance of what is going on elsewhere within the practice of laundering if the goal is to re-configure it in a more sustainable register. For example, the positive consequences of washing at lower temperatures are mitigated by the increasing frequency with which people wash clothes and, consequently, how often tumble dryers or drying functions on washer-dryers are used. Our analysis suggests that the use of washing machines can only be understood in relation to a broader battery of laundry-related tasks (separating, pooling, sorting, drying, ironing, storage), the rhythms of domestic life (how laundry is fitted around other demands on households' time) and the social context in which clothing and other items are used (the requirements to clean clothing and regularly change outfits, routinized washing patterns and the habit of only wearing garments once or twice). Crucially, it is the intersection of these factors that underpins the increasing use of washing machines and the escalation of associated environmental impacts.

Shove's (2003) account of resource intensive laundry practices emphasizes normalization and standardization. To this we would add the suggestion that there are important counter-trends, or ambivalent relationships between the dynamics of differentiation, standardization and change. Our analysis suggests that patterns of diversity exist across the processes of managing laundry in the treatment of different items, reasons and frequency for washing items, separating and sorting processes, and drying. It follows that diversity in laundry underpins resource intensive habits, such as frequent washing or washing when the drum is not filled. Policy attention and sustainability scholarship should focus not only on the temperature at which goods are washed, but also drying and aspects of laundering that drive increased washing and drying frequency, such as separation and the escalating production of 'dirty' clothes.

In terms of specific policy recommendations, a holistic understanding of domestic laundry requires an approach that addresses several interconnected problem areas. These are (1) energy-intensive drying, (2) high wash volumes and frequencies and (3) the interconnections between the conventions, associations and practices that shape the demand for 'clean' laundry. These considerations should be pursued alongside existing efforts to reduce wash temperatures.

Most simply, subsidies of more efficient tumble dryers (as in the Netherlands, see Fawcett *et al.*, 2000), or of washer-dryers that use similar drying technology, should not be considered. Machines remain enormously energy intensive despite efficiency savings: recent estimates suggest that they use more energy than any other single household appliance excepting fridge-freezers (EST-DECC-DEFRA, 2012). Only around 60% of UK households own tumble dryers (DECC, 2013, Table 3.12) and many appear little used; stimulating a market for marginally improved tumble-drying technology would be wasteful and highly counter-productive. It is worth noting that energy efficiency labelling currently works on the basis of comparing across different available appliances, implicitly presupposing that every household must have one of each despite huge variation even in economically developed countries over what is 'normal'. The focus should be on exploiting existing proclivities for multiple drying methods by, for example, encouraging or subsidizing sales and use of outdoor drying apparatuses, or on establishing communal or building-specific drying rooms as are common in Scandinavia, through retro-fitting and creating appropriate space in new properties. A shift in eco-labelling to reflect the choice of different ways of materially provisioning practice, to acknowledge the huge environmental savings achieved with line-drying, would be an interesting move.

The frequency and volume of laundry is rising due to both a demand for 'clean' clothes and a supply of 'dirty' clothes. The demand for 'clean' clothes is related, at least in part, to prevailing understandings of appropriate workplace attire. This being so, a deliberate relaxation of dress codes and standards in UK workplaces – such as those fostered by the Cool Biz campaign in Japan (see Shove *et al.*, 2012) – might loosen the imperatives of textile maintenance that currently underpin resource intensive patterns of laundering, while improving energy efficiency in work environments. The flipside of this point about managing the demand for clean garments is that our analysis has emphasized that the *supply* of 'things that need laundering' is at least as important for understanding the frequent use of washing machines. In this view, policies that seek to foster more environmentally sustainable laundry habits might be well advised to focus on the design of laundry baskets and their location in domestic spaces as means of tackling the use of washing machines. Qualitative studies suggest that used or worn garments are routinely consigned as 'dirty' after they are worn irrespective of whether they are dirty, in part because of normative injunctions to not wear the same clothes on consecutive days (Gram-Hanssen, 2007). Sections of wardrobes or drawers designated for 'used but not dirty' items might help extend usage prior to washing. This is particularly true for those items that are routinely washed after one or two uses such as day-to-day clothing.

Of course, we understand that the current policy vogue for focusing on washing machines and their use is likely to remain in place for the foreseeable future. With that in mind, our findings intimate that innovations in low-temperature washing detergents should continue until perceptions of quality across different washing temperatures are further eliminated (Laitala *et al.*, 2012). The key to this will be working with existing associations and understandings of 'clean' and 'dirty' laundry as well as taking active measures to define and shape perceptions of qualities.¹² With regards to the latter, the association between clean laundry and the smell of products used in the wash (see earlier) could be interpreted as a step in the right direction if it substitutes for the association of having to wash with very hot water. Similarly, our analysis suggests that the imperative to take care of the items being laundered (such as

¹²Such efforts may be of particular use for lengthening use of bedsheets, bathroom and kitchen items and sports clothing, where dirt evaluation appears most important.

delicates) leads to them being washed at lower temperatures. It follows that revision of the ISO-labelling scheme might capitalize on concerns about care to help break down resistance to washing at lower temperatures – some UK supermarkets have independently begun to label their clothing accordingly (DEFRA, 2011, p. 10). Labels might also emphasize the potential for tumble dryers to damage the items being laundered whilst giving advice about alternative methods of drying. Clothing and detergent manufacturers might be persuaded to pursue similar approaches.

Contextualizing the ‘turn to 30’ campaigns in their wider social context is undertaken in a spirit of critique, not condemnation: the campaigns line up with the theoretical orientations that underpin our analysis. At one level, it seems effective insofar as it communicates with households around a specific issue (rather than raising awareness of laundry’s environmental impacts in an abstract and generalized manner), and without the moralizing tone that is all too familiar in sustainability communications. More substantively, it is a rare example of a sustainable consumption initiative that is provisioned by a commercial organization and, as such, it moves beyond the default of ‘responsibilizing’ individual consumers (Barnett *et al.*, 2011). Indeed, there appears to be recognition that the things people do cannot be divorced from the design and production of the things that they use in the course of their everyday life. The significant innovation here, then, is not the development of detergents capable of washing at low temperatures (low-temperature detergents preceded the campaign by many years), nor is it the campaign to change consumer behaviours. Rather, it is the orchestration of an initiative that conceptualizes technological innovation and user practices as two sides of the same coin, and recognizes that processes of consumption and their environmental impacts are actively shaped by the organization of production (McMeekin and Southerton, 2012). Taking this a step further and looking forward, it seems sensible for policies intending to reduce the environmental impacts of laundry to take seriously the interconnections between production and consumption – particularly in terms of responsibility for environmental impacts. If clothing is worn even less over its life-course due to trends towards ‘fast fashion’, the environmental (and social) costs of fibre, yarn and fabric will further outweigh the ‘use phase’ of clothing (see Wrap, 2012, Figure 1; Madsen *et al.*, 2007, pp. 42–44).

Looking beyond the specific example of laundry, this case study highlights that social science research on sustainability and behaviour change should not focus on particular appliances, ‘hot spots’ or aspects of practices in isolation. Indeed, a singular focus on ‘low-temperature washing’ would have missed many of the dynamics of how households do their laundry and would have failed to account for significant environmental impacts occurring elsewhere within the practice. It follows that whatever the focus – ranging from domestic energy use through personal mobility to patterns of food consumption – it is essential to contextualize the behaviour in question by considering the dynamics of related activities encompassed in the practice and the effects of related and interlocking practices and cultural meanings around it. Nevertheless, focusing specifically on low-temperature laundry campaigns is instructive insofar as it draws attention to the potential and limits of sustainable consumption initiatives, and by extension the importance of acknowledging the connections between innovation and use, and production and consumption.

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