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On an average family day data is everywhere. Shopping lists, utility bills, artificial intelligence devices, social media platforms, mobile apps, doctor appointments, school communications, and entertainment devices, all gather, archive and store highly personalised forms of data. In this context, critical questions are emerging on the data traces of children, their everyday surveillance, and the ways in which they may be affecting their rights. What is becoming obvious is that children's personal information is being collected, stored, archived and profiled in ways that were not possible before, and that parents' digital practices are directly related to this transformation. In the last few years, we have thus seen the emergence of research that has looked at children's data. Some scholars have focused on the practice of 'sharenting', which sees parents sharing personal data of their children on social media (Ammari et al., 2015; Kumar and Schoenenbeck, 2015; Blum-Ross and Livingstone, 2016; Bessant, 2017), others have looked at mobile apps, and in particular early infancy apps (Thomas and Lupton, 2015; Leaver, 2017; Barassi, 2017), whilst some have instead focused on the internet of things and AI toys (Chaudron et al., 2017). By reflecting on all these data traces, Williamson and Lupton (2017) concluded that at an historical time where we are witnessing 'unprecedented capacities for monitoring children' we are also seeing the rise of the "datafied child" (2017: 783).

This paper aims to bring the argument about datafied children further by showing that we cannot analyse the increased datafication of children without asking critical questions about changing notions of digital citizenship. The article draws on the findings of the Child | Data | Citizen project, an ethnographically informed research project on the impacts of big data on family life. In the first part of the paper I will explore the concept of digital citizenship not only by taking into account how it relates to the concept of child (Third and Collin, 2016) but also by highlighting the ways in which the concept is being transformed by our data-driven cultures (Barassi, 2016a; Hintz et al., 2016). This first part of the article will argue that the emergence of the 'datafied child' raises critical question about the ways in which digital citizenship is being re-defined by the surveillance and tracking of citizens from birth. In the second part of the paper, however, I will argue that it is important that we avoid essentialist images of the 'datafied child', which understand children as quantified selves, surveilled and

profiled by corporate platforms and algorithmic logics. In fact, I will show that what is missing from this essentialist understanding, is a careful reflection about the messiness, unpredictability and inaccuracy of processes of datafication in family life. The paper will thus conclude that it is precisely in this messiness, which leads to algorithmic inaccuracies that lie the most problematic social and political implications of the datafication of children.

Digital Parenting in the ag and the Datafication of Everyday Life

On a hot summer day in 2016 I walked in the home of Alicia[1], a mother of two young children in her 30s who lived in a wealthy neighborhood of Los Angeles. I had known Alicia for few months. That day we set down, with a glass of wine, for an hour interview. After the interview we kept chatting for another few hours. We had the afternoon for ourselves. Alicia recounted how she experienced the 'data revolution', that social and cultural transformation, which saw a dramatic increase in the collection of highly personalised and context-specific data. For her the process, at the beginning, was slow, almost imperceptible. Yet at a certain point, over the last two years, she suddenly realised that she couldn't join a service without giving up precious personal information, that her health records, utility bills, shopping habits, and the educational data of her children were all digitised and probably stored in some archive. She also realised that she was constantly targeted by companies.

Alicia used to work in advertising and marketing and she knew how companies used the data, how they profiled consumers and how they approached them through targeted advertising. She also knew that much of the data collected from users, was collected from or integrated with social media content. So she talked about this transformation, and how it affected her life and the life of her family.

Alicia was very aware that her own digital practices and choices as a parent determined the amount of data traces that were produced about her children: she regularly posted her children's photos on Facebook; she used an app operated surveillance system in their bedroom; she relied on different digital platforms to monitor their educational progress as well as their health. Yet overall she conveyed the impression that for her the techno-historical transformation was inevitable and that her children were going to grow up with large amounts of exploitable and highly personalised data traces, which may impact on their lives as future citizens.

Alicia's interview was one of the first that I collected for the Child | Data | Citizen project, which aims to provide a rich, qualitative analysis of the multiple ways in which parents are experiencing and understanding the datafication of family life. The research focuses on families in the U.K. and the U.S. with children between 0 and 13 years of age. It investigates

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[1] Fictional name to protect the participant's anonymity.

how parents produce children's data traces, how they understand digital surveillance and online privacy, and how they negotiate with the advent of big data and artificial intelligence. The project relies on a multi-method approach, which combines 50 semi-structured in-depth interviews, one year of participant observation, 9 months of digital ethnography of the social media of 8 families, 2 focus groups, and the qualitative platform analysis of 4 social media platforms, 10 early infancy apps, 4 AI devices and Home automation hubs and 2 AI Toys.

The project aims to explore the interconnection between children's data traces and the making of digital citizenship. It's aim is to shed light on the fact that children's data traces are not only constructing their public and civic persona, but need also to be understood with reference to broader processes of surveillance of citizen's personal data. In the last few years, the notion of digital citizenship has been at the centre of an interdisciplinary debate between those scholars that understand digital citizenship as describing the ways in which people use digital technologies to 'participate' to society (Mossberger et al, 2007) or enact specific rights (Isin and Ruppert, 2015) and those scholars that understand digital citizenship as linked to the surveillance and governance of citizen's data (Hintz et al., 2016). According to Hintz et al., (2016) "at an historical time where both state agencies and companies surveille every aspect of citizen's life, we are not just digital citizens because of our actions but also because we increasingly live and operate in a datafied environment in which everything we do leaves data traces" (2016:732).

The Child | Data | Citizen project is based on the belief that it is precisely by looking at the datafication of childhood that we can fully appreciate the ways in which digital citizenship is being transformed. Today children are not only digital citizens because their digital practices enable them to enact and perform their public persona (Third and Collin, 2016), they are datafied citizens because they are coerced into digitally participating to society through their data traces (Barassi, 2017a, 2017b). By signing off terms and conditions, sharing personal information on social media, buying the latest home hubs or AI technologies, parents like Alicia are co-participant in coercing children's digital participation and shaping their data traces. Often parents do not have much choice and even if they clearly see the privacy and security implications for their children, they find themselves forced by their children's schools, health care providers etc. into joining the latest Facebook group or downloading the latest app. As the next part of the paper will show, at an historical time in which willingly or unwillingly parents become co-participants in coercing their children into participating to society through data traces, we at first need to start unpicking and understanding the complex relationship between data traces and digital citizenship, and secondly we need to shed light on the fact that in our data driven society corporations, governments and institutions are using children's data in non-transparent and non-accountable ways.

The Child as Datafied Citizen

We cannot understand the relationship between childhood and digital citizenship without considering Third and Collin's (2016) insightful contribution that argues that we need to re-think the notion of children's citizenship by looking at digital practice. The scholars place a special emphasis on the concept of *performance*, and show that children/youth's digital acts are often directed at confronting, contesting and challenging the adult world in a public and performative way. The emphasis on the performative dimension of digital citizenship is of course not new. Third and Collin's are influenced by scholars like Couldry et al. (2014) who argued that the performance of digital citizenship is often achieved through digital storytelling (Couldry et al, 2010) or Isin and Ruppert (2015) who have focused on the relationship between the performance of digital citizenship and the power of speech (2015:51- 65). According to Third and Collin's (2016), however, children's ambiguous position in society, as not-yet-citizen, makes the performance of their digital citizenship more creative and radical than the adult one.

Third and Collin's (2016) article is of fundamental importance as it sheds light on how the public dimension of childhood is enacted through digital practice. Yet there is a fundamental aspect that is being overlooked in Third and Collin's (2015) argument on children's digital citizenship: the question about data traces. If digital citizenship is performed through speech acts, then an important question that we need to address is what happens when data traces 'speak for' and 'about us'. This question lied at the heart of the the Child | Data | Citizen project. The project revealed that on an average family day multiple narratives can be constructed departing from children's data traces, which define them as citizen subjects. These include not only the social media narratives of parents and other family members and friends, like many scholars have shown (Kumar and Schoenenbeck, 2015; Blum-Ross and Livingstone, 2016; Bessant, 2017) but also the digital narratives that are constructed through the mining of children's personal data.

It is by considering how data traces talk about and for individuals that we realise that when we think about the datafication of children the issue at heart is not only one about privacy and surveillance, but it is about the type of assumptions and conclusions that are reached through the profiling of children's data. A critical example of this can be found if we consider the role of data brokers in our everyday life. According to a report by the Federal Trade Commission (2014) the data collected by data brokers relates to numerous different dimensions of family life from web browsing activities to bankruptcy information, voting registration, consumer purchase data, warranty registrations, and other details of everyday

interactions. What is interesting about the FTC report is the fact that individuals are identified as 'consumers' yet when the data collected and profiled - as the report suggests - is about voting registration or details about one's own religion, ethnicity etc, then we are not simply talking about consumers and consumers' rights, but citizens' and citizens' rights.

When we think about children's data then, the issues at stake is not only about the protection of the private information that is collected and shared, but also about how the data collected and processed can impact on their everyday life through practices of predictive analytics (Crawford and Schultz, 2014:98-100). Now, although predictive analytics needs to be understood as a function of artificial intelligence that enables machines to bring different databases together and trace individual patterns (Elmer, 2004), we also need to be aware of the fact that our everyday digital interactions are often determined by individuals who try to 'read' 'profile' and 'predict' other people's behaviours on the basis of their online profiles. The school headmaster, the employer, the insurer constantly checks the data traces of individuals in order to reach conclusions and predict outcomes of specific behavioural or psychological characteristics.

The impact of predictive analytics and digital profiling on people's life is triggering a shift in policy regulations. The latest advances in EU Data Protection laws, for instance, place a particular emphasis on the 'right to be forgotten' and also pay particular attention to children's personal information. The problem with the new laws for data protection is represented by their implementation. This becomes evident in the following quote from the EU Commission

> "when children have made data about themselves accessible – often without fully understanding the consequences – they must not be stuck with the consequences of that choice for the rest of their lives. This does not mean that on each request of an individual all his personal data are to be deleted at once and forever. If, for example, the retention of the data is necessary for the performance of a contract, or for compliance with a legal obligation, the data can be kept as long as necessary for that purpose" (EU Commission Fact Sheet, 2017:1-2)".

The above quote shows that the implementation of the right to be forgotten is not straightforward at all and can be extremely problematic. In addition to that, when we think about the digital profiling of children, as Savirimuthu (2015) rightly argued, we need to be aware of the fact that the empowerment discourse about data protection, which assumes that citizens are agents in the protection of their own privacy (e.g. in requesting to be forgotten) does not address the social complexity of processes of datafication. In the next part of the paper, I would like to focus on an element of this complexity: algorithmic inaccuracies.

Algorithmic Inaccuracies, Digital Profiling and Data Justice in Family Life

It becomes clear from the above parts that today the experience of childhood is being affected by processes of datafication. Yet, when we think about children as datafied citizens we should move away from the essentialist notion of 'the datafied child', which seems to define children as 'data assemblages' (Lupton and Williamson, 2017). Whilst such notions are tempting when we map - like Lupton and Williamson (2017) successfully do - the multiple digital technologies that collect the data of children, we must acknowledge that the datafication of children is not a linear, cohesive or even a rational process that is transforming them into quantified selves. It is a rather complex and messy process defined by an incredible and almost untraceable plurality of digital practices that lead to the construction of multiple, messy, inaccurate and contradictory predictions.

This latter point emerged vividly during my research. Parents were asked to imagine the type of narratives that people would construct on the basis of the information they shared on social media or through other digital practices and to predict how these narratives could impact on the making of their children as future citizens. Findings revealed that multiple and contradictory narratives could be build on the basis of the data traces of one individual child, and that children could be profiled as consumer, political, gendered, health, legal or class subjects. I do not have the space here to explore the different narratives that could be constructed about a single child or to describe how parents reacted as they reflected on the issue of digital profiling. Part of these findings can be found elsewhere (Barassi, 2017b) where I have explored the relationship between digital storytelling, political data flows and political profiling in family life.

What I am interested in analysing here is the fact that children are being profiled on the basis of highly contradictory, inaccurate and imprecise data traces. When I was carrying out research in the U.S. for instance I interviewed Pia[2] who lived in detached home surrounded by a large garden in the heart of a middle class neighbourhood in Los Angeles. The living room had all the signs of an intense family life, with two mothers, a 9-month old baby, two cats and two dogs. She recounted how her family life was entirely organised around digital technologies, especially the phone, and how she and her partner used both pregnancy and baby apps to monitor the growth of their baby. She then told me that, although at first these apps seemed to be a good idea because her and her partner would share important information about feeding, sleeping habits etc., at a certain point they just became 'too much work', and the data they inputted was messy and inaccurate.

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[2] Fictional name to protect participant's anonymity.

Apps are one of the fundamental examples of the fact that when we think about the relationship between family life, daily technological use and processes of datafication, there is a clear *human disconnect* between technological discourses and structures (e.g. the promotional culture of self-tracking apps or their design) and everyday practices. During the research it became evident that parents most of the times did not use the technologies as they were supposed to and that the narratives that could be constructed about children's data traces were often the result of imprecise behavior or carefully employed *tactics* (Barassi and Trere, 2012) to protect their privacy and the ones of their children.

The imprecision of children's data flows is a fundamental feature of the datafication of family life. In this context the profiling of children's data is particularly problematic. Of course through the collection of digital data people can trace connections and behavioural patterns of a child's life. Yet it is important that we understand that these connections and patterns are not necessarily accurate, as this type of data is a type of data, which is systematically taken out of context (boyd and Crawford, 2012:670-671) and detached from the intention, desires and understandings that shape everyday technological use in the family.

In understanding the datafication of children therefore we need to ask critical questions about algorithmic inaccuracies and how they can impact on children's life as future citizen. In a beautiful piece on algorithmic bias McQuillan (2016) argues that algorithms are the 'eye' of big data. According to him, 'algorithmic seeing' does not produce a computational panopticon but a mechanism of prediction which many times reproduces the prejudice of inputs. When we think about algorithmic inaccuracies and the datafication of children, therefore, we realise that current debates about surveillance and privacy should move beyond and include a discussion about fair representation, transparency and accuracy of digital profiling. In other words, we should begin to start reflecting on the issue of data justice in family life.

Conclusion

Today the lived experience of childhood and family life is being transformed by intrusive and impactful practices of datification. This paper has argued that we cannot analyse the increased datafication of children without asking critical questions about changing notions of digital citizenship in our data-driven cultures). The paper has shown that children are not only digital citizens because their digital practices enable them to enact and perform their public persona (Third and Collin, 2016), they are datafied citizens because they are coerced into digitally participating to society through the data traces produced by their parents (Barassi, 2017a, 2017b).

In the second part of the paper I have argued that when we think about children as datafied citizens the issue at heart is not only one about privacy and surveillance, it is about the type of assumptions and conclusions that are reached through the profiling of children's

data. This later point is particularly important if we appreciate the fact that the datafication of children is not a linear, rational and accurate process but leads to a multiple variety of messy and contradictory data traces, which are then used to profile children as citizen subjects. In this context, the article concluded, we need to further develop our debates about privacy and surveillance by taking into account critical questions about data justice in family life.

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