Vivewell: Speculating Near-Future Menstrual Tracking through Current Data Practices

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ABSTRACT

In this pictorial, we explore how emergent menstrual biosensing technologies compound existing concerns for the everyday ethics of extracting and analyzing intimate data. Specifically, we review the data practices of a set of existing menstrual tracking applications and use that analysis to inform the design of speculative near future technologies. We present these technologies here in the form of a product catalog for a fictional company called Vivewell. Through this work, we contribute both a set of speculative design proposals and a case study of a design project that begins with the analysis of existing data policies.

AUTHORS KEYWORDS

Biosensing; menstruation; data policies; speculative design.

ACM CLASSIFICATION KEYWORDS

• Human-centered computing~Human computer interaction (HCI)

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INTRODUCTION

Sensor technologies measuring data about our bodies, feelings, and behaviors are increasingly present throughout daily life. Smartphone applications, wearable devices, and even remote sensors hidden from view quantify and analyze the steps we walk throughout the day, the breaths we take, and the quality of our sleep at night. In doing so, they also shape our relationships to ourselves; they tell us how to interpret our bodily processes and how we might endeavor to live differently [4,15]. They compare us to one another, encourage us to set goals for improving health and wellness, and—while promising this efficiency and self-improvement—tend not to allow for varied interpretations of the self [7] or expression of corporeal experience [20] as others in the DIS community have highlighted. These systems also introduce new and far-reaching concerns for cybersecurity and surveillance as they tend to be "leaky," or prone data breaches, and rely on marketing logics that depend on the circulation of user data [16,18].

In this pictorial, we discuss our work to understand emergent biosensing technologies and their privacy implications. Specifically, we focus on menstrual tracking, or systems designed to collect and analyze data about one's menstrual cycle. This form of sensing is widely engaged in via smartphone applications (with over 200 million downloads, as of 2016 [5]) and integrated into prominent health platforms (i.e. Apple Health Fitbit). It accounts for forms of intimate experience—collecting, analyzing, and often sharing potentially sensitive information about the body (e.g., cervical fluid, sleep patterns, sexual activity, emotional state).

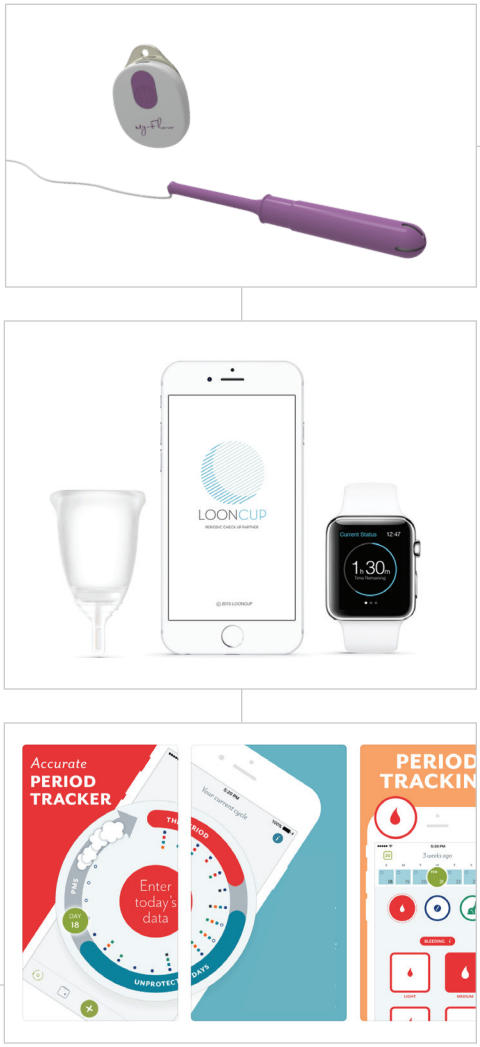
Product catalog for the fictional company Vivewell.

We join speculative design research methods [6,21] with policy review techniques from legal scholarship [19] to interrogate how pervasive intimate data collection might create benefits and risks that are unevenly distributed across those who use these systems. Using policies as a basis for design helps us think beyond artifacts to highlight the legal and administrative worlds in which such systems could exist. In taking up this integrative approach, we make two key contributions to the DIS community. First, we offer a set of speculative design proposals that engage the emotional, social, and political implications of emergent sensing technologies in the form of a fictional product catalog. Second, we contribute a case study of a design project that begins with the analysis of companies' existing data policies.

In this pictorial, we present the findings of our policy review and show how it informed our speculative design proposals. We then present a fictional product catalog of three speculative design proposals—Lithe, Privvy, and Vivid—highlighting the data practices they illustrate. We then reflect on how this approach might inform processes of consent and be used to advocate for more responsible and responsive approaches to data privacy.

MENSTRUAL TRACKING & INTIMATE TECHNOLOGY

Hundreds of smartphone applications offer to predict the length and frequency of one's menstrual cycle and "fertile days" (e.g., [23]). In exchange, users are called on to record potentially sensitive information (particularly if combined with other measures, or identifiable information) such as emotional state, sexual activity, medication usage, sleep patterns, and so on. Recently developed wearable devices such as my.Flow [24] and LOONCUP [25] use embedded sensors to automatically gauge menstrual flow volume, color, and cycle length, as well as promote data sharing with health providers or family and friends. These systems of tracking and sharing are ripe for critical investigation, as data practices are in flux and questions of privacy and safety are evolving. In a recent example offering texture and urgency to these disscussions, the Washington Post reported that the firm Ovia sells its users' health data to employers with little oversight or regulation on how it might be put to use (e.g., discrimination based on pregnancy or health status) [11].



The existing landscape of menstrual tracking includes mobile phone applications and wearable devices such as Clue Period Tracker (bottom), my.Flow (top), and LOONCUP (middle).

Legal scholar Karen Levy outlines this form of tracking as "intimate surveillance," or data collection practices that increasingly capture information about seemingly mundane yet private aspects of our daily lives (e.g., dating, fertility) to be stored on commercial platforms and made newly available to internet service providers, data brokers, and—with the case of Ovia—one's manager [12]. Turning to the systems of capital that undergird these platforms, information scholar Amelia Abreu outlines how trends in the quantified self movement maintain gendered division of labor, where the invisible work of menstrual tracking profits male-dominated corporate interests [1]. HCI researchers Pierce, Fox, Wong, and Merrill highlight how the data- and cybersecurity threats present on these "leaky" platforms combine with relational markers of social position (e.g., race or gender) to form differential vulnerabilities, where some who uses them are made to be more or less vulnerable to potential harms (i.e., breaches, stalking) [9]. Surfacing the stakes of these concepts to the public, artist-activists Natasha Felizi and Joana Varon use detailed illustration and diagrams to show how developers of menstrual tracking applications leverage scant privacy policies and the collection of intimate data to seek profit from third-parties [8].

POLICY REVIEW

To conduct our policy review, we examined menstrual tracking applications' data practices, terms of use, and privacy policies. This work complements existing research on the usability of such technologies [7,13,14], to instead offer insights on (1) the range of depth in policies (from generic boilerplate to specific standards and adherences); (2) how responsibility for ensuring user privacy may be offloaded or delegated (e.g., apps directing users to configure their device-wide privacy settings on iOS or Apple HealthKit or simply to "Be responsible"); (3) types of opt-outs afforded; and (4) the ways in which app providers share and retain data (e.g., some intentionally limit collection of user metadata, others claim to not share with third-parties, and still others share anonymized or "aggregate" data).

POLICY LANDSCAPE

Top 5 Menstrual Tracking Apps from Google and Apple Stores

Flo

#1 in Apple Store, #3 in Google Store | Privacy Policy: Boilerplate

Full name • date of birth • gender • email address • place of residence • ID • menstrual cycle start and end dates • physical and emotional symptoms • frequency of sexual intercourse • sex drive • ovulation • medication • weight • daily sleep duration • basal body temperature • water consumption • physical activity • travel • disease • injury • alcohol consumption • vaginal discharge • open text entry

Period Tracker

#2 in Apple Store, #1 in Google Store | Privacy Policy: Blanket policy for apps by developer

Menstrual cycle start and end dates • physical and emotional symptoms • ovulation

Clue

#3 in Apple Store, #5 in Google Store | Privacy Policy: Policy specific to the app

Menstrual cycle start and end dates • physical and emotional symptoms • frequency and type of sexual activity • ovulation • medication • cervical fluid • quality of skin and hair • daily sleep duration • physical activity • open text entry

Eve

#4 in Apple Store, #7 in Google Store | Privacy Policy: Blanket policy for apps by developer

Gender • age • birthdate • name • email address • mobile phone number • menstrual cycle • weight • temperature • occupation • hobbies • interests • zip code • information related to your past • present or future physical or mental health conditions • credit card numbers and/or cell phone numbers • data that may relate to HIV and/or other sexually transmitted diseases • mental and behavioral health conditions and treatment • substance abuse conditions and treatment • other Sensitive Personal Data content ("Content"), such as photos and other media

Life

#5 in Apple Store, Unranked in Google Store | Privacy Policy: Boilerplate

Menstrual cycle start and end dates • physical and emotional symptoms

My Calendar

Unranked in Apple Store, #4 in Google Store | Privacy Policy: Boilerplate

Menstrual cycle start and end dates • menstrual blood flow • physical and emotional symptoms frequency of sexual activity • ovulation • medication • weight • temperature • open text entry

Period Tracker - Period Calendar Ovulation Tracker

Unranked in Apple Store, #2 in Google Store | Privacy Policy: Boilerplate

Menstrual cycle start and end dates • physical and emotional symptoms • frequency of sexual activity • medication

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We analyzed the top 50 menstrual tracking applications in the U.S. from Apple and Google's app stores, based on their results ranking for the search query "period tracker" in winter 2018. Acknowledging that search results are automatically sorted based on operating system, device type, location, etc., we adopted this approach to see the space a potential user might be likely to encounter when choosing to download a menstrual tracking application.

Our review surfaces the data types collected, ranging from menstrual dates and cycle length, breast tenderness, fatigue, emotions, dates and types of sexual intercourse, cervical mucus texture, medication use (especially contraceptive pills or intrauterine devices), etc. We highlight varying specificity in privacy policies. Some use "boilerplate" policies (policies that generically disclose data collection and use practices—such as data tracking for usage analytics and advertising—but do not specifically discuss menstrual or other bodily data types). Others are specific to the app (or a blanket policy for a family of apps) and specific about the types of bodily data that the app collects and uses. The table illustrates these distinctions across the top ranked applications from Google and Apple. We found that while many policies describe these data as sensitive, only one we reviewed—from Eve—explicitly notes being subject to US HIPAA health privacy laws and classifies its data collection as "protected health information" [26].

Our analysis raises potential privacy and security concerns around the data collection practices specific to period tracking applications and how they may subject the menstruating body to undue surveillance. For example, while a number of privacy policies state users should be over the age of 13 in order to use the application (adhering to the US Children's Online Privacy Protection Act), there are few or no measures put in place to ensure that users understand or comply with such terms within the interaction flow of the app, intensifying ramifications of a potential data breach about child users. In other instances, while users have the ability to delete their self-reported tracking data at any time, automatically collected metadata (such as their device IDs, IP address, and "information about the way you use the Application") can be retained by the company for multiple years [22]. Some privacy policies point readers to other companies' privacy policies which may govern particular features of data, such as the policies for Facebook ads, Apple Health Kit, or Google Fit Our analysis suggests a response model distributed among users, developers, operating system, and platform providers, where responsibility rests in the hands of all and none at the same time. Our close reading of policies and data collection practices identified a set of concerns that we see as being increasingly important as distributed, quantified approaches to healthcare become more commonplace.

POLICY REVIEW CALLOUTS

Individual Responsibility and Choice.

Many privacy policies use language of individual responsibility in describing data protection. Yet, this approach places the burden of responsibility on those who use these platforms (rather than those who design or profit from them). Some policies state users must be careful about sharing personal data, or that it is users' responsibility to periodically check companies' policies for changes over time . As we conducted the review, this raised questions about differences in ability to exert control. For instance, many policies state that if users want to "opt out" of data collection, they must entirely discontinue use of or delete the app. The ability to opt out and not use the application varies greatly among individuals (e.g., those who use tracking applications to gain access to affordable health care plans). The "choice" to opt out becomes further circumspect when considering future sensing technologies such as Privvy, which may continuously collect these data across environments with considerable power differentials such as the workplace.

> **[Y]ou should be extra careful before instructing us to share that information with anyone else.** Your menstrual cycles, fertility information and pregnancy status is much more sensitive than the number of steps you took today or where you were when you took your most recent selfie.
>
> **— Eve/Glow**

> Your continued use of the App after the effective date of an updated version of the Privacy Policy will indicate your acceptance of the Privacy Policy as modified. **We encourage you to periodically review this website for the latest information on our privacy practices. If you do not accept the terms of the Privacy Policy, we ask that you do not use the App.**
>
> **— Period Tracker Flo, Pregnancy & Ovulation Calendar**

Young Users.

Due to compliance with United States and European Union child privacy protection regulations, many applications either require parental consent or do not allow users under the age of 13 to use their services. However, these laws do not align with usage patterns in the context of menstrual tracking and sensing. For instance, those who begin menstruating before 13 may benefit from access to applications oriented toward cultivating bodily sensemaking or offering advice on material preparation. Furthermore, young users may not be willing to share their information, yet parents in the US have the legal right to this data. As we describe with our speculative design proposal Vivid, there is potential for such sharing to lead to greater intimate surveillance of young people's bodies.

> We do not knowingly allow individual Users under the age 13 to create accounts that allow access to our secure site or that use Glow Apps, **without them obtaining the prior consent of a parent or guardian.**
>
> **— Eve Period Tracker - Love, Sex & Relationships App**

> **Our website, products and services are all directed to people who are at least 13 years old or older.**
>
> **— Period Tracker**

> If a parent or guardian becomes aware that his or her child has provided us with information without their consent, he or she should contact us at https://gpapps.com/feedback-contact-us/. **We will delete such information from our files within a reasonable time.**
>
> **— Period Tracker Deluxe**

Metadata and Data Ownership.

Some apps include forums for users to communicate with one another or to share added detail about their experiences, through photos and freeform text. Popular app Glow's policy has a clause that authorizes the app developer to reuse and share this forum data. This raised questions about ownership, particularly on what might happen if companies own data adjacent to menstrual tracking data (such as metadata, user-provided data describing their experiences, or inferences made from combined anonymized datasets).

> [T]he text of any posting on any one of the forums, bulletin boards, or other similar publically accessible systems offered by Glow (including any marketplace or wish list) **becomes the property of Glow, and may be republished by Glow in its sole discretion** and will be made available to other people through the internet.
>
> **— Eve Period Tracker - Love, Sex & Relationships App**

SPECULATIVE DESIGN PROPOSALS: VIVEWELL PRODUCT CATALOG

Building on the issues surfaced by our policy review, we used techniques of speculative design to explore the future of menstrual tracking. In doing so, we not only examine current implications of intimate technology, but also critically consider how these technologies and their data practices might affect users well into the future—across social, economic, and legal contexts. While the menstrual tracking apps we reviewed generally require users to manually input and share their data, other devices automatically sense and store information about human bodies. To that end, our speculative proposals blend current models of use and privacy with emergent technologies that more pervasively collect and organize intimate data through automated sensing (e.g., instrumented clothing and smart environments).

Like other speculative design fiction proposals, we use the form of a product catalog to present a set of speculative products [2, 21, 31]. The form of a product catalog helps create a fictional world where the reader can imagine how these technologies might fit (or not fit) into forms of everyday life. Moreover the catalog allows us to engage with media discourses that depict particularcertain female bodies' characteristics and behaviors as more normative or desirable. The catalog helps build a perceptual bridge between our present realities and the imagined world depicted [2] by inviting readers to inhabit both the excitement and unease of potential futures of intimate sensing technologies.

Combining the textual and visual language of innovation technocultures and modern lifestyle brands, the proposals take the form of a product catalog for a fictional company named "Vivewell." The three speculative design proposals in the catalog—***Lithe***, ***Privvy***, and ***Vivid***—explore different form factors and modes of data sharing. Lithe is a set of undergarments for women, both highlighting normative notions of sexuality and fitness that are often embedded within current menstrual technology and offering to extend this gaze by sharing "emotional" data with a (presumably heterosexual male) partner. Privvy office toilets emphasize worker productivity through the collection of biometric "efficiency"data and the circulation of analytics with managers. The Vivid menstrual cup targets teens newly menstruating, and is meant to allow parents to keep tabs on their child's cycle. Looking beyond individual consumers to situatioins of the workplace and family sensing, we invite readers to critically consider futures of intimate tracking.

Naming the fictional company "***Vivewell***" is meant to blend wellness, joie de vivre, and in vivo scientific experiments, gesturing to sthe corporate motto: "***Live smart, live well.***"

We offer an "unboxing" experience which involves opening sealed plastic wrapping with a warning label about its contents. The warning was included in part due to initial feedback that the catalog's contents may be "offensive" or "uncomfortable" for some readers. The warning label is presented partly in jest, and as a way to highlight and recognize how discussion of menstruation in the public discourse is often relegated as taboo.

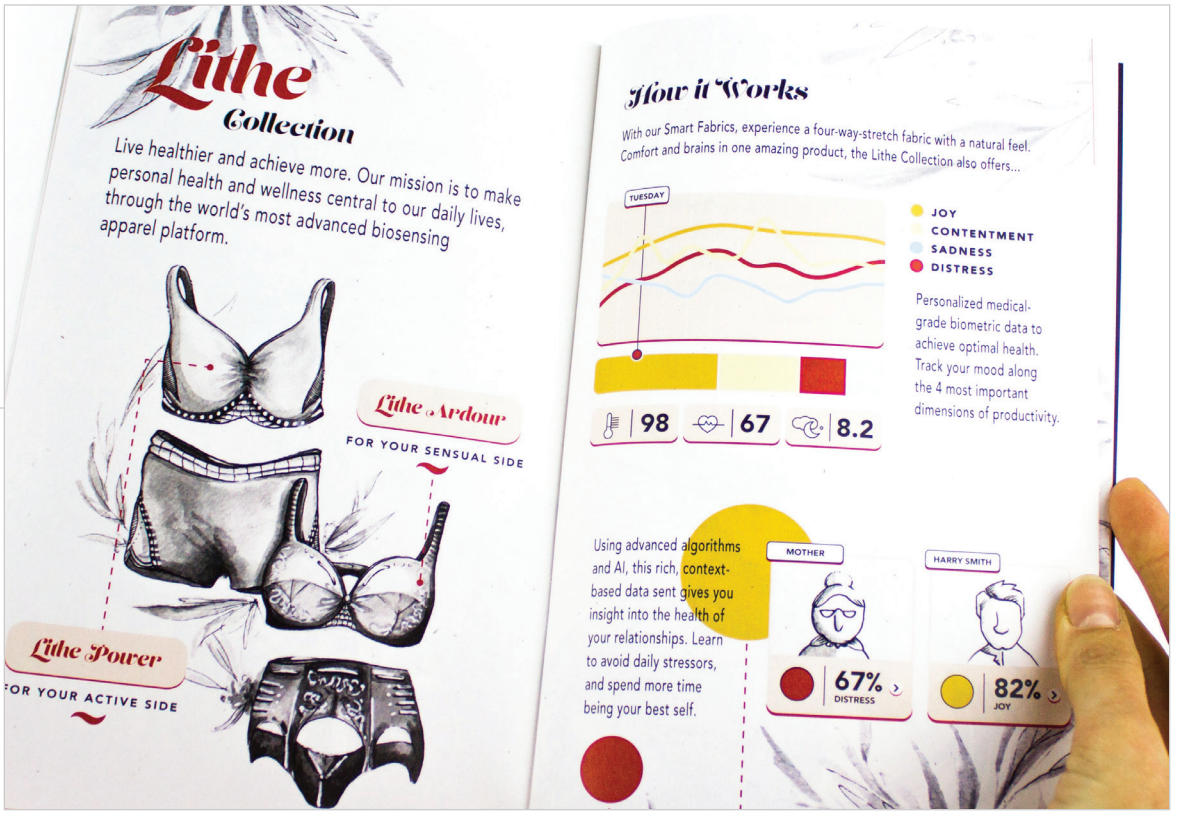
LITHE COLLECTION

With Lithe, we adapt, exaggerate, and deploy the features of existing tracking technologies as a means to engage with the future of sensing.

We chose two stereotypical yet intertwined goals imposed upon women's bodies, that of being fit and that of being desirable. We emulated the hype of present day descriptions of self-tracking products that emphasize individual self-optimization through data-driven insights.

Like many brands, the names of the products we designed indicate values to which consumers may aspire: being lithe, having power, and ardor.

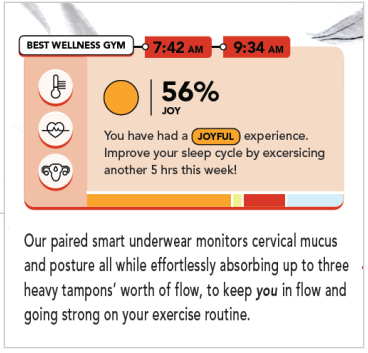
Present day trackers such as Feel [29] claim to detect emotions in real time to optimize wellbeing, framing affective states as discrete and discernable categories. These systems tend to make sweeping claims on which relationships one should cultivate, favoring those which regularly promote positive feeling. Yet, experiences like caring for an ailing relative, for example, may not offer immediate feelings of joy, but can be crucial for close, intimate relationships and in processes of dealing with grief.



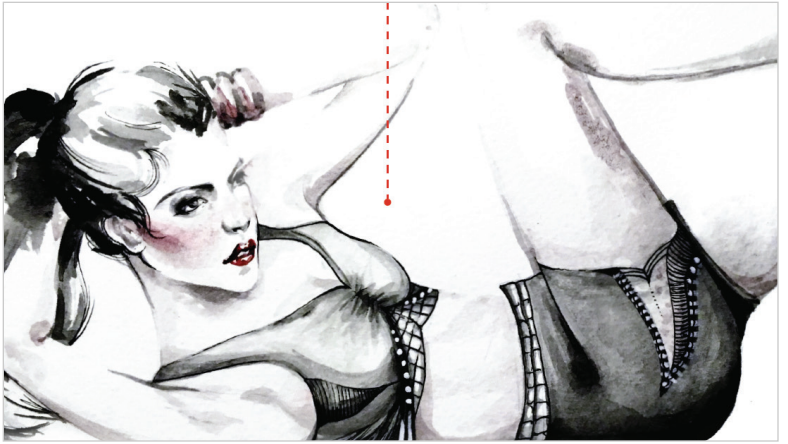
LITHE POWER

Actively seeking methods for conforming to societal norms of fitness, productivity, happiness, and appearance is framed as empowering. Objective metrics guide fitness routines and inform efforts to improve our productivity, sleep quality, and happiness. Experiences of menstruation too can be optimized through data.

Our policy review surfaced the common reliance on individual responsibility and control over personal data. This may make sense in a context where apps are designed to encourage users to self-report data in exchange for insights, but less sense for clothing-based or environmental sensors that automatically measure data from users.



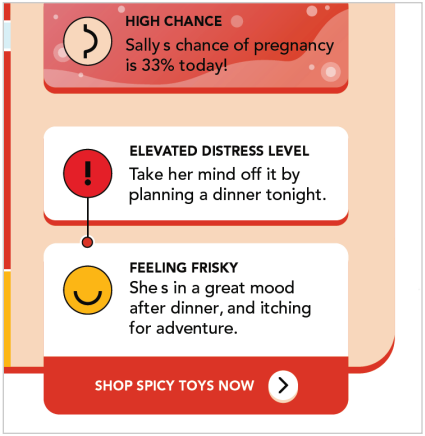
Our paired smart underwear monitors cervical mucus and posture all while effortlessly absorbing up to three heavy tampons' worth of flow, to keep ***you*** in flow and going strong on your exercise routine.



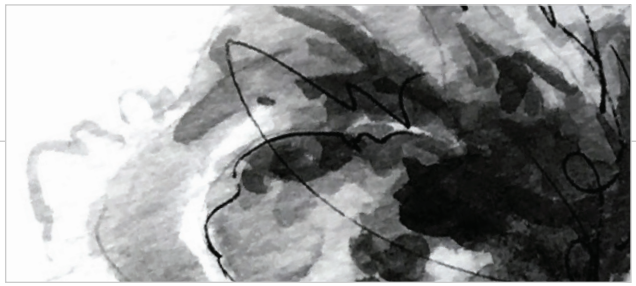
LITHE ARDOUR

Ardour offers a "partner view,"which features algorithmically-informed prompts and activities. These suggestions on how to interact withs Sally are reductive and play toward sexist norms, inspired by an existing app [17].

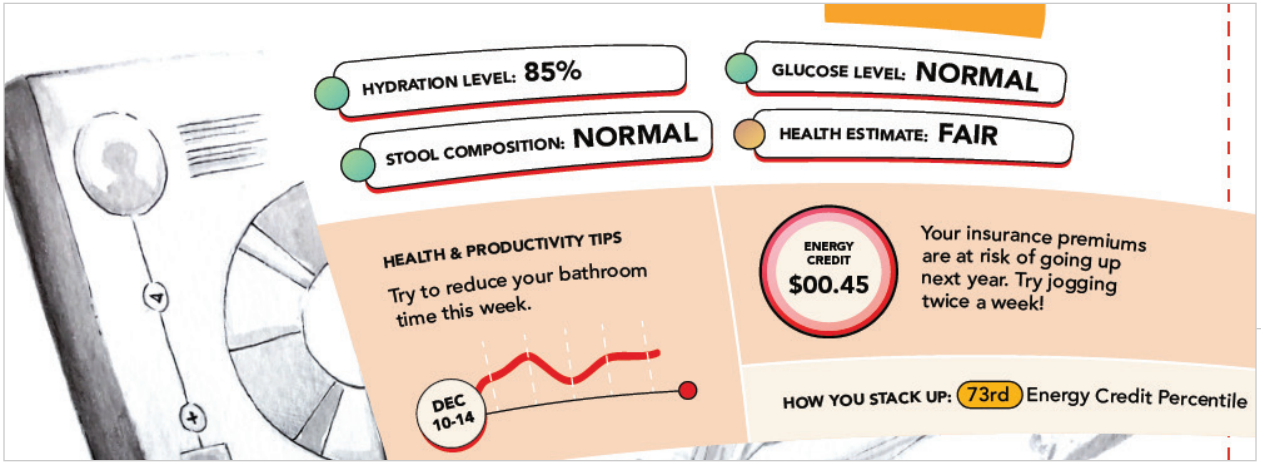
The question of "what women need" during the unpredictability of menstruation is thus delegated to the technology. The partner's burden of "emotional management," for instance, is relieved in the call to shop for "spicy toys."This highlights how algorithmic suggestions may go awry especially as they obscure the need for active consent in situations of ongoing surveillance.



The paternalistic impulse of Lithe is reminiscent of vintage magazine advertising, from which we drew inspiration. A *Lord & Taylor* issue from 1941, for instance, invites men to buy lingerie: "***Give her a private life -- give her something dramatic and wonderful for evenings at home***."



Backgrounds featuring natural textures suggest that the body is unwieldy, something that should be controlled like a well-tended garden.



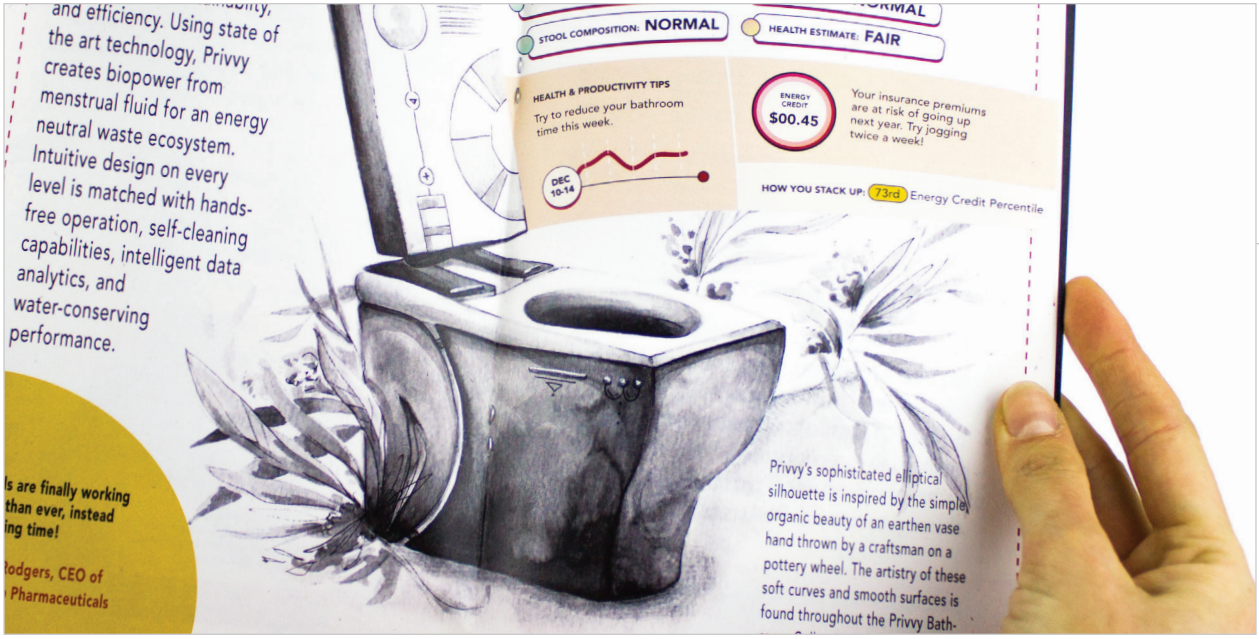
PRIVVY

With Privvy, we move beyond personal tracking to explore the ethics of workplace monitoring [10, 30] and how a corporate push for efficiency becomes intertwined with aspirations toward improved personal wellness.

Employer-provided insurance liability is already being linked to tracking devices [3]. Privy cuts the need to remember to wear a wristbad, and offers seamless data collection.

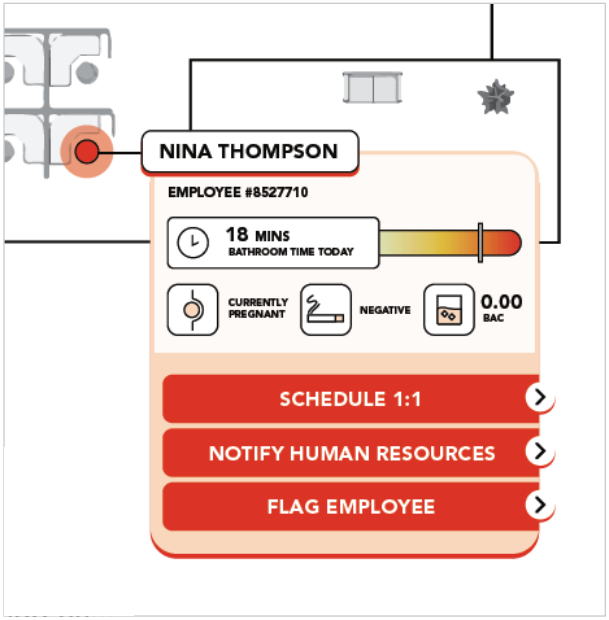
Corporate analytics of individuals' data reflects questions raised from the policy review about adjacent data that is collected and (re)used by the company.

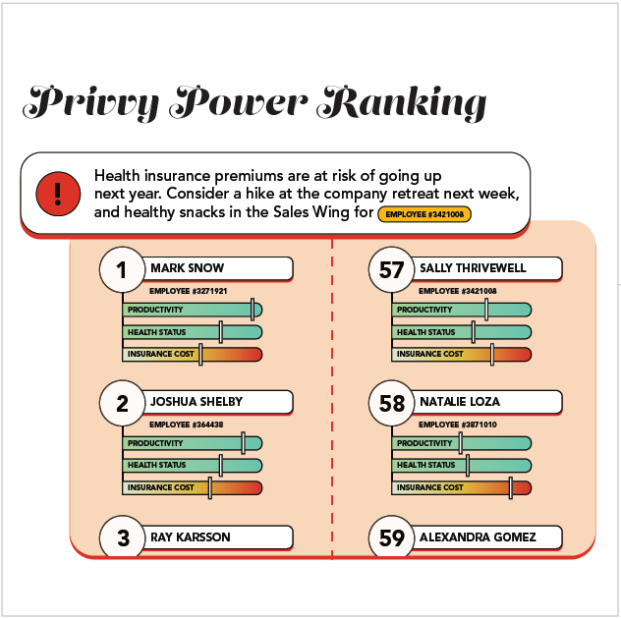
More than simply about data insights, Privy also contributes to company sustainbility iniatives. Energy is harvested from employee fecal matter, and menses is collected to fertilize the office plants.



PRIVVY MANAGER SUITE

While seated at the toilet, the employee might see individual readings of their own usage patterns and the results of various tests on their urine and fecal matter. But here, we foreground the the view of the manager to speculate on how data will be shared with and used by employers as a form of workplace surveillance.





Employers are offered the ability to individually rank employees by health status and production of energy. The system pushes for competition, rather than support or community.

VIVID

As another form of data sharing, we speculate on a device designed to join together the interest of a child who is newly menstruating and their parent who is seeking to understand and monitor their experience.

Inspired by data policies requiring parental consent for children under 13 using data-tracking technologies, and the legal ability for parents to access their children's data.

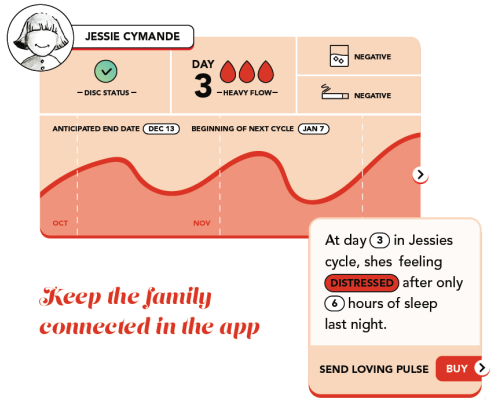
Your Menstruating Teen

Healthy, smart period

Vivid brings together the convenience of a menstrual disc, with its reusable form and long-lasting wear, together with the intelligence of connected technology. Vivid is the world's first smart menstrual disc—safe, convenient, and super smart, with a securely embedded sensor that speaks directly to your smartphone!

Designed for young, active lives

Think of Vivid as your child's monthly period partner – a friend who drops by to make sure they're taking care of their body during this important time. It can tell you and your child exactly how full it is, and when it's time to refresh.



Keep the family connected in the app

Apps encourage parents to channel their anxieties into purchases.

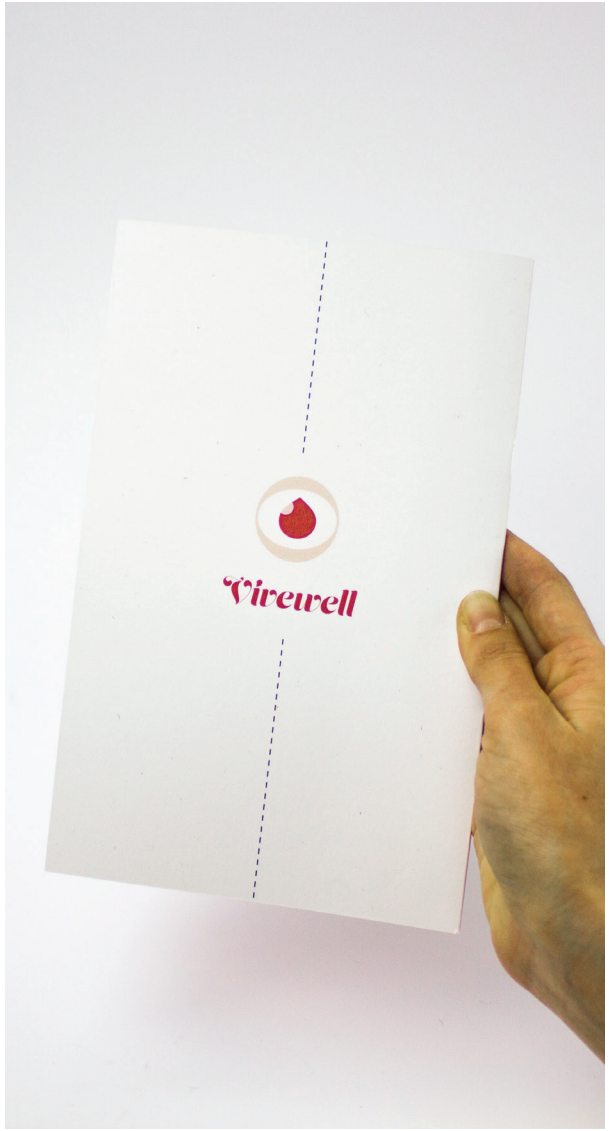
CONCLUSION

Throughout this pictorial, we have described a process of developing a set of speculative design proposals building upon present day approaches to data collection and handliing. Our privacy policy analysis uncovered the prevalence of boilerplate privacy practices that do little to protect even the most generic of data sets. These boilerplate policies rest alongside a troubling model whereby responsibility for privacy and data protection is distributed among users, app developers, operating system, and platform providers, where responsibility rests in the hands of all and none at the same time. With many menstrual tracking applications calling for the long-term collection of sensitive information such as cervical mucus texture, sexual activity, or medication use, there is a need for more work to define the potential harms that could result and how these systems and policies might be constructed differently to better support the interests of the user.

Building from this call, our speculative proposals contend with how near-future technologies might reinforce existing threats, as well as forms of intimate surveillance that could exist—from workplace monitoring to partner or parent surveillance. By joining techniques of legal scholarship and speculative design research, our proposals are both grounded in present day issues while engaging in thought-provoking speculative futuring.

The form of a product catalog for speculative design fiction proposals, allows the designers and viewers to explore and ask questions about everyday experiences using, encountering, adapting to, and (mis)using near-future technologies. Importantly, our design process allows the catalog of design to highlights ways in which existing threats and systems of power could use and adapt technologies towards new forms of intimate surveillance.

Presented as a product catalog from fictional company Vivewell, these speculative design proposals ask us to consider what it might mean to live amidst and be subjected to increasingly pervasive intimate data tracking, and how we might begin to design otherwise.



Back cover of Vivewell catalog, featuring the company's watchful drop logo.

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