

## **Sexuality Among Young Danes Treated for Long-Lasting or Severe Physical Disease**

### *Baseline Findings in a Nationwide Cohort Study*

Graugaard, Christian; Bahnsen, Mikkel Kjær; Boisen, Kirsten A.; Andresen, Josefine Bernhard; Andersson, Mikael; Frisch, Morten

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## Original article

## Sexuality Among Young Danes Treated for Long-Lasting or Severe Physical Disease: Baseline Findings in a Nationwide Cohort Study



Christian Graugaard, M.D., Ph.D.<sup>a,\*</sup>, Mikkel Kjær Bahnsen, M.Sc.<sup>b</sup>, Kirsten A. Boisen, M.D., Ph.D.<sup>c</sup>,  
Josefine Bernhard Andresen, M.Sc.<sup>a,b</sup>, Mikael Andersson, M.Sc.<sup>b</sup>, and  
Morten Frisch, M.D., Ph.D., Dr.Med.Sci.<sup>a,b</sup>

<sup>a</sup> Center for Sexology Research, Department of Clinical Medicine, Aalborg University, Aalborg, Denmark

<sup>b</sup> Department of Epidemiology Research, Statens Serum Institut, Copenhagen, Denmark

<sup>c</sup> Center of Adolescent Medicine, Department of Pediatric and Adolescent Medicine, Copenhagen University Hospital Rigshospitalet, Copenhagen, Denmark

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## A B S T R A C T

**Purpose:** Sexual ramifications of physical disease are well-documented in adult populations, but are scarcely investigated among adolescents and young adults (AYA). This study compared measures of sexuality and sexual health among 8,696 15-year-old to 24-year-old Danes with and without a history of treatment for long-lasting or severe physical disease.

**Methods:** Using baseline data from Project SEXUS, a nationally representative cohort study on sexual health in the Danish population, differences in various domains of sexual behaviors and sexual health between AYA who have and AYA who have not been treated for long-lasting or severe physical disease were investigated. Logistic regression analyses yielded demographically weighted age-adjusted odds ratios (ORs) for associations between physical diseases and sexual outcomes.

**Results:** AYA treated for long-lasting or severe physical disease resembled their healthy peers on fundamental aspects of sexual interest, activity and satisfaction. However, significantly increased odds ratios of various sexual difficulties and dysfunctions, early sexual debut, high sex partner numbers, discontentment with body or genital appearance, gender nonconformity, nonheterosexuality, and exposure to sexual assaults were observed, overall or within specific disease categories.

**Discussion:** The overall similarity in sexual profiles between AYA treated for physical disease and healthy peers indicates that clinicians should routinely address questions related to sexuality and relationships when encountering AYA with chronic health conditions. Moreover, the observed excess of certain adversities, including sexual assaults, among physically ill AYA highlights the need for preventive measures and counseling services specifically targeted at AYA afflicted by physical disease.

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IMPLICATIONS AND  
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AYA treated for long-lasting or severe physical disease resemble their healthy peers on fundamental aspects of sexual interest, activity, and satisfaction. However, they also display increased odds of sexual dysfunctions, early sexual debut, body discontentment, gender nonconformity, nonheterosexuality, and sexual assaults. Healthcare for young people afflicted by physical disease should therefore embrace issues of sexual health.

Young people pass through years of biological, psychological, and social change, and during adolescence and early adulthood,

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\* Address correspondence to: Christian Graugaard, M.D., Ph.D., Center for Sexology Research, Department of Clinical Medicine, Aalborg University, 15 Sdr. Skovvej, DK-9000 Aalborg, Denmark.

E-mail address: [chgr@rn.dk](mailto:chgr@rn.dk) (C. Graugaard).

comprehensive transformations of identity and interpersonal relations take place. It is, however, well known from both research and clinical experience that the occurrence of somatic illness or disability during childhood or adolescence might disrupt trajectories of physical and psychosocial growth [1–7]. Also, since sexual development constitutes an essential part of young people's separation-individuation process, it is expectable

that domains of sexuality and romanticism will be adversely affected by long-lasting or severe illness [8].

Previous studies, focusing mainly on cancer survivors, have demonstrated that physical disease renders adolescents and young adults (AYA) susceptible to impeded self-esteem, autonomy, and social participation [2,3,8–12]. Clearly, such challenges may inhibit AYA's keenness and ability to engage in sexual activities, as is already known to be the case among adult patients [13–16]. In addition, existing research has suggested that chronically ill AYA may be involved in more risky sexual interactions than their healthy peers, resulting in higher rates of early sexual debut, sexually transmitted infections (STIs), and sexual victimization [17–22].

Despite such patterns, sexual behaviors and wellbeing of young people who are, or have previously been, affected by long-lasting or severe physical disease are only cursorily investigated, and disease-associated sexual obstacles therefore remain poorly recognized in adolescent medicine. Founded on data from a comprehensive nationwide cohort study on sexual health in the Danish population, this explorative investigation outlines key dimensions of sexuality and sexual health among 15-year-old to 24-year-old Danes who have, or have not, received medical treatment for long-lasting or severe physical disease.

## Methods

### Participants and procedures

We used baseline data from Project SEXUS ([www.projektsexus.dk](http://www.projektsexus.dk)), a prospective national cohort study with a strict focus on sexual health in the general Danish population. A comprehensive online questionnaire consisting of approx. 600 questions was applied, but due to strategic filter questions, each participant was presented with a median of 180 items. No missing values were registered since the questionnaire required a reply to all items. An English translation of the full questionnaire is available at the project website ([https://www.projektsexus.dk/Questionnaire\\_2017-2018](https://www.projektsexus.dk/Questionnaire_2017-2018)).

The cohort was established using a probability-based sampling frame, and potential participants were randomly selected from the national Civil Registration System and approached online via their officially designated personal mailbox (e-Boks). Up to five reminders were issued, including a postal invitation letter forwarded to eligible teenagers, who had not responded to previous invitations. The invitation letter briefly outlined the scope and aims of the study, emphasizing that participation was voluntary and that answers would be treated strictly confidentially. Consent was given by completing and submitting the questionnaire.

Between September 2017 and August 2018, 187,084 Danes aged 15–89 years were invited to participate in the study, and 64,706 individuals gave complete or almost-complete responses, resulting in an overall AAPOR (The American Association for Public Opinion and Research) response rate 1 of 34.6% [23]. Upon restriction to 15-year-old to 24-year-old participants born between September 1, 1992, and November 30, 2002, the AAPOR response rate 1 was 30.9%. Overall, 8,696 individuals provided data for the present study, and we applied an individual weighting procedure ensuring national representativeness regarding sex, birth year, region of residence, marital status, cultural background, and twin status [15,24–26].

### Physical health problem measures

We assessed physical health problems by asking the question “Have you ever been treated by a doctor for a long-lasting or

severe physical disease?” (yes, no, I do not know). Participants responding affirmatively were presented with a comprehensive list of physical diseases and asked to specify which of these they had received treatment for (see the Appendix). After consultation with a clinician within adolescent medicine (KAB), diseases were grouped in the following eight categories: “Lung diseases, skin diseases and allergies”, “Pain conditions”, “Gastrointestinal and liver diseases”, “Rheumatic diseases”, “Cardiovascular diseases”, “Endocrine diseases”, “Nervous system diseases”, and “Other/unspecified diseases.”

### Sexual and relational measures

Variables were selected to provide a broad characterization of the intimate lives of 15-year-old to 24-year-old Danes, covering dimensions such as masturbation, sexual needs, sexual experience, partner status, sexual identity, contentment with appearance of body and genitalia and gender conformity. Further, adverse outcomes such as sexual difficulties and dysfunctions, risky sexual behaviors, and exposure to sexual assaults were included.

Gender nonconformity was ascribed to respondents answering *very well* or *well* on a 5-point Likert scale to the question “How well, or how poorly, does the following statement fit you: As a child or young person, I had difficulties living up to other people's perception of ‘a real boy’/‘a real girl’?”. Participants responding anything but *heterosexual* to the question “How would you describe your sexual identity?” were considered having a nonheterosexual identity.

Sexually active participants were asked if and how often they had encountered specific sexual difficulties during partnered sexual activity within the last year, and whether or not they considered a reported difficulty as a problem (yes, no). To be categorized as having a *sexual dysfunction*, we required that an experienced sexual difficulty be both frequent (i.e., *often* or *every time*) and perceived as a problem. Less frequent difficulties, and difficulties that were not perceived as a problem, were categorized as *sexual difficulties*. In addition, female sexual functioning was measured by the six-item Female Sexual Function Index (FSFI-6). Women with an FSFI-6 score of 6–19 points (*female sexual dysfunction*) were compared to those with a score of 20–30 points (*normal sexual function*) [27].

To identify participants with possible hypoactive sexual desire disorder, both sexually active and inactive respondents with a partner were asked to indicate their level of sexual desire within the last four weeks. For this purpose, we used the first question about sexual desire in the FSFI-6 with response options presented as a five-point Likert scale (*very low or none at all*, *low*, *moderate*, *high*, *very high*). Participants were further asked if they perceived their reported level of sexual desire as a problem (yes, no). We categorized participants whose level of sexual desire was *low* or *very low or none at all*, and who considered their level of sexual desire as problematic, as having hypoactive sexual desire disorder. We included a third category consisting of participants reporting problematic sexual desire associated with *very high*, *high*, or *moderate* levels of sexual desire, but results for this category are not reported here.

Our operationalization of sexual difficulties and dysfunctions has been described in detail elsewhere [15,26], and details about all other sexual outcome measures are given in the Appendix. Participants' sex was defined by their legal sex as registered in

the national Civil Registration System upon establishment of the Project SEXUS cohort in 2017.

### Statistical analyses

Binary and polytomous logistic regression analyses yielded demographically weighted odds ratios (ORs) with 95% confidence intervals (CIs) for associations between physical diseases and sexual outcomes. Throughout, participants who had never received treatment for any long-lasting or severe physical disease or, in disease-specific analyses, those who had never received treatment for the disease in question, served as reference. All ORs were adjusted for age in 2-year intervals (five categories). All statistical analyses were carried out using the *nnet* package in R (version 4.02).

### Ethics

According to Danish law, questionnaire-based research does not require approval by The Scientific Ethical Committee system. Before study onset, institutional approval at Statens Serum Institut (no. 21–00053) was obtained to ensure compliance with the EU's general data protection regulation (GDPR). To preserve participant confidentiality, all statistical analyses were performed using a pseudonymized dataset.

### Results

The sex and age distribution of study participants as well as self-reported proportions treated for specific diseases are shown in Table 1. Slightly more women than men had ever received medical treatment for long-lasting or severe physical disease (14.1% vs. 11.7%). Among both genders, the composite disease category “Lung diseases, skin diseases and allergies” was most prevalent, currently or formerly afflicting around 5% of respondents. Two point six percent and 5.0% of male and female participants, respectively, reported to have had more than one long-lasting or severe physical disease.

As shown in Table 2, there were only few differences in selected sexual and relational characteristics between AYA who had or had not received treatment for a long-lasting or severe physical disease. Specifically, treated and nontreated AYA did not differ significantly with regard to partner status or relationship contentment, sexual needs, current sex life satisfaction, pornography use, masturbation, or partnered sexual activity in the last year. However, more treated than nontreated women had ever had partnered sex (OR: 1.35; CI: 1.08–1.70), and more treated than nontreated men considered their sex life meaningful and rewarding (OR: 1.30; CI: 1.07–1.59) or had talked with a healthcare professional about sexual issues or problems within the past five years (OR: 1.34; CI: 1.00–1.78).

Table 3 shows increased odds of sexual difficulties and dysfunctions among AYA treated for long-lasting or severe physical disease compared to healthy peers. For men, statistically significantly elevated odds were seen for premature ejaculation dysfunction (OR: 1.47; CI: 1.05–2.07), genital pain difficulty (OR: 1.47; CI: 1.17–1.86), and genital pain dysfunction (OR: 4.13; CI: 2.20–7.72). For women, a statistically significant association was observed for lubrication dysfunction (OR: 1.57; CI: 1.10–2.25).

Prevalences and ORs for indicators of sexual risk situations are shown in Table 4. Overall, men treated for long-lasting or severe physical disease had elevated odds of sexual debut before age

**Table 1**

Distribution of sex, age, and treatment for long-lasting or severe physical disease in the study population of 8,696 15-year-old to 24-year-old Danes

	Men	Women
	N (%)	N (%)
Overall	3,233	5,463
Age (years)		
15–16	493 (16.8)	833 (16.8)
17–18	732 (24.5)	1,157 (23.3)
19–20	684 (21.2)	1,133 (21.7)
21–22	682 (19.3)	1,159 (19.1)
23–24	642 (18.1)	1,181 (19.1)
Treatment for a long-lasting or severe physical disease		
Never treated	2,754 (88.3)	4,516 (85.9)
Ever treated	366 (11.7)	750 (14.1)
Treatment for specific physical diseases (ever)		
Lung diseases, skin diseases and allergies	156 (4.9)	277 (5.2)
Pain conditions <sup>a</sup>	38 (1.2)	168 (3.0)
Gastrointestinal and liver diseases	45 (1.5)	107 (1.9)
Rheumatic diseases <sup>b</sup>	27 (0.8)	93 (1.8)
Cardiovascular diseases <sup>c</sup>	25 (0.7)	49 (0.8)
Endocrine diseases <sup>d</sup>	15 (0.4)	49 (0.8)
Nervous system diseases	10 (0.3)	31 (0.5)
Other/unspecified diseases <sup>e</sup>	110 (3.3)	258 (4.7)

N = unweighted, (%) = weighted proportion.

<sup>a</sup> Including migraine or recurring headache and chronic pain conditions.

<sup>b</sup> Including back disorders, rheumatoid arthritis, and connective tissue disease.

<sup>c</sup> Including cardiac rhythm disorders, hypertension, apoplexia, and other heart diseases.

<sup>d</sup> Including diabetes and hyperthyroidism or hypothyroidism.

<sup>e</sup> Including functional disorders, cancer, kidney diseases, gynecological diseases, and unspecified diseases.

15 years, which marks the age of sexual consent in Denmark (OR: 1.41; CI: 1.11–1.78), and similarly increased odds occurred in several disease categories. Further, among males ever treated for “Pain conditions”, the odds of reporting a lifetime number of sex partners in the top quintile for one's age group were doubled (OR: 2.06; CI: 1.23–3.43), whereas the odds of having experienced a sexual assault were almost five-fold increased (OR: 4.73; CI: 1.78–12.6). No overall differences were observed concerning unsafe sex or STI acquisition, but men treated for “Endocrine diseases” were less likely to have engaged in unsafe sex (OR: 0.10; CI: 0.02–0.42), and men with “Other/unspecified diseases” were less likely to have acquired an STI (OR: 0.43; CI: 0.20–0.93).

Among women treated for long-lasting or severe physical disease, we observed overall elevated odds of sexual debut before the age of consent (OR: 1.57; CI: 1.29–1.92), top-quintile numbers of sex partners (OR: 1.31; CI: 1.10–1.55) and sexual assaults (OR: 2.21; CI: 1.78–2.76) compared to women with no such history of treatment. Elevated odds were also seen for several specific disease categories. Most notably, ORs for sexual assault were two to three times increased for women treated for “Nervous system diseases” (OR: 3.20; CI: 1.34–7.66), “Gastrointestinal and liver diseases” (OR: 2.83; CI: 1.77–4.54), or “Pain conditions” (OR: 2.68; CI: 1.83–3.94). No differences between treated and nontreated women were observed concerning unsafe sex, STI acquisition, or induced abortion.

As seen in Table 5, odds of discontentment with general body appearance were increased among men treated for “Rheumatic diseases” (OR: 6.43; CI: 2.23–18.53) or “Gastrointestinal and liver diseases” (OR: 4.07; CI: 1.97–8.45), and increased ORs for discontentment with genital appearance were seen for men with “Rheumatic diseases” (OR: 4.80; CI: 1.44–16.00), “Gastrointestinal and liver diseases” (OR: 3.99; CI: 1.79–8.86), or “Lung

**Table 2**

Associations between treatment (ever) for long-lasting or severe physical disease and selected sexual and relational characteristics among 8,696 15-year-old to 24-year-old individuals, Denmark 2017–2018

	Men				Women			
	Never treated		Ever treated		Never treated		Ever treated	
	N (%)	OR (95% CI)	N (%)	OR (95% CI)	N (%)	OR (95% CI)	N (%)	OR (95% CI)
Partner status								
Having a partner	2,714 (36.0)	1 (ref)	364 (40.7)	1.18 (0.98–1.41)	4,445 (46.6)	1 (ref)	743 (48.7)	1.02 (0.86–1.21)
Quality of current partnership <sup>a</sup>								
Good or very good	1,000 (93.4)	1 (ref)	145 (95.3)	1.44 (0.76–2.73)	2,140 (94.8)	1 (ref)	371 (94.7)	0.97 (0.57–1.63)
Ever had sex with another person								
Yes	2,726 (71.8)	1 (ref)	361 (72.2)	0.92 (0.74–1.13)	4,471 (75.2)	1 (ref)	743 (81.0)	1.35 (1.08–1.70)
Sexually active within the last year <sup>b</sup>								
Yes	2,691 (64.7)	1 (ref)	358 (66.2)	0.99 (0.82–1.20)	4,415 (71.5)	1 (ref)	734 (75.8)	1.20 (0.97–1.47)
Perceived importance of having a good sex life								
Important, very important or extremely important	2,619 (84.0)	1 (ref)	352 (85.3)	1.06 (0.82–1.36)	4,182 (82.2)	1 (ref)	700 (85.7)	1.24 (0.97–1.58)
Sexual needs within the last year								
Had sexual needs	2,640 (93.6)	1 (ref)	351 (95.5)	1.29 (0.85–1.97)	4,304 (87.0)	1 (ref)	717 (88.0)	1.00 (0.76–1.31)
Sexual needs met within the last year								
To a high or very high extent	2,640 (40.2)	1 (ref)	351 (42.1)	1.03 (0.86–1.24)	4,304 (45.7)	1 (ref)	717 (46.0)	0.96 (0.80–1.15)
Rating of current sex life <sup>c</sup>								
Good or very good	2,689 (46.6)	1 (ref)	357 (48.8)	1.03 (0.84–1.25)	4,391 (51.6)	1 (ref)	731 (54.7)	1.03 (0.84–1.26)
Sex life considered meaningful and rewarding <sup>c</sup>								
To a high or very high extent	2,127 (45.2)	1 (ref)	284 (52.7)	1.30 (1.07–1.59)	3,381 (51.8)	1 (ref)	581 (52.1)	1.00 (0.83–1.21)
Masturbated within the last year								
Yes	2,694 (96.5)	1 (ref)	352 (95.2)	0.67 (0.44–1.02)	4,338 (78.3)	1 (ref)	729 (77.5)	0.92 (0.75–1.13)
Watched porn within the last year								
Yes	2,670 (93.4)	1 (ref)	353 (92.1)	0.80 (0.58–1.11)	4,378 (50.2)	1 (ref)	733 (50.8)	1.01 (0.86–1.20)
Ever talked with parents about sexuality <sup>d</sup>								
Yes	1,377 (69.1)	1 (ref)	181 (69.1)	1.00 (0.77–1.30)	2,279 (80.7)	1 (ref)	372 (77.7)	0.85 (0.64–1.12)
Talked with a healthcare professional about sexual issues or problems (within the last five years) <sup>d</sup>								
Yes	1,350 (20.5)	1 (ref)	175 (25.3)	1.34 (1.00–1.78)	2,231 (38.6)	1 (ref)	367 (43.1)	1.19 (0.94–1.51)

Numbers do not sum up to 8,696, because respondents answering "I do not know" to relevant sexual, relational or physical disease questions were not included in the specific analyses. Also, in some cases, questions were posed to a restricted group.

N(%) = number of respondents with or without a history of treatment (ever) for a physical disease and corresponding proportion (weighted) reporting the sexual or relational characteristic in question; OR = odds ratio adjusted for age in 2-year categories; CI = confidence interval.

<sup>a</sup> Among individuals with a partner.

<sup>b</sup> Among individuals with interpersonal sexual experience.

<sup>c</sup> Among individuals who reported interpersonal sexual activity within the last year.

<sup>d</sup> Question only posed to half the cohort (N = 4,428).



**Table 3**

Associations between treatment (ever) for long-lasting or severe physical disease and sexual difficulties and dysfunctions within the last year among 8,696 15-year-old to 24-year-old individuals, Denmark 2017–2018

		No sexual difficulties	Sexual difficulties		Sexual dysfunctions	
	N	(%)	(%)	OR (95% CI)	(%)	OR (95% CI)
Men						
Erectile function <sup>a</sup>						
Never treated	1,755	(61.1)	(36.8)	1 (ref)	(2.2)	1 (ref)
Ever treated	236	(62.4)	(34.7)	0.90 (0.71–1.13)	(2.9)	1.23 (0.64–2.37)
Premature ejaculation <sup>a</sup>						
Never treated	1,750	(36.5)	(51.7)	1 (ref)	(11.8)	1 (ref)
Ever treated	236	(31.7)	(53.0)	1.16 (0.91–1.47)	(15.2)	1.47 (1.05–2.07)
Orgasmic function <sup>a</sup>						
Never treated	1,737	(50.3)	(44.9)	1 (ref)	(4.8)	1 (ref)
Ever treated	237	(47.8)	(45.4)	1.04 (0.83–1.30)	(6.8)	1.47 (0.94–2.31)
Genital pain <sup>a</sup>						
Never treated	1,751	(71.9)	(27.0)	1 (ref)	(1.2)	1 (ref)
Ever treated	237	(61.9)	(34.1)	1.47 (1.17–1.86)	(4.1)	4.13 (2.20–7.72)
Hypoactive sexual desire disorder <sup>b</sup>						
Never treated	957	(84.5)	.	.	(1.4)	1 (ref)
Ever treated	132	(82.4)	.	.	(0.7)	0.43 (0.08–2.34)
Women						
Lubrication <sup>a</sup>						
Never treated	3,192	(31.9)	(60.8)	1 (ref)	(7.3)	1 (ref)
Ever treated	558	(28.4)	(61.6)	1.15 (0.92–1.42)	(10.0)	1.57 (1.10–2.25)
Orgasmic function <sup>a</sup>						
Never treated	3,187	(16.4)	(59.6)	1 (ref)	(24.0)	1 (ref)
Ever treated	555	(16.0)	(57.2)	1.00 (0.76–1.31)	(26.8)	1.18 (0.87–1.60)
Vaginal cramps <sup>a</sup>						
Never treated	3,153	(88.9)	(10.0)	1 (ref)	(1.1)	1 (ref)
Ever treated	549	(85.4)	(12.6)	1.32 (0.98–1.77)	(2.1)	2.04 (0.99–4.19)
Genital pain <sup>a</sup>						
Never treated	3,202	(43.2)	(50.5)	1 (ref)	(6.3)	1 (ref)
Ever treated	561	(40.5)	(50.4)	1.04 (0.83–1.30)	(9.1)	1.47 (0.94–2.31)
Hypoactive sexual desire disorder <sup>b</sup>						
Never treated	1,979	(80.4)	.	.	(8.5)	1 (ref)
Ever treated	350	(75.4)	.	.	(7.3)	0.89 (0.56–1.43)
Female sexual dysfunction (FSFI-6≤19) <sup>c</sup>						
Never treated	2,013	(88.0)	.	.	(12.0)	1 (ref)
Ever treated	354	(88.2)	.	.	(11.8)	0.97 (0.67–1.42)

N (%) = number of respondents with or without a history of treatment (ever) for a long-lasting or severe physical disease and corresponding proportion (weighted) reporting the sexual difficulty/dysfunction in question; OR = odds ratio adjusted for age in 2-year categories; CI = confidence interval.

<sup>a</sup> Within the last year among 1,993 sexually active men and 3,783 sexually active women.

<sup>b</sup> Within the last four weeks among 1,089 men and 2,329 women with a spouse/partner.

<sup>c</sup> Within the last four weeks among 2,367 women with a spouse/partner who had attempted sexual intercourse.

diseases, skin diseases and allergies" (OR: 1.81; CI: 1.00–3.28). Gender nonconformity did not differ between treated and non-treated men, whereas odds of having a nonheterosexual identity were increased among men treated for "Nervous system diseases" (OR: 3.33; CI: 1.07–10.38).

Among women who had ever received treatment for long-lasting or severe physical disease, increased odds for gender nonconformity were seen overall (OR: 1.39; CI: 1.05–1.84) and among respondents ever treated for "Cardiovascular diseases" (OR: 4.83; CI: 2.02–11.56), "Pain conditions" (OR: 1.82; CI: 1.10–3.00) or "Lung diseases, skin diseases and allergies" (OR: 1.56; CI: 1.02–2.37). Overall, odds of identifying as nonheterosexual were raised among treated women (OR: 1.24; CI: 1.00–1.54), and having received treatment for "Other/unspecified diseases" was associated with same-sex sexual experience (OR: 1.55; CI: 1.01–2.36).

## Discussion

Overall, yet with noteworthy exceptions, our study revealed numerous similarities in sexual behaviors and sexual health between AYA with and without a history of long-lasting or severe

physical disease. In other words, it seems that young people who have ever been physically ill resemble their healthy peers in key aspects of intimacy and sexuality. Previous research has reached comparable conclusions. For example, among 7,435 17-year-olds to 34-year-olds in the British Natsal-3 study, no differences in relational status, number of sex partners, or coital frequency were observed between participants with and without long-standing illness, disability, or infirmity [17]. Tendencies within health care settings to desexualize or even infantilize AYA with a chronic disease or disability have previously been reported [8,20,28], but health professionals should be aware that AYA with a history of physical disease are generally no less sexually attentive, experienced, or active than their healthy peers. In our study, participants who had ever been treated for a long-lasting or severe physical disease were even more likely to have had their sexual debut before age 15 years, and we saw increased odds of treated men considering their sex life meaningful and rewarding and of treated women having ever had partnered sex compared to nontreated peers.

Nonetheless, there were areas where AYA reporting a history of a long-lasting or severe physical disease exhibited more sexual

**Table 4**

Associations between treatment (ever) for long-lasting or severe physical disease and measures of sexual risk among 8,696 15-year-old to 24-year-old individuals, Denmark 2017–2018

	Sexual debut before age of consent (15 years)		Highest quintile of sex partners for age group		Ever victim of a sexual assault		Engaged in unsafe sex within the last year		Ever had a sexually transmitted infection		Ever had an induced abortion	
	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)
<b>Men</b>												
Treatment for a long-lasting or severe physical disease												
Never treated	1,980 (21.3)	1 (ref)	2,754 (25.0)	1 (ref)	2,745 (1.5)	1 (ref)	1,732 (53.9)	1 (ref)	1,978 (11.8)	1 (ref)	.	.
Ever treated	261 (26.7)	1.41 (1.11–1.78)	366 (27.9)	1.16 (0.96–1.40)	365 (2.5)	1.65 (0.94–2.92)	237 (51.4)	0.90 (0.72–1.11)	262 (10.3)	0.79 (0.56–1.11)	.	.
Treatment for specific physical diseases (ever)												
Lung diseases, skin diseases and allergies	116 (29.4)	1.57 (1.13–2.18)	156 (30.7)	1.30 (0.99–1.70)	155 (2.4)	1.38 (0.60–3.18)	105 (52.6)	0.93 (0.68–1.27)	116 (9.4)	0.76 (0.46–1.27)	.	.
Pain conditions	28 (38.5)	2.24 (1.22–4.11)	38 (41.7)	2.06 (1.23–3.43)	38 (7.5)	4.73 (1.78–12.6)	28 (61.0)	1.40 (0.77–2.57)	28 (19.2)	1.55 (0.72–3.32)	.	.
Gastrointestinal and liver diseases	34 (41.1)	2.64 (1.54–4.54)	45 (35.4)	1.59 (0.99–2.56)	45 (4.8)	2.86 (0.97–8.40)	32 (49.8)	0.84 (0.49–1.45)	34 (11.9)	0.90 (0.39–2.05)	.	.
Rheumatic diseases	20 (30.1)	1.54 (0.71–3.30)	27 (35.9)	1.59 (0.86–2.96)	27 (0)	.	19 (49.2)	0.87 (0.42–1.78)	20 (14.4)	0.89 (0.33–2.45)	.	.
Cardiovascular diseases	16 (31.4)	1.65 (0.70–3.91)	25 (26.1)	1.02 (0.49–2.09)	25 (0)	.	14 (37.5)	0.54 (0.22–1.31)	16 (8.4)	0.61 (0.14–2.57)	.	.
Endocrine diseases	11 (20.2)	0.96 (0.30–3.07)	15 (9.0)	0.28 (0.07–1.18)	15 (0)	.	11 (10.9)	0.10 (0.02–0.42)	12 (18.3)	1.49 (0.46–4.81)	.	.
Nervous system diseases	5 (0)	.	10 (12.8)	0.42 (0.10–1.76)	10 (0)	.	<5	.	5 (25.9)	2.10 (0.43–10.2)	.	.
Other/unspecified diseases	76 (20.5)	0.87 (0.55–1.38)	110 (30.4)	1.27 (0.91–1.77)	110 (2.2)	1.29 (0.45–3.72)	68 (57.3)	1.19 (0.80–1.76)	76 (6.3)	0.43 (0.20–0.93)	.	.
<b>Women</b>												
Treatment for a long-lasting or severe physical disease												
Never treated	3,447 (22.9)	1 (ref)	4,516 (29.1)	1 (ref)	4,437 (9.6)	1 (ref)	3,206 (47.9)	1 (ref)	3,346 (19.0)	1 (ref)	4,458 (4.1)	1 (ref)
Ever treated	607 (32.0)	1.57 (1.29–1.92)	750 (35.2)	1.31 (1.10–1.55)	736 (19.4)	2.21 (1.78–2.76)	560 (49.5)	1.08 (0.90–1.31)	606 (19.1)	0.97 (0.76–1.23)	739 (5.2)	1.19 (0.81–1.75)
Treatment for specific physical diseases (ever)												
Lung diseases, skin diseases and allergies	224 (38.6)	1.98 (1.48–2.66)	277 (40.4)	1.65 (1.27–2.13)	273 (18.7)	1.89 (1.36–2.63)	209 (48.5)	1.00 (0.75–1.34)	224 (18.4)	1.00 (0.69–1.45)	273 (4.8)	1.14 (0.62–2.10)
Pain conditions	148 (39.1)	2.00 (1.39–2.88)	168 (43.0)	1.77 (1.27–2.46)	163 (25.2)	2.68 (1.83–3.94)	136 (51.2)	1.17 (0.81–1.70)	148 (22.9)	1.22 (0.79–1.87)	162 (4.2)	0.83 (0.36–1.90)
Gastrointestinal and liver diseases	96 (29.8)	1.32 (0.82–2.14)	107 (38.0)	1.39 (0.91–2.13)	104 (26.9)	2.83 (1.77–4.54)	88 (52.8)	1.30 (0.82–2.05)	96 (19.2)	0.85 (0.48–1.49)	105 (4.7)	0.87 (0.33–2.32)
Rheumatic diseases	71 (34.1)	1.57 (0.93–2.64)	93 (37.8)	1.44 (0.91–2.18)	92 (16.7)	1.54 (0.87–2.73)	66 (50.8)	1.21 (0.73–2.01)	70 (23.4)	1.13 (0.62–2.05)	90 (7.1)	1.49 (0.63–3.51)
Cardiovascular diseases	39 (29.1)	1.10 (0.51–2.38)	49 (35.7)	1.27 (0.67–2.41)	49 (17.6)	1.64 (0.73–3.66)	37 (42.9)	0.87 (0.42–1.78)	39 (31.2)	1.77 (0.81–3.87)	49 (4.0)	0.76 (0.16–3.70)
Endocrine diseases	42 (22.6)	0.84 (0.38–1.88)	49 (39.0)	1.45 (0.77–2.74)	49 (19.8)	1.85 (0.85–4.01)	39 (33.6)	0.57 (0.27–1.19)	42 (22.5)	1.09 (0.48–2.47)	48 (8.1)	1.61 (0.51–5.14)
Nervous system diseases	26 (29.6)	1.21 (0.47–3.07)	31 (42.1)	1.68 (0.77–3.68)	30 (29.7)	3.20 (1.34–7.66)	24 (57.9)	1.52 (0.62–3.73)	26 (20.6)	1.10 (0.37–3.21)	31 (11.2)	2.39 (0.68–8.42)
Other/unspecified diseases	210 (28.8)	1.28 (0.92–1.77)	258 (29.1)	0.96 (0.72–1.28)	252 (19.9)	2.02 (1.44–2.84)	193 (48.2)	1.01 (0.74–1.37)	210 (19.9)	1.03 (0.71–1.51)	255 (4.3)	0.93 (0.48–1.80)

Numbers do not sum up to 8,696, because respondents answering "I do not know" to relevant sexual risk or physical disease questions were not included in the specific analyses. Also, in some cases, questions were only posed to individuals with sexual experience.

N (%) = number of respondents with or without a history of treatment (ever) for a long-lasting or severe physical disease and corresponding proportion (weighted) reporting the specific measure of sexual risk; OR = odds ratio adjusted for age in 2-year categories; CI = confidence interval.

**Table 5**

Associations between treatment (ever) for long-lasting or severe physical disease and various measures related to body and sexuality among 8,696 15-year-old to 24-year-old individuals, Denmark 2017–2018

	Discontentment with general body appearance <sup>a</sup>		Discontentment with appearance of genitalia <sup>a</sup>		Gender non-conformity <sup>a</sup>		Same-sex sexual experience		Non-heterosexual identity	
	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)	N (%)	OR (95%CI)
<b>Men</b>										
Treatment for a long-lasting or severe physical disease										
Never treated	1,342 (8.8)	1 (ref)	1,115 (7.6)	1 (ref)	1,210 (15.2)	1 (ref)	2,726 (4.6)	1 (ref)	2,754 (8.2)	1 (ref)
Ever treated	183 (11.8)	1.37 (0.93–2.02)	160 (9.7)	1.35 (0.86–2.11)	171 (16.5)	1.08 (0.77–1.53)	361 (4.8)	0.98 (0.65–1.47)	366 (8.4)	1.03 (0.75–1.40)
Treatment for specific physical diseases (ever)										
Lung diseases, skin diseases and allergies	75 (12.4)	1.41 (0.81–2.45)	65 (12.9)	1.81 (1.00–3.28)	69 (14.7)	0.92 (0.54–1.57)	153 (4.0)	0.81 (0.43–1.55)	156 (9.5)	1.13 (0.73–1.73)
Pain conditions	19 (19.3)	2.39 (0.97–5.89)	17 (13.7)	1.89 (0.65–5.55)	17 (27.7)	2.08 (0.89–4.85)	38 (3.3)	0.61 (0.15–2.50)	38 (4.9)	0.57 (0.18–1.83)
Gastrointestinal and liver diseases	22 (28.2)	4.07 (1.97–8.45)	21 (23.8)	3.99 (1.79–8.86)	21 (14.2)	0.90 (0.35–2.33)	45 (6.4)	1.34 (0.52–3.41)	45 (4.4)	0.50 (0.16–1.49)
Rheumatic diseases	10 (37.5)	6.43 (2.23–18.53)	10 (24.1)	4.80 (1.44–16.0)	10 (22.6)	1.47 (0.44–4.97)	26 (0)	.	27 (0)	.
Cardiovascular diseases	13 (10.1)	1.13 (0.27–4.78)	12 (10.9)	1.48 (0.34–6.34)	11 (9.3)	0.57 (0.11–2.91)	25 (4.1)	0.88 (0.18–4.37)	25 (4.1)	0.47 (0.10–2.32)
Endocrine diseases	5 (0)	.	<5	.	5 (6.5)	0.37 (0.02–6.17)	15 (6.6)	1.25 (0.24–6.62)	15 (0)	.
Nervous system diseases	<5	.	<5	.	<5	.	10 (12.8)	2.73 (0.64–11.65)	10 (23.5)	3.33 (1.07–10.38)
Other/unspecified diseases	64 (6.9)	0.70 (0.32–1.55)	52 (4.0)	0.47 (0.15–1.43)	61 (17.3)	1.08 (0.63–1.86)	109 (6.4)	1.35 (0.71–2.55)	110 (10.8)	1.33 (0.81–2.18)
<b>Women</b>										
Treatment for a long-lasting or severe physical disease										
Never treated	2,184 (17.1)	1 (ref)	1,628 (11.1)	1 (ref)	2,069 (19.9)	1 (ref)	4,471 (7.3)	1 (ref)	4,516 (15.0)	1 (ref)
Ever treated	371 (20.8)	1.29 (0.96–1.73)	286 (10.6)	0.97 (0.63–1.50)	351 (25.6)	1.39 (1.05–1.84)	743 (9.3)	1.27 (0.95–1.70)	750 (17.5)	1.24 (1.00–1.54)
Treatment for specific physical diseases (ever)										
Lung diseases, skin diseases and allergies	131 (20.1)	1.18 (0.75–1.87)	95 (11.9)	1.15 (0.59–2.25)	122 (29.2)	1.56 (1.02–2.37)	275 (10.0)	1.36 (0.88–2.08)	277 (17.3)	1.12 (0.80–1.57)
Pain conditions	84 (25.2)	1.62 (0.95–2.75)	68 (10.0)	0.91 (0.39–2.14)	81 (32.4)	1.82 (1.10–3.00)	165 (10.7)	1.37 (0.80–2.34)	168 (18.7)	1.32 (0.87–2.01)
Gastrointestinal and liver diseases	60 (19.8)	1.24 (0.62–2.47)	50 (6.5)	0.60 (0.18–2.05)	58 (25.8)	1.33 (0.70–2.53)	107 (9.9)	1.18 (0.59–2.34)	107 (14.2)	0.96 (0.54–1.73)
Rheumatic diseases	53 (16.0)	0.92 (0.42–2.00)	43 (12.4)	1.17 (0.45–3.10)	52 (28.9)	1.56 (0.82–2.94)	92 (11.6)	1.48 (0.76–2.91)	93 (21.9)	1.62 (0.96–2.71)
Cardiovascular diseases	25 (29.8)	2.05 (0.81–5.18)	18 (6.8)	0.68 (0.09–4.94)	24 (55.5)	4.83 (2.02–11.56)	48 (4.6)	0.54 (0.12–2.36)	49 (23.2)	1.70 (0.82–3.52)
Endocrine diseases	27 (29.3)	2.01 (0.80–5.03)	22 (8.8)	0.84 (0.16–4.51)	27 (18.7)	0.85 (0.29–2.46)	48 (10.3)	1.18 (0.42–3.32)	49 (11.3)	0.73 (0.28–1.93)
Nervous system diseases	11 (9.2)	0.49 (0.05–4.52)	8 (15.6)	1.44 (0.18–11.4)	9 (11.8)	0.49 (0.05–4.90)	31 (7.9)	0.93 (0.22–3.93)	31 (21.2)	1.53 (0.59–3.97)
Other/unspecified diseases	120 (22.9)	1.47 (0.92–2.35)	95 (14.0)	1.35 (0.70–2.58)	114 (26.2)	1.36 (0.86–2.14)	256 (11.5)	1.55 (1.01–2.36)	258 (22.3)	1.62 (1.18–2.23)

Numbers do not sum up to 8,696, because respondents answering "I do not know" to relevant body or sexuality or physical disease questions were not included in the specific analyses.

N (%) = number of respondents with or without a history of treatment (ever) for a physical disease and corresponding proportion (weighted) reporting the specific measure of body or sexuality; OR = odds ratio adjusted for age in 2-year categories; CI = confidence interval.

<sup>a</sup> Question only posed to half the cohort (N = 4,268).



adversity than their healthy peers. For example, it is noteworthy that the odds of genital pain conditions were markedly increased among male AYA treated for a physical disease, whereas treated women had elevated odds of lubrication dysfunction. In general, sexual functioning among AYA is insufficiently researched, and investigations of sexual adversity among AYA with chronic disease are even sparser. However, in the Natsal-3 study, one-third of women with a troubling long-standing illness, disability, or infirmity had sought help for their sex life in the past year, which was significantly more than among healthy peers [17]. In a recent study among 15-year-old to 29-year-old Danish cancer survivors, 22% had encountered a sexual problem during the past week, while nearly one-third (31%) stated that cancer had affected their sexual desire negatively [29].

As mentioned, both male and female respondents treated for physical disease exhibited significantly increased odds of having had their first sexual intercourse before the age of consent. This finding concurs with research from the UK [17] and Switzerland [21], whereas an older study among North American secondary school students found no difference in age at sexual debut between ill or disabled AYA and healthy controls [22]. Early sexual debut may be a sign of failing social negotiating agency or it may reflect a chaotic and potentially harmful coping strategy, where ill AYA attempt to gain peer recognition by mimicking or exaggerating what is perceived to be “normal” behavior [8,20]. Similar interpretations might apply to the increased odds of having top-quintile sexual partner numbers among both male and female AYA with “Pain conditions.”

The elevated odds of sexual assaults experienced by female AYA ever treated for a long-lasting or severe physical disease and among male AYA with a history of “Pain conditions” are well in line with previous research based on both clinical and population-based samples of ill or disabled youth [17,18,22,30]. For example, in Natsal-3, the odds of having experienced nonvolitional sex were three-fold increased among women reporting limiting disease or disability [17], and a survey among 17-year-old to 18-year-old Swedes revealed increased odds of force being used at sexual debut among AYA with any disability. The odds of force being used at sexual debut were highest among female respondents and increased among those reporting multiple disabilities [18].

The increased odds of sexual victimization seen primarily among female AYA treated for physical disease indicate that physical disease may render AYA vulnerable to predatory behavior, as they may lack physical, emotional, or social competences to protect their own boundaries [8,20]. However, causality may also be reverse, and the strong association observed between sexual assaults and “Pain conditions” could be an indicator that victimization may lead to chronic pain. More generally, adverse childhood experiences, including sexual assaults, have been shown to trigger both mental and somatic disease [31,32]. Sonu et al. recently observed a dose-response relationship between childhood adversity scores and an array of physical diseases and, among younger respondents, those reporting  $\geq 4$  adverse childhood experiences had two to four times higher risk of a chronic condition or poor health status compared to respondents reporting no such childhood experiences [31]. Unfortunately, the cross-sectional nature of our questionnaire data does not allow us to determine the timing between reported sexual assaults and the onset of physical disease or its treatment.

Regarding unsafe sex, STIs, and induced abortion, our study showed no overall differences between treated and nontreated

AYA. These findings partially contrast previous studies, where some unsafe sex situations were reported more frequently among ill or disabled AYA [17,20,22]. Such discrepancies notwithstanding, the value of sexual and reproductive healthcare services for all segments of AYA is worth remembering. It is thus well-documented that ill or disabled AYA may miss crucial guidance concerning safe sex and contraception [33,34].

The increased odds of discontentment with the appearance of one's body or genitals among men treated for certain medical conditions underpin the general tendency to self-devaluation among sick or disabled AYA reported in previous studies, predominantly among cancer survivors [1–3,5,11,12,29]. In a study among young Danes diagnosed with cancer between 15 and 29 years of age, 54% reported that disease had impacted negatively on their body satisfaction, and 45% felt less attractive than before being diagnosed [29]. In our study, the odds of discontentment with general body appearance were more than four-fold increased among male participants with “Rheumatic diseases” and “Gastrointestinal and liver diseases” compared with healthy peers and, in these two disease categories, odds of discontentment with genital appearance were similarly elevated. To our knowledge, such findings have not previously been reported and they call for further investigation.

Interestingly, women treated for long-lasting or severe physical disease did not exhibit increased odds of body discontentment, whereas gender nonconformity was reported by significantly more treated than nontreated female AYA. Most notably, this was seen among those treated for “Cardiovascular diseases” with four-fold increased odds compared to healthy women. These findings need to be confirmed and elucidated by future research.

Sexual preferences and orientations of ill or disabled AYA have received limited attention in prior studies. Surís et al. found no differences in sexual orientation between AYA with and without a chronic disease [22], whereas Natsal-3 reported 2.39 times higher odds of having had a same-sex sexual partner the past five years among ill/disabled women compared to female peers [17]. In our study, we observed elevated odds of having a nonheterosexual identity among treated women and among men treated for “Nervous system diseases”. Also, the odds of ever having had a same-sex sexual experience were increased among women with a history of “Other/unspecified diseases”. The literature offers no explanation for the surplus of non-heterosexual behaviors and identities among AYA with physical health problems, and the directionality of the association needs further scientific attention. It may, thus, be hypothesized that AYA with a physical disease are more prone to take on a marginalized sexual identity since they are already marginalized due to their health condition—or that LGBTQ+ youth are more susceptible to health adversities due to minority-related stress. From a broader clinical perspective, it should be remembered that, just like their healthy peers, ill or disabled AYA represent a rich diversity of sexual expressions.

In preceding research, AYA with a history of mental or somatic disease have expressed a strong need for dialogue with health professionals about puberty, sex, contraception, fertility, and relationships [5,9,28,35–38]. In a study among young cancer survivors, a need to discuss issues of sexuality and intimacy with a health professional was expressed by more than 80% of the respondents [29]. In the present study, we did not collect information about the wish to talk about sexuality in a clinical setting. However, we observed that treated men more often than their

healthy male peers had discussed sexual issues or problems with a health professional within the past five years. This may be due to the well-known risk of disease-induced sexual complications and side-effects [13], or it may simply reflect better opportunities to query health professionals about sexual topics among chronically ill males than among healthy males.

In contrast, no differences were seen between treated and nontreated AYA regarding conversations about sexual matters with parents. It might have been expected that parents would be more attentive to the educational needs of their sick children than parents of healthy adolescents, but it is also well-known that some parents do not expect their sick AYA to engage in age-appropriate sexual activities [8]. Overall, more treated women than men had recently talked with parents (77.7% vs. 69.1%) or health providers (43.1% vs. 25.3%) about sexual matters, perhaps reflecting a general readiness to discuss contraceptive strategies with young women.

The main strengths of our investigation include the size of the study population, the weighting procedure that ensured national representativeness and the detailed assessment of health-related variables and sexual outcomes. It is, however, a limitation that we could not differentiate between AYA with active disease requiring current medical treatment and those experiencing sequelae from disease at earlier life stages. Further, some disease categories and sexual dysfunctions comprised only few participants, rendering associated ORs statistically unstable. Also, we cannot exclude that some of the statistically significant associations in our study might have occurred by chance, considering the large number of diseases and sexual outcomes studied. In the Natsal-3 study, the AAPOR response rate 1 was 55.1% [39], and although our identically calculated general response rate (34.6%) is modest in comparison, it compares favorably to those of other sexuality studies around the world [24]. Nonetheless, the low response rate could have produced somewhat conservative results, if AYA with the most severe physical health problems were systematically less likely to take part in the study. Also, because sexual inactivity might be a consequence of impaired sexual function, it represents a potential limitation that all analyses regarding sexual dysfunctions, except for hypoactive sexual desire disorder, were restricted to sexually active individuals. However, this potential limitation appears to be mostly theoretical, as we observed no differences in sexual activity within the past year between treated and nontreated AYA. Finally, it is an inherent weakness of questionnaire-based research that it relies exclusively on self-reported data and in addition, the cross-sectional data set used in this study makes it impossible to establish causal directionality between physical disease and adverse sexual outcomes.

Overall, our study showed that AYA reporting treatment for a long-lasting or severe physical disease resembled their healthy peers on fundamental aspects of sexual interest, activity, and satisfaction. However, the observed excess of sexual dysfunctions, early sexual debut, discontentment with body or genital appearance, gender nonconformity, nonheterosexuality, and sexual assaults among AYA treated for physical disease calls for attention among researchers and professionals providing healthcare to AYA. It is important to keep in mind that AYA experiencing long-lasting or severe physical disease are sexual beings, and our findings underscore that youth-friendly health services, including transitional care, should routinely encompass sexual, romantic, and relationship issues.

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## Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2023.02.039>.

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