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"The Best I Could": Future Orientations for Danish Women with Gestational Diabetes

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ABSTRACT

The introduction of personalized medicine marks a shift in pregnancy-related screening, from fetal to maternal health risks putting the pregnant woman's future orientations center stage. Drawing on fieldwork from pregnancy outpatient clinics and 11 interviews with pregnant women diagnosed with gestational diabetes and offered genetic testing, we use their experiences of time to explore how futurity is reshaped by notions of early detection and at-riskness. We offer the concept of "future prism" to capture how multiple situations of orienting toward the future shape and circumscribe one's experience of the future - an orientation that makes genetic testing almost impossible to refuse.

KEYWORDS

Anthropology of reproduction; Denmark; future orientation; genetic testing; gestational diabetes; personalized medicine

Emily was expecting her first child. She was 42 years old, lived with her boyfriend and was excited about the pregnancy. They had been trying to have a child for 20 years. Her voice was soft as she described "Project Baby:" She gained 35 kilos due to the hormones in the fertility treatments, and her boyfriend had a thrombosis 2 days after she had spontaneously miscarried for the umpteenth time. When they decided to stop trying, Emily suddenly became pregnant: A little girl with Down syndrome who "chose us – she stayed inside me," as Emily said. During pregnancy, Emily needed to go to the hospital often so she and the baby could be monitored: the baby for the complications associated with Down syndrome; Emily for regular checkups. After numerous tests, Emily received the news that she had "a little bit" of gestational diabetes (pregnancy-related diabetes, GDM), but, as she explained to me [Anna], this was a minor issue in the bigger diagnostic odyssey. When I asked Emily – as I did with all the women I interviewed – whether she would want a genetic test that could identify what subtype of diabetes she had, along with her risk of type 1 diabetes later in life and her tolerance of statins (a drug for lowering cholesterol), I felt rather silly. Asking about the three genetic diabetes variants that a research project aimed to find using whole-genome sequencing in women with gestational diabetes felt like completely missing the point about what was important in her life here and now. But to my surprise, Emily said that she would "definitely" take the genetic test. "Why?," I asked. "My mother just died [of cancer], 62 years old," she said. "So, if by taking this genetic test, I can take really good care of myself and live 10–20 years longer, then yes, I would definitely do it!" I asked her whether she believed the test held such a beneficial potential, and she responded: "I'm not enough of a health professional to know about such things, but I would at least think that I've done the best I could."

In the following months, as I interviewed other pregnant women with gestational diabetes, my surprise gradually faded. Both my interlocutors and I struggled to understand what the genetic test was able to do. Nevertheless, it was clear that all the women envisioned that the genetic test had the potential capacity to act into the future.

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This article deals with issues of pregnancy, gestational diabetes and futures. Emily's story encapsulates many aspects of the reproductive hardships medical anthropology has dealt with for decades; pregnancy loss (Layne 2003), assisted reproduction (e.g. Franklin 1997; Inhorn 1994; Thompson 2005), prenatal genetic diagnosis (Rapp 1999), decision-making (Heinsen 2018; Rapp 1999; Rothman 1986; Schwennesen et al. 2010) and reproductive histories framing decisions (Navne and Svendsen 2018). Also, Emily's story reminds us that pregnancy is a site for risk governance (Sufrin 2017; Weir 2006), surveillance (Heinsen et al. 2021) and intervention (Clarke and Shim 2011; Ticktin 2011). However, there is something genuinely novel about the way Emily anticipates the future. Future risk, hope, and potential seem to shape the way she orients herself toward the future and the way she acts on this orientation in the now. In the above ethnographic excerpt, the potentiality exceeds the baby and spills into how Emily envisions her own future – i.e. that genetic testing may extend her life 10–20 years – in the context of her pregnancy and gestational diabetes. However, extreme Emily's hopes for gene technology may be, they underline the powerful future-making qualities of genomic medicine. Emily's pregnancy came after many years of unfulfilled hopes and unsuccessful fertility treatment. Now, a dream is about to come true, but this future is riddled with uncertainty. How many years will she live, considering that her mother died young? How many years will her boyfriend live, considering his risk of stroke? How will the gestational diabetes diagnosis affect her future? And who will take care of their daughter with Down syndrome if they are no longer around? For Emily, the genetic test might be able to offer a relief for these worries. In the interview, Emily approaches her future from several angles. The future's vague contours hint toward many possible endings.

In this article, we bring together scholarship on reproductive anthropology and a more recent anthropology of the future (Bryant and Knight 2019) to explore the unknown of such endings. Whereas previous work in reproductive anthropology on prenatal screening and diagnosis has primarily focused on the monitoring of fetal development and health (e.g. Gammeltoft 2014; Morgan 2009; Rapp 1999; Rothman 1986; Schwennesen and Gammeltoft 2021; Taylor 2008), so far, very little research has been done on how new genetic technologies facilitate the monitoring of *pregnant women's* health. Based on Anna's fieldwork in a research project (TRANSLATE) that sought to offer genetic testing to pregnant women with gestational diabetes in four Danish hospitals, we observed a shift in the way health in pregnancy is approached: from being focused mainly on the baby's health toward a new focus on the pregnant woman's present and future health through GDM screening and genetic testing.

GDM or "gestational diabetes mellitus" is a diagnosis that more and more women receive during their pregnancy and that often disappears after they have given birth. The GDM diagnosis indicates risk for the future health of both baby and mother. For the baby it may lead to overweight later in life, jaundice, type 2 diabetes and hypoglycemia. For the mother, the GDM diagnosis indicates a risk of premature birth, cesarean section, preeclampsia, and not least of developing type 2 diabetes and cardiovascular diseases later in life (Sundhed 2022). When a group of genetic researchers target women with GDM with genetic testing, they aim public health interventions directly at the mother and her potential life trajectory. Thus, genomic medicine, we argue, introduces not only novel experiences of the future but also enables and marks a shift in the focus of pregnancy-related screening from fetal to maternal health risks: a shift from "maternal vanishing" (Reyes-Foster 2022; Wendland 2007) to what we call "maternal illumination."

Inspired by recent scholars in the anthropology of the future arguing that the way people perceive the future come to orient people's actions in the present (Adams et al. 2009; Bryant and Knight 2019; Vigh 2011), we explore how genetic testing and a GDM diagnosis shapes pregnant women's orientation toward the future. We ask: how do pregnant women with gestational diabetes experience the diagnosis and the offer of genetic testing? And how do their experiences shape their orientations to the future? Following Bryant and Knight, we ground these future orientations in the particular individual experiences of how people envision their futures and how envisioned futures are anchored in particular situations and institutional arrangements. In our empirical material, we find three situations in which the women's future orientations seem anchored, illuminating their futures in different ways.

First, we take the situation of pregnancy as a tangible form of future-making and a "window of opportunity" in which health care professionals envision a healthier future for the mother. Second, we point to the situation of gestational diabetes, which is a diagnosis that is hugely shaped by its status as a risk-disease. Being diagnosed with GDM may mean little here and now, but as a borderline diagnosis, it poses a future threat and a problem to the pregnant woman. Third, we point to the situation of the offer of genetic testing. The genetic test is a particular tool with which to act preemptively into the future by gaining knowledge about a future risk of disease. Finally, we introduce the concept of a "future prism." With this concept, we seek to capture the way women's orientation toward the future is circumscribed through the introduction of new technologies. An optical prism is a transparent object in which a beam of light is distorted or changed in different ways when enlightened – it can distort, slant, disperse, refract and color light (Merriam-Webster 2024). Viewing the women's orientation to the future through the prism metaphor directs attention to how the future is circumscribed in particular ways when different situations invite new reflections about the future and may even distort how the women envision the future. With new technologies such as whole-genome sequencing, the transparent glass of the prism appears lit through more clearly than ever – an illumination of maternal future horizons, such as expectations about future health and genetic risk. What we point to, however, is also that seemingly unrelated phenomena – such as one's potential subtype of diabetes and one's experience of at-riskness during pregnancy – may converge toward the same future orientation, which may render technologies such as genetic testing almost impossible to refuse.

We begin with a short methodological section, describing our ethnographic approach and role in the genetic research project TRANSLATE. We then discuss how reproduction and the future has been described in anthropology, before we proceed to the analysis, which is divided into three sections, each discussing a situation that is differently lit up in the future prism metaphor (pregnancy, GDM diagnosis, and genetic testing).

Methods and study

Since 2017, a Danish national strategy for "personalized medicine" has supported huge investments in genetic research involving whole-genome sequencing of Danish citizens. In 2020, the state-financed Innovation Fund Denmark granted 30 million DKK to a five-year research project named TRANSLATE working toward implementing genetic information into patient care to make diagnosis and treatment of non-autoimmune diabetes in Denmark more precise. It does so by performing a comprehensive mapping of their genome called a whole genome sequencing (WGS) on patients with type 2 diabetes and women with gestational diabetes mellitus (GDM). Diabetes is conventionally grouped into three major subtypes: Type 1, which results from the body's failure to produce insulin; type 2, which results from insulin resistance; and GDM, which is characterized by elevated glucose level first recognized in pregnancy and often disappears after having given birth. The main goal of the TRANSLATE project is to further subcategorize and thus make the diabetes diagnosis more precise based on genomic data, which is part of a larger ambition in the Danish health care sector of creating more personalized medicine (Og Ældreministeriet and Regioner 2016). In mapping the individual's genome, the project seeks to tailor treatment to the individual patient and prevent improper treatment, specifically among women with GDM. The TRANSLATE project includes a small social science work group focusing specifically on the ethical implications of including whole-genome sequencing in treatment of type 2 diabetes and GDM. The authors were part of this social science work group and conducted a pilot study in which Anna interviewed women with GDM about their ideas of genetic testing. Meanwhile, the bigger part of the project that involved conducting genetic testing awaited approval from the local administration in the Capital Region of Denmark and the National Committee on Health Research Ethics regarding dataflow and processes of informed consent to whole-genome sequencing (see also Svendsen and Navne 2022).[1] This approval was granted later; however, this analysis is based on empirical data collected before the approval.

Between December 2020 and June 2021, both authors interviewed an obstetrician and the clinical leader of the research project. Moreover, Anna interviewed 11 women with GDM envisioned to benefit from the project as well as three obstetricians, a researcher, an endocrinologist, and a care assistant at the four pregnancy outpatient clinics that are part of the research project. Most interviews took place online due to the COVID-19 pandemic during which Denmark went into lockdown during the first months of 2021. In addition, Anna did 2 days of fieldwork at pregnancy outpatient clinics observing obstetricians and patients interacting in consultations on GDM. In this article, we focus on the experiences of the women with GDM.

In interviews with the potential research participants, Anna spent half of the interview inquiring about their diagnosis and pregnancy and the second half of the interview discussing the research project with them, describing each step of the project and asking them whether they could imagine saying yes to participating in TRANSLATE. Mediating the TRANSLATE project's mission, Anna (whose background is in anthropology and not genetics) introduced the three genetic variants that the research project aims to identify: the possibility of having subtypes of monogenetic forms of diabetes, the women's risk of developing type 1 diabetes, and tolerance of a specific drug for lowering cholesterol called statins.

Being partners in the TRANSLATE group, responsible for studying the ethical implications of introducing WGS in patient care not only gave us unique access to the field site but also raised ethical conundrums. Previous studies on genetic research have raised the concern that social scientists invited to probe ethical questions to technological innovations risk legitimizing rather than challenging the introduction of new technologies (see for instance Reardon 2017). To our surprise, most of the women (9 of 11) we talked to would accept the offer of genetic testing without much questioning, even though they were uncertain about what the offer entailed. This made us conscious about our own role in shaping the women's understanding of the risks and benefits of genetic testing. Did our participation in the project make the women less ethically concerned about genetic testing? Did our queries about potential risk to women, who were in already vulnerable positions cause further worry rather than just enlighten the ethical consequences of the research project? Asking ourselves these questions may bring space for ethical reflection, but does not necessarily remove the uncertainty. Instead, these reflections on our own experience of asking the women about genetic testing reminded us of the difficult position health care professionals often find themselves in when they ask potential research participants to partake in research projects on genetic testing and personalized medicine. In interviews, health care professionals expressed ethical concerns that patients consent not so much to the testing as to *any* suggestion from experts as an act of general trust in the medical doctor sitting in front of them. While the discourse around genetic testing and personalized medicine offers hope and promise for the future, the same position risk generating patient expectations it cannot meet (Hedgecoe 2004; Hilgartner 2017; Hoeyer 2019; Reardon 2017; Tutton 2014). The task to translate genetic knowledge's implications for the future to the women thus adds an additional problem in how to envision genetic testing.

Addressing the future in the anthropology of reproduction

The anthropology of reproduction has strong roots going back to the 1970s where American feminist anthropologists voiced concerns about the medicalization of pregnancy and birth and the control this allowed medicine to exercise over women's bodies (Martin 1987; Rothman 1982, 1986). Medical anthropologists, feminists, and STS scholars alike have since contributed extensively with analyses of technological interventions into pregnancy and the diagnostic screening of pregnant women and their offspring, demonstrating among other things how reproductive medicine has made women the subjects of increased surveillance (e.g. Davis-Floyd 1992; Ginsburg and Rapp 1991; Terry 1989) and pregnancy a site for selection (Wahlberg and Gammeltoft 2017). Studies of assisted reproduction (e.g. Franklin 1997; Thompson 2005), prenatal diagnostic screening (Browner and Press 1995; Schwennesen and Gammeltoft 2021; Thomas et al. 2017), and newborn genetic screening (Latimer 2013; Timmermans and Buchbinder 2013) are just a few examples. Taking reproduction as a site of

politics (Ginsburg and Rapp 1995), scholars have critically engaged with the role of biomedical technology in shaping the pregnant space and in alienating and dislodging women's confidence in their own embodied knowledge when facing biomedical authoritative knowledge in prenatal care (Browner et al. 1997; Davis-Floyd 1992; Jordan 1997). Along the same vein, scholars have suggested the concept of "maternal vanishing" to describe the process by which those birthing become "dismissed, disempowered, and disengaged" by medical staff during birth (Reyes-Foster 2022:50). The idea of the "vanishing" mother was first used by Claire Wendland (2007) to describe how the absence of maternal experiences in obstetric scientific literature shapes obstetric care, particularly in cases of cesarean section.

Pregnancy is a liminal and dangerous space full of transformative potential (Turner 1967; Van Gennep et al. 1960 [1908]), and prenatal screening processes lend themselves to the projection of the unborn child's possible future into the present. Some scholars have therefore suggested that we understand this existential experience of uncertainty and the yet-to-come in pregnancy through the analytical lens of potentiality (Bryant and Knight 2019; Gammeltoft 2013; Schwennesen and Gammeltoft 2021; Svendsen 2011:417; Zhu 2013). The idea of "potentiality" is also central in the anthropological literature on the future. According to Taussig et al. (2013), potentiality serves as a central concept in biomedical practices and indexes a gap between what is, should be, and might be.

The research project we followed was oriented toward the potentiality of the future, yet it was not so much the future of the fetus that was to be projected, as it was the future health and trajectory of the mother. Therefore, we introduce the idea of maternal illumination – not as opposed to maternal vanishing, nor to suggest that genetic testing necessarily empowers the pregnant woman, but rather to signify how she and her future is increasingly put into focus, as the new genetics expands the future orientation of pregnancy to include the mother. To help us unfold what is at stake when women are offered genetic testing in relation to their GDM diagnosis, we use Bryant and Knight's (2019) idea of teleological orientations toward the future.

Bryant and Knight conceptualize the future as a teleology; that is, looking at the future from the perspective of its imagined end. They suggest that there are several ways of orienting toward the future. They refer to these as different "teleoaffective structures." The different orientations are not just different ways of envisioning the future; they are also orientations that encourage people to *act* in the present. This emphasizes how the imagined "ends" of future-oriented projects shape action/non-action. The different orientations relate differently to "horizons of expectations," establishing the future as "separable temporalities" (2019:2). The present, they argue, is multi-temporal, because of the open-endedness of these teleological orientations toward the future. Taking seriously these ways of orienting to the future help us grasp how the present is shaped by the future. For Emily, the imagined "end" is the possibility to live 10–20 years longer. She envisions the potential of present action (genetic testing) to achieve that end.

Pregnancy: Monitoring potentiality in the present

> We are very careful to make sure that everything is as it should be, that's why we are watching you. The reason why we're monitoring you so closely [*når vi er så opmærksomme*] is just because we live in a culture where we like to keep an eye on things to see if everything is on track.
>
> - Obstetrician, to a pregnant woman at pregnancy outpatient clinic during consultation

The above quote illustrates the classic medical anthropological observation that pregnancy has globally become an object of medical surveillance and identification of at-risk-ness (Hammer and Burton-Jeangros 2013; Heinsen et al. 2021; Ivry 2009; Lupton 2012; Smith-Morris 2005; Weir 2006; Zhu 2013). That the obstetrician in the quote above underscores how "we are watching you" implicitly here means monitoring the maternal-fetal dyad with a specific emphasis on the baby's health. The obstetrician manages to calm the woman, not by reassuring them that the numbers are "normal" but by

normalizing the culture of "keeping an eye out." Here, she mobilizes a specific Danish history of prenatal screening preceding most other countries in the world. In 1978, prenatal screening was introduced in Denmark and offered to all pregnant women above 35 years old (such as screening for Down syndrome). Since 2004, free prenatal screening became part of standard public antenatal health care all pregnant women independent of age (Heinsen 2018). Thus, biomedical monitoring of pregnant women has become what Ayo Wahlberg calls a "routinized" technology (Wahlberg 2018). The actual monitoring of pregnant women includes tests of glucose load, blood pressure, and blood tests. Furthermore, pregnancies are triaged by professionals as either "green," "yellow," or "red," depending on the risk of current or future complications (The Capital Region of Denmark 2021).

According to medical literature, the merits of monitoring are many, and pregnancy is framed as a "window of opportunity" to improve both maternal and infant health (Arabin and Baschat 2017; Bloch and Parascandola 2014) as expecting mothers will often do everything in their power to ensure the health of their developing fetus (Browner and Press 1995). Maria, a woman with GDM and pregnant with her third child exemplified this when she let Anna in on her eating habits: "I love to eat delicious stuff. But on the other hand, I need to learn to eat healthy. (. . .) [But] I don't think about myself [in this regard], I think more about my kids." Even though Maria sees her own health needs as secondary to those of her children, the window of opportunity is not only open to the future health of the baby but also to the future health of the mother. In other words, the mother's body and health becomes a possible intervention point and most of the pregnant women we talked to were indeed very interested in and perceptible for interventions. Following this line of thought, we view pregnancy as opening up what the perceived future "end" entails. The same idea was expressed by an obstetrician in an interview, stating "[pregnancy] is a life-changing event; a lot of things are happening, mentally, and you reflect a lot on life and the future."

The mother's future orientation is situated in this context, where the perceived "end" of a pregnancy is more than giving birth. In the institutional setting, offering close surveillance, pregnancy is also loaded with the potential of a healthy baby and a healthy mother who might even be healthier after birth than she was when she first entered the maternity ward. Taking our metaphor of the future prism in this situation reveals how the future is something that the expecting mother is orienting toward in how she sees her present. Bryant and Knight frame "potentiality" as the future's capacity to become the future, existing alongside the actual as "a present pregnant with possibilities" (2019:107). Looking at her belly, the expecting mother sees a life in the making, the future in the present. Thus, in the future prism metaphor, light is shone in to the prism, but the light that is reflected out to the future contains an openness that is full of possibility, a "window of opportunity." In the situation of being pregnant in the Danish welfare state, the future becomes a tangible space of future-making, where life in the woman's belly promises potential of a multiplicity of possible futures.

Diagnosis: Uncertain risk in borderline diabetes

Futures may in contrast become restricted. If the close monitoring regime described in the previous section reveal that everything is *not* on track, i.e. if deviating numbers indicate an underlying health problem, the future is slightly circumscribed. The light reflected from the future prism points to a future horizon with possible threats and problems. One example of a deviating number revealed during pregnancy could be an elevated blood sugar level, resulting in the diagnosis gestational diabetes, GDM. In the maternity ward, the GDM diagnosis belongs to the "yellow" category if the condition can be controlled through diet and to the "red" category if it requires treatment with insulin. Gestational diabetes is estimated to occur in 2–3 percent of all Danish pregnancies (Lauenborg et al. 2004), and studies find that the numbers are growing, both in Denmark (Sundhed 2022) and globally (Zhu and Zhang 2016). Although it is assumed that this increase is due to a general rise in global obesity, a recent study in Canada suggests that it may also be related to changing screening practices (Nethery et al. 2023).

While diabetes is commonly known as a chronic disease, GDM is characterized by being a temporary condition. Normally GDM disappears after the woman has given birth. However, a woman diagnosed with GDM during pregnancy has a 50 percent higher risk of developing type 2 diabetes within the next 10 years. Even though the condition is generally considered asymptomatic, women diagnosed with GDM are monitored closely by the healthcare system to minimize their elevated risk of pregnancy complications such as preeclampsia, cesarean section, and high birth weight, as well as to monitor the future diabetic health of the offspring (Smith-Morris 2005). To establish the GDM diagnosis, the obstetrician measures the woman's blood sugar levels using a glucose tolerance test. If her blood sugar level is above a certain level, she is diagnosed with GDM and will be monitored more closely during her pregnancy. Depending on what the measurements show, she might need to take insulin. Finally, she receives counseling regarding her diet, exercise, and weight, and is informed that the obstetricians will monitor her more closely in future pregnancies.

In her seminal work on diagnostic controversies around GDM, Smith-Morris (2015, 2005) documents how biomedical communities negotiate when to diagnose, with what means, and what cut off values for "normal" blood sugar levels to use when diagnosing GDM. Smith-Morris argues that the diagnosis takes shape of what she and her interlocutors call "borderline diabetes." She does so because GDM is mostly asymptomatic and has unclear borders, and as such the diagnosis indicates a risk of developing a disease and not necessarily an "existing" disease. Different recommendations in different countries result in different cut off values for diagnosing GDM (McIntyre et al. 2018), further underscoring Smith-Morris' observation of the diagnostic controversy surrounding GDM. In Danish maternity wards, the unclear borders of GDM are reflected for instance when obstetricians negotiate whether a woman with GDM belongs to the "yellow" or "red" category. The unclear borders of borderline diabetes, in other words, points to the liminal space that GDM occupies: A liminal space in a temporary sense as well, because the disease often disappears, but signifies increased future risk, when the woman has given birth.

The unclear borders of diabetes were also prevalent in the experience of GDM among the women we spoke to. Several women referred to their GDM diagnosis as an indicator that they "might develop diabetes" and stressed that they did not feel sick at all. They described how, after being diagnosed, self- and hospital monitoring of their pregnancy had increased drastically. For instance, they were required to document what they ate and when, and to self-measure blood sugar levels weekly or daily. The women had to present this documentation at monthly meetings at the pregnancy outpatient clinic, either in small notebooks or via an app.

GDM is a harbinger of the "yet-to-come" rather than a full-blown disease here and now. In the words of an obstetrician, GDM is basically "an expression of an increased risk of type 2 diabetes. So, it is a form of pre-diabetes." Therefore, although the diagnosis is important to the health professionals to be aware of future possible complications for both mother and child and seek to prevent some of these complications, if possible, the diagnosis comes to resemble a risk estimation rather than an actual disease in the present. Among anthropological scholars working with risk, scholars have shown that risk estimations are never morally neutral, as they allow experts to reduce direct intervention into people's lives and instead responsibilize self-regulation through the idea of "risk management" (Lock and Nguyen 2018:267). In other words, the experience of risk and the experience of responsibilization associated with being a "good mother" and adhering patient are closely linked (see also Lappé 2014; Rapp 2011).

Annestine, who had had GDM in her second pregnancy and had now been diagnosed again in her third pregnancy, recalls how she at first experienced being met by health professionals who left her with a feeling that "if you are not doing it well enough, then you are a bad mother," as she put it. During Annestine's second pregnancy, she recalls thinking:

> Every day felt a bit like an exam, or at least the days I had to measure my blood sugar. Like, "Oh, will I stay within the numbers I'm supposed to." But now I know that it's over soon [the pregnancy], now it is what it is!

For Annestine, adhering to the monitoring regime and staying "within the numbers" to manage her perceived risk of developing diabetes implies the management of her past and present health to sustain the future health

of her baby. But Annestine's thoughts also reveal how she orientates toward the future in the present in the context of her own pre-diagnosis. The monitoring regime of GDM is perceived as having an end, and although the possibility of a chronic future looms, she experiences her condition as temporary. In this way, GDM may act as a "sentinel device," to use the concept of Lakoff and Keck (2013). A sentinel device, which can best be defined with reference to the way canaries were used in gold-mines to alarm workers of gas leakage, to "aid in preparation for an uncertain, but potentially catastrophic future" (2013:2). As such, the GDM-diagnosis can be viewed as similar to other more recent diagnoses, such as hypertension, obesity and high cholesterol, which by being "pre-cardiovascular diseases" have become diseases in themselves,[2] or how genetic mutations have become pre-diagnostic categories that shape "genetically at risk" chronicities (Heinsen et al. 2021; Konrad 2003). To speak with our metaphor of the future prism, the future – that is, the reflection of light through the prism – shapes a particular trajectory that points to more restricted, circumscribed horizons compared to the "open" pregnancy described in the previous section. Although in Annestine's words, "it's over soon," an uncertain future with potential of chronic disease looms in the horizon.

Gene testing: Envisioning an actionable future

> I [have the feeling that] it is also my fault [that I have GDM]. Wouldn't it be nice if it was *me* who could show that... perhaps it wasn't really my fault, but it's actually because I was built this way. But I can't help thinking: What if [the genetic test] shows that ... that it's *not* [genetic]. It can also show the opposite, you know. That I'm not susceptible at all, gene-wise, and (...) then that's bound to really hit hard [*så er det først der, man bliver slået oveni hovedet*]!
>
> - Nanna, woman with gestational diabetes

Uncertain about the future results of the genetic test, Nanna's words not only remind us of the inevitable responsibilization associated with lifestyle diseases, but also how the future horizon may paradoxically appear more limited or finite by genetic testing. Using the future prism metaphor, we see here how genetic testing, although illuminating the woman's inner risk and potential future disease, shapes how Nanna envisions her future. Nanna feels ambivalent about the genetic test: Will the stigmatizing burden of having a life style disease be alleviated or intensified through genetic testing? Will the illumination of her future restrict what possible trajectory her life will take? It is important to note that Nanna was one of the only women who declined the offer of genetic testing. Instead, most women were happy about the potential of genetic testing as being able to offer certainty regarding the uncertain future that pregnancy complications caused. For instance, Maria had gestational diabetes in her previous pregnancy. Her first child had meningitis at birth, the second was born prematurely, and during Anna's interview with her, she was worried that the same would happen to her third child. She was enthusiastic about the possibility of genetic testing, no matter what kind of genetic mutations were being tested for: "I would see it as a luxury if I could learn more [about my genes]. Because I'm a person who is often anxious. Also, because I smoke, and because [we have cancer] in the family, so often, I'm scared that there might be something [wrong] (...) I would rather know if I'm at risk so that I know what to pay attention to!"

For Maria, knowledge from genetic testing is framed as a luxury that could offer certainty and alleviate some of her anxieties. As such, her experience is similar to that of Emily, who was quoted in the beginning of this article, who also saw genetic testing as a way to get as much knowledge as possible on which to act. Maria says that part of her anxiety is related to her smoking while pregnant, and she suggests that knowledge about her inherited risk of diseases could prepare her for future disasters, as she would be able to anticipate what would happen instead of seeing the future as a dark, unclear horizon. A gene test would illuminate the future horizon, making Maria aware of what to "pay attention to," and perhaps ultimately, help her to decide whether to continue smoking. Although it is not clear exactly how knowledge from genetic testing will enable them to act on the future, Emily, Nanna, and Maria all share the idea that genetic testing holds a particular potential for action that can shape the future – and their future health – in particular ways. While Nanna experiences this potential as able to restrict future possibilities negatively in terms of increased guilt, Maria and Emily would rather take the test and have the future circumscribed in order to know what to act on in the future. This

argument rings similar to the increase in pre-diagnoses described in the section above. Our findings are in line with what Adams et al. (2009) describe as a shift from regimes of prevention to regimes of anticipation, especially within biomedicine. Instead of preventing disease, we anticipate it and estimate its probability: "[I]n the space of anticipation, prevention *becomes* biopreparedness . . . generating new and better means of dealing with inevitable disasters rather than actually preventing them" (2009:257–8, emphasis original). It is in other words not a question about preventing, but rather about anticipating the potential disasters of the future. Genetic testing, we could say, functions as an anticipatory space, where women with GDM use increased knowledge to better prepare for this possible future. That is, the genetic test presents a situation that invites action. The idea of biopreparedness suggests that the anticipatory regime in biomedicine makes people prepare for the future's possible catastrophes instead of action through prevention. Vigh (2011) sums up the difference between the two by defining the word "pre-emption." Differentiating between prevention and preemption, Vigh states that while the first is directed "toward shaping the future in a given way," the second is an "interactivity related to an already existing – but latent – force or imagined future effect" (2011:110). Similar to viewing potentiality as the present pregnant with the future (Bryant and Knight 2019), preemption is about acting on that already existing future in the present, particularly when that potentiality is seen negatively as threatening the present. Sofia, who was pregnant with her third child, articulated the negative role of knowledge in anticipating the future. Although hesitant toward genetic testing, she decided that she would probably accept the offer of a genetic test, because, as she said: "Well, in the end, you cannot act on something you don't know." She didn't like the prospect of knowing her risk for type 1 diabetes, but framed the decision as a cost-benefit analysis by saying: "Do I get *more* value if I know, or will I be defrauded of my blissful ignorance?" Sofia decided that more knowledge was better for her to prepare for the future. For Sofia, an orientation toward the seed of action, which is toward "potentiality" in Bryant and Knight's terminology, was essential in her decision to say yes to genetic testing. Undiagnosed type 1 diabetes may cause acute situations that can be avoided if you know how to act when symptoms arise. But the knowledge came at a cost for Sofia. Acting toward a teleology of potentiality, hence illuminating future dangers, could also restrict the open-endedness of her current horizon.

The women with GDM in our ethnographic material find themselves in liminal contexts as both pregnant and having "borderline diabetes," not knowing whether diabetes will return after their pregnancy or will remain dormant for the rest of their lives. In this context, we may see the acceptance of genetic testing as a preemptive measure for the women to act upon the future before it acts upon them. Thus, genetic testing not only holds a moral imperative for pregnant women to demonstrate responsibility and intentions to become good mothers, but can also be a preemptive tool to be able to engage with an unknown future.

Considering the conditions Emily, Nanna, Maria and Sofia anticipate to act on (early death, guilt, cancer, type 1 diabetes) based on a genetic test, these examples are important reminders of what role patients may (implicitly) assign to health professionals in clarifying the limits of how genetic knowledge can be translated into clinical action. We see here that the women experience genetic testing as somehow illuminating their future, as the transparent glass of the future prism is lit up. Staying within the future prism metaphor, we may ask how the beam of light will be reflected in the glass. The orientation toward the future shapes a particular future trajectory. In a time where new technologies in personalized medicine promise to bring along new potentials, it is however sometimes unclear – even to the genetic researchers themselves – what the implications of an illumination of the future entails. In light of technological development in health, the future is full of potentiality to be illuminated – yet, the potential remains uncertain, and may perhaps even distort how we envision the future. Especially if none of us – neither researchers, clinicians nor patients – are entirely sure what the technological developments can do in this fast-approaching future.

Discussion: Maternal futures illuminated

When Emily accepts the genetic test in the hope that she might live 10–20 years longer, she reminds us that the future is a "becoming" (Andersson 2012). Emily's hopes and concerns for her own future, her husband's future, her unborn child's future, her mother's absence in the

future, her diagnosis, and her space for action all converge. Facing the opportunity of genetic testing while being pregnant with GDM introduces an infinite number of futures that materialize in the interplay between different situations. In this article, we have demonstrated three particular situations where the future is circumscribed and distorted in different ways; that is when the women are confronted with the future through pregnancy, gestational diabetes and genetic testing. Using the metaphor of a "future prism" we have analyzed how different beams of light project differently into the future. The idea of a prism conveys that the future is illuminated through a particular perspective that shapes or distorts how this future horizon is envisioned, anticipated, perhaps even feared of. Through the three particular situations, we see how the orientation toward the future and the distortion that different situations bring can take on many forms. Pregnancy in itself opens up to indefinite future trajectories as a "window of opportunity." Gestational diabetes as a sentinel device brings with it a pre-diagnosis that may bring more uncertainty for the women confronted with the experience of "borderline diabetes," confining some of these futures. In addition, the offer of genetic testing gives the women a tool to preemptively act upon the future before it acts upon them, but in some ways this future seems more riddled with uncertainty than before the light shone through the future prism. Through our 11 interviews, we learned that for some, genetic testing can give a direction, so that the women know how to act toward the future, and for others, it can further alleviate existing experiences of guilt or deprive them of blissful unawareness. The light that emanates from the prism can take on multiple colors and point to multiple directions. Thinking along the lines of Bryant and Knight, these rays of light can be seen as teleological orientations, pointing toward different perceived ends with "differing depths of time" (2019:2). However, these different orientations and different temporal depths remain in flux and may constantly change depending on a given subject. With Bryant and Knight's terminology we suggest that "potentiality" is a shared teleoaffective structure that spans across several different situations. Highlighting the different situations in which the women orient toward the future, and thus how this envisioned potentiality comes into being, enable us to demonstrate the unintended consequences of well-intended initiatives such as prenatal screening and genetic testing.

With this article, we have shown that offering genetic testing in a context of uncertainty may lead to high patient expectations with regard to the actionability of such genetic knowledge; expectations that may exceed the actual knowledge genetic testing can provide. For instance, the risk estimations in relation to future diabetes offered by the genetic test remain estimations of probability rather than facts and only hint at what contours may or may not lie in the horizon.

Introducing personalized medicine in pregnancy care, everything is lit through. We have demonstrated that the experiences of the women with GDM who are offered genetic testing mark a shift in pregnancy-related screening from fetal to maternal future health risks. We term this shift "maternal illumination." The shift reflects the responsibility that researchers in genomic medicine have to administer and navigate when offering personalized medicine to pregnant women. When offering genetic testing to women with GDM researchers and clinicians alike need to be wary of the women who are simultaneously in a liminal state as pregnant and having borderline diabetes, and that they may find it difficult to refuse the offer. With Emily's words, the woman may seek to do all that stands in their power: to do "the best I could," to act on the future preemptively, and genetic testing becomes a way of doing so.

Notes

1. In Denmark, ethical approval is not mandatory in interview and observation studies. According to Danish law, the data collected for the study on which this article is based has been approved by the Danish Data Protection Agency.
2. We thank one of our reviewers for bringing attention to this point.

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