# Measuring and Modeling Adolescent Utilization, Judgments, and Trust of Online Sexual Health Information

by

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Abstract

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The Internet holds tremendous promise for providing youth with sexual health knowledge at critical times in their lives. Adolescent health advocates, researchers, and practitioners have enthusiastically endorsed digital interventions for adolescent sexual health as a necessary component for sexuality education, including the development of sexuality education websites. Prior research has investigated the quality and accuracy of online sexual health interventions, and general adolescent attitudes towards the Internet as a source of health information. Yet our current evidence base lacks a clear understanding of how adolescents utilize the web for sexual health topics, if their process is consistent based on what kind of sexual health information they need, and what leads adolescents to trust and utilize certain online resources over others.

Through this dissertation, I aim to refine our understanding of how the Internet may be an essential resource for sexual health knowledge for adolescents. To accomplish this, I designed the following studies to capture *in situ* adolescent user experiences for searching and evaluating sexual health information in the digital environment.

In the first paper, “Late adolescent user experiences with online sexual health resources: A qualitative study,” I report findings from a computer-based qualitative study with 30 interviews and web behavior observations with individuals in late adolescence. Four phases of interaction with the Internet for sexual health information are discussed: (1) approach; (2) selection; (3) assessment; and (4) corroboration. Together these four phases comprise a framework for understanding adolescent behavioral process for using the web for sexual health knowledge. In addition, I report on seven corresponding themes that fit within this framework, including implicit trust placed in top search results for sexual health queries and a preference among adolescents for storytelling to learn about sexual identity. Implications and recommendations for sexuality education website developers are discussed.

In the second paper, “Risks and rewards of sexual health information seeking online: Late adolescent user views of online privacy and personalization,” I report a subset of findings from the first study focused on adolescent views of privacy when interacting with online sexual health interventions. Five emergent themes are discussed: (1) Adolescents believe searching for sexual health information online is normal, but fear of stigma for searching for sexual disease information persists in the online environment. (2) Online appointment making features for clinical services are popular and perceived to have high benefits and low risk to the user. (3) Adolescents are willing to disclose their age and gender on intervention sites to receive tailored information, but are not likely to disclose more personal data like email addresses or full names. (4) The event of a sexual health emergency warrants sharing your location, but otherwise this is viewed as a violation of privacy. (5) Online privacy is generally compromised by “big brother” tracking groups for which average users have no control. Implications for understanding the boundaries of online privacy for adolescents are discussed.

In the final paper, “Constructing a theory-driven model for adolescents’ judgment and trust in online sexual health information: A systematic literature review,” I systematically review research pertaining to adolescent development, dual process theories of information processing, and online trust and web credibility for relevance to adolescents using the Internet for sexual health learning. I present results of 22 quantitative, qualitative, and theoretical studies captured in the review and thoroughly discuss their applicability for adolescent web users. This paper concludes by presenting a new conceptual model for adolescent judgments and trust in online sexual health information and discusses implications and future research applications of the model.

As a whole, this dissertation highlights the need for future research on adolescents’ use of digital tools for sexuality education to be grounded in innovative, interdisciplinary research strategies.

This dissertation is dedicated to young people everywhere.

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[1] Author's note: Papers 1 and 2 draw from the same data collection endeavor. Sample characteristics for both studies are presented in Table 1-2.

ACKNOWLEDGEMENTS

I am deeply grateful to all the people in my life who challenged, supported, and loved me during this journey.

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I will always be grateful to Amani Nuru-Jeter, who I have been fortunate to work with since first coming to Berkeley. Amani, you are an extraordinary mentor, and I am so humbled and proud to be your mentee. Thank you for leading a special seminar that created an environment of compassionate excellence and personal growth, and for your willingness to help me see the beauty and wrestle the horrors of interdisciplinary research. I will always be grateful to my advisor and Chair, Julie Deardorff, whose commitment and enthusiasm to this project never waivered and only grew stronger with each passing phase. Thank you, Julie, for being an always encouraging, always positive mentor to me in my graduate career, and for your enthusiasm for disseminating our work to new audiences. It has been an honor and a pleasure to have you as my Chair.

I am extremely grateful to all the young people who participated in this research. Each of you inspired me with your honesty and vulnerability, and reminded me that this topic has everything to do with social justice. I have been fortunate to be a Predoctoral Fellow at the Public Health Institute's Center for Research on Adolescent Health and Development with funding from the Ford Foundation, which provided scholarship and financial support during my first two years of the DrPH program. I am also grateful to have been a grant recipient from The National Science Foundation and the Experimental Social Science Research Lab (X-Lab) at the University of California Berkeley. Additionally, I have been supported in this work by the Undergraduate Research Apprenticeship Program (URAP) and the School of Public Health at the University of California Berkeley.

I extend very special thanks Don Moore, Miho Tanaka, and Rowie del Castillo for your funding and technical assistance at the X-Lab. Your support made this research not only possible, but allowed data to be collected with timeliness and sensitivity. As

special analytic contributors to this research, Anand Marshall and Riya Singh also receive my very heartfelt gratitude. Anand and Riya, your energy and willingness to dive into a complex analysis project lit up my world and made all the difference. Thank you, Riya and Anand, for your outstanding analytic work and thoughtful contributions.

My fellow DrPH students have generously given their practical and moral support to me throughout the last four years. I thank my incredible cohort group Carlos Penilla, Cassie Marshall, and Tyler Martz for time and again offering constructive feedback and encouraging outlooks. I also thank the members of the Amani Nuru-Jeter Research Seminar for all of the open-hearted listening and feedback you gave me in the spirit of compassionate excellence. Thank you Vicky Gomez, Kelechi Uwaezuoke, Stephanie Fong, Berké Brown, and Melody Tulier. I am also grateful to the members of the DrPH Research Seminar during my last year of study. Thank you Anna Summer, Cassie Blazer, Carly Strouse, Leena Singh, Mike Harvey, and Norah Ojeda, for sharing your scholarship in inspiring and constructive ways. I am so proud to be in the company of all my fellow student researchers.

I would like to thank select DrPH alumni and friends, who never hesitated to lend a listening ear and advice about how to succeed in this program. Thank you, Rebecca Braun, Courtney Henderson, and Joe Schuchter, for being such amazing friends and confidants. Thank you, Ahna Suleiman, for graciously discussing your work early on in my process. A special thank you to Nancy Berglas and Sara Marques, two exceptional sexuality education researchers, who never hesitated to share their experiences and help me through methodological challenges. My sincere thanks go to Jen Lachance, who was always ready with a kind word of encouragement. Jen, I have appreciated how gracefully you pair pragmatism and optimism. I would also like to thank Tamar Antin. Tamar, thank you for lighting my fire for qualitative inquiry, which began with your clear and comprehensive instruction in qualitative methods. I especially appreciate your thought-provoking insights when I was facing methodological decisions for this dissertation.

These past years would not have been possible without the support and love from my family, both near and far. Thank you Mom, Hunter, Grayson, Chick, Paw Paw, Ginger, and Lawrence for believing in me and always reminding me that this was possible. Thank you for supporting this life goal unconditionally, and for your steady love always.

And, finally, I send love and gratitude to Francesco. You were on board with this dream from day one. Thank you for all the things you did to care for me along the way, from stocked fridges and foot rubs, to keeping me grounded in our future goals. Thank you for having faith in me, and in us. I can’t wait for what’s next in life with you.

# SUMMER STARLING

## Summary

With 10 years' experience in the field, I believe public health research and programming today means building scientific and advocacy approaches across disciplines and sectors. I also believe it means investigating today's "black box" social and health problems using the best tools available in the digital age. I specialize in creative ways to build robust research agendas, coupled with smart communication strategies, to address health inequities and advance a more just actualization of public health.

Areas of specialty include behavioral change theory and interventions; qualitative and mixed methods designs for public health research; visionary thinking and strategy; research translation and dissemination; and tech and computer-based solutions for public health data collection and research presence

## Education

**University of California Berkeley /** Doctor of Public Health
AUGUST 2012 - MAY 2016, BERKELEY, CA, USA
Dissertation: "Measuring and Modeling Adolescent Utilization, Judgments and Trust of Online Sexual Health Information"

**Columbia University** / Masters of Public Health
AUGUST 2007 - MAY 2009, NEW YORK, NY, USA
Thesis: Forecasting Emergency Contraception Policy Impacts in the U.S.
*Magna Cum Laude*

**Guilford College** / Bachelor of Arts
AUGUST 2001 - DECEMBER 2003, GREENSBORO, NC, USA
Majors: English Literature & Environmental Sciences
Minors: Creative Writing & Dance
*Highest Honors*

## Research Experience

**Public Health Institute /** Research Specialist
JUNE 2014 - PRESENT, OAKLAND, CA, USA
Manage multi-state research team in California & Alabama to clarify most effective local organizational partnerships for STD control. Lead research activities and academic publications for $500,000 2-year Robert Wood Johnson Foundation initiative. Design & develop online survey on STD prevention, screening, treatment, & follow-up practices & partnerships in 2 states. Collaborate for innovative study design

& proposal. Survey STD state controllers to assess organizational partnerships for evidence-informed interventions & policies to reduce STD burden.

**University of California Berkeley /** Doctoral Researcher
SEPTEMBER 2012 - PRESENT, BERKELEY, CA, USA
Conduct independent & collaborative cutting-edge research on adolescent sexual judgment & decision-making. Manage & mentor an undergraduate team of researchers on qualitative analysis. Create & manage research protocols & Human Subjects Review Board applications. Analyze qualitative & quantitative data using grounded theory approach. Author academic articles and presentations.

**Public Health Institute /** Research Scientist I
JULY 2012 - JULY 2014, OAKLAND, CA, USA
Investigated content, quality, & accuracy of popular sexuality education websites through applied qualitative methodologies & collaborative content analysis. Conducted other mixed methods research on various projects related to adolescent sexual health, including sexual readiness. Initiated, designed, & delivered 3 Ted-style talks with academic & community audiences in two years.

**Brown Miller Communications /** Resident Researcher
MAY 2013 - SEPTEMBER 2014, MARTINEZ, CA, USA
Designed, conducted, & translated community-participatory qualitative research project to capture attitudes among public health professionals, community & opinion leaders on STD disparities among youth in Solano County, California. Analyzed qualitative findings collaboratively with BMC President & PHI executive leadership. Project impacts for Solano County include $200,000 new allocated STD funding; 1 new full-time CDI hired solely to focus on STDs; and 2 presentations to the Solano County Board of Supervisors.

**Population Council /** Research Consultant
SEPTEMBER 2011 - JUNE 2012, NEW YORK, NY, USA
Evaluated scope of 80 information communications technology (ICT) programs worldwide to inform programmatic investments. Presented programmatic recommendations to over 25 staff members across 4 divisions which led to one new dedicated working group.

**Global Service Corps (GSC-TZ) /** Evaluation Associate
MAY 2008 - SEPTEMBER 2008, ARUSHA, TANZANIA
Led first-ever evaluation initiative into effectiveness of international HIV prevention and testing programs by analyzing data from over 300 field surveys and producing report in 3-month span. Produced more reliable survey instruments based on field experience.

**Consulting Experience**
**Citizen Insights /** Public Health Consultant
SEPTEMBER 2015 - PRESENT, SAN FRANCISCO, CA, USA

Consult with start-up health firm on methods for SMS-based community health interventions in Portola Valley, CA. Guide team on data collection methods & evaluation strategies using mobile phones.

**Verbi Software Systems /** Qualitative Software Trainer
OCTOBER 2015 - PRESENT, NORTH AMERICA
Train corporate groups & individuals on qualitative software MaxQDA. Offer advanced workshops on using MaxQDA for mixed methods and theoretically-based qualitative analysis.

**Data Lab /** Consultant
JANUARY 2015 - PRESENT, BERKELEY, CA, USA
Consult with University of California Berkeley students and affiliates on conceptualizing qualitative studies and analytic strategy design; guidance for developing code systems/codebooks and coding in teams. Provide guidance for qualitative analysis: grounded theory, narrative/thematic analysis, and content analysis. Software assistance available for MaxQDA, Atlas.TI, and Qualtrics.

**Illume Advising /** Consultant
SEPTEMBER 2015 - DECEMBER 2015, OAKLAND, CA, USA
Evaluated new PG&E energy-efficiency campaign by conducting 25 in-depth interviews with CA small business owners in six weeks. Synthesized qualitative results for executive leadership at start-up consulting firm.

**The Ford Foundation /** Consultant
JUNE 2011 - JULY 2012, NEW YORK, NY
Strengthened communications and research capacity of the Sexuality Research Initiative (SRI) by implementing cloud-based solutions during 2011-12 RFP grant cycle. Directed communications strategies for 6 cutting-edge sexuality research teams at U.S. academic institutions around translation and public dissemination of grant-supported research. Piloted, developed, and administered private online tool used to support FF SRI grantee communications.

**Family Care International (FCI) /** Consultant
SEPTEMBER 2011 - DECEMBER 2011, NEW YORK, NY, USA
Generated report for the International Consortium of Emergency Contraception (ICEC) 2011 convening. Report disseminated to over 1,500 ICEC members and affiliates in over 65 countries.

**EngenderHealth /** Communications Consultant
FEBRUARY 2011 - JULY 2011, NEW YORK, NY
Collated, revised & synthesized communications products & tools related to proprietary family planning supply-demand model developed by client. Researched & produced original patented content on contraceptive security, demand, & social marketing programs.

**Peer-Reviewed Publications**

**Starling**, S. & Cheshire, C. (2016). Information Seeking and Evaluation of Online Sexual Health Resources among Late Adolescents. *ACM: Computer-Human Interaction (CHI'16) Extended Abstracts*, doi: 10.1145/2851581.2892528.

Marques, S., Lin, J., **Starling**, M. S., Goldfarb, E. S., Daquiz, A., Garcia, K., Antin, T., & Constantine, N. A. (2015). Sexuality education websites for adolescents: A framework-based content analysis. *Journal of Health Communications: International Perspectives*, doi: 10.1080/10810730.2015.1018621.

**White Papers**

**Starling**, M. S. & Constantine, N. A. (2014). "Communicating about youth sexually transmitted disease disparities: Insights and recommendations from Solano County, California." Oakland, CA: Public Health Institute.

**Starling**, S. & Weiner, A. "Why Girls? Belize Adolescent Girls Data Guide." (2012). New York, NY: Population Council.

**Starling**, S. & Ramarao, S. "Where We Are Now: ICT Review of Programs for Reproductive Health since 2005." (2011). New York, NY: Population Council.

**Presentations**

Silver, L., **Starling**, S., Weech-Maldonado, R., Rodriguez, H., Kandel, Z. & Do, H. Improving the Reach and Effectiveness of STD Prevention, Screening & Treatment in Local Public Health Systems. (2015, December). Academy Health Conference on the Science of Dissemination and Implementation, Washington, D.C.

**Starling**, S. Adolescent Judgments and Trust in Online Sexual Health Resources: A Dual-Process Framework. (2015, November). American Public Health Association (APHA) Annual Meeting, Chicago, IL.

**Starling**, S., Deardorff, J., Nuru-Jeter, A., Cheshire, C., Marshall, A., & Singh, R. Adolescent Judgments & Trust in Online Sexual Health Information: Preliminary Findings. (2015, May). University of California Berkeley School of Public Health Research Symposium, Berkeley, CA.

**Starling**, S. & Miller, M. Effective Message Frames for Communicating about Youth STD Disparities. (2013, November). Community presentation organized by Vallejo, CA NAACP, California State STD Control Branch, and University of California Berkeley Academic Senate

Marques, S., **Starling**, S., Daquiz, A., & Garcia, K. (2013, April). Online Comprehensive Sexuality Education: A Content Analysis. 6th annual ISIS/YTH-Live Conference on Youth, Tech, & Health, San Francisco, CA.

**Starling**, S. TED-style Talk: Sexuality Education Online: Content & Delivery. (2013, April). University of California Berkeley Passion in Action: Inspiring Innovation in Public Health Conference, Berkeley, CA.

Marques, S., Daquiz, A., **Starling**, M. S., & Garcia, K. (2012, December). Finding comprehensive sexuality education online: A content analysis of sex education websites. University of California Berkeley School of
Public Health Student Research Symposium, Berkeley, CA.

Goldfarb, E. S., Marques, S., Daquiz, A., **Starling**, M. S., Garcia, K., Lin, J., Antin, T., & Constantine, N. A. (2012, November). Comprehensive Sexuality Education Online? A Content Analysis of Website Messages.
The Society for the Scientific Study of Sexuality Annual Conference, Tampa, FL.

**Invited Speaking**

**Starling**, S. "Moving from Quantification to Visualization of Qualitative Data for Deeper Analysis." (2016, March). Qualitative Methods Summit, University of California, Berkeley, CA.

**Starling**, S. Guest lecture: "Sexual stigmatization, slut-shaming, & implications for community health." (2015, March & April; 2014, June). Invited by Dr. Amani Nuru-Jeter & Dr. Sarah Gamble, University of California Berkeley, Berkeley, CA.

**Starling**, S. Guest lecture: "Qualitative Approaches in Evaluation." (2014, April & 2015, April). Invited by Dr. Julianna Deardorff and Dr. Ahna Suleiman, University of California Berkeley, Berkeley, CA.

**Starling**, S. Guest lecture: "Ethical Considerations in Evaluation." (2015, April). Invited by Dr. Ahna Suleiman, University of California Berkeley, Berkeley, CA.

**Starling**, S. Guest lecture: "Photography & Social Change: The Lens of Social Responsibility." (2012, April). Invited by Head of the School of Professional & Graduate Studies, St. Joseph's College, Brooklyn, NY.

**Starling**, S. "The Feminist Career Path." (2012, March). Soapbox, Inc. Conference on Mentorship, New York, NY.

**Starling**, S. "The New Politics of Birth Control." (2012, January). CUNY Graduate School of Journalism, New York, NY.

## Teaching & Advising Experience

**University of California Berkeley /** Graduate-level Instructor
ACADEMIC YEARS 2013-14, 2014-15, BERKELEY, CA, USA
Courses (3):
Qualitative Methods & Analysis using Grounded Theory
Evaluation of Health & Social Programs
Healthy People: Introduction to Public Health
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ACADEMIC YEAR 2014-15, VALLEJO, CA, USA
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Behavioral & Social Aspects of Public Health
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**St. Joseph's College /** Faculty Lecturer
ACADEMIC YEARS 2010-11, 2011-12, BROOKLYN, NY, USA
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## Technical Skills

**Analysis software**: MaxQDA, Atlas.TI, Stata, Dedoose, SPSS
**Computer**: iWork/Mac, MS Office, Photoshop, Adobe AcrobatPro
**Survey platforms**: Qualtrics, SurveyMonkey
**Programming**: PHP, WordPress, BuddyPress
**Social / Project Management**: BaseCamp, WebEx, GoToMeeting, liveBooks

## Advocacy & Fundraising Experience

**Planned Parenthood Federation of America (PPFA) /** Communications Manager
AUGUST 2009 - JUNE 2010, NEW YORK, NY, USA
Advanced policy goals and strengthened coalition relationships by crafting and presenting over 15 sets of talking points detailing Congressional developments and implications for Medicaid recipients and 20 legislative and policy briefings in 3-month span.

**Planned Parenthood of New York City (PPNYC) /** Associate
FEBRUARY 2005 - DECEMBER 2007, NEW YORK, NY, USA
Collaborated with senior executives to plan and execute annual fundraisers, raising over $3 million in two years. Cultivated the inception of two new robust annual events in a two-year tenure.

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JANUARY 2004 - FEBRUARY 2005, NEW YORK, NY, USA
Organized and led 10 community workshops in North Bronx about nutrition and access to local fresh foods via weekly farmers' market garden-to-table venue. Grew over 2,000 pounds of organic vegetables for donation to Bronx emergency food providers.

## Awards & Fellowships

- Predoctoral Research Award, 2014-15, Experimental Social Science Lab (XLab), Haas School of Business, University of California Berkeley
- Graduate Dean Summer Research Award, University of California Berkeley, 2014
- Ford Foundation Predoctoral Fellowship in Youth, Sexuality, and Public Policy, Center for Research on Adolescent Health & Development, 2012-2014
- Mayhem & Helen Derryberry Fellowship in Public Health, University of California Berkeley, 2014-2015
- School of Public Health Merit-based Block Grant Award, 2013-2014

## Leadership & Service

### Academic

DrPH Management Committee, University of California Berkeley School of Public Health, 2013-2016
Student Representative, University of California Berkeley School of Public Health Student Government, 2012-2014

### Professional

Board Member, Center for Health Leadership Association, 2012-PRESENT
Public Relations Volunteer, Dress for Success San Francisco, 2012-PRESENT
Career Counseling Volunteer, The Doe Fund, Inc., 2010-2012
Mentor, Step Up Women's Network, 2010-2012
Founder & Steering Committee Member, New York Area Reproductive Health Networking Initiative, 2009-2012

## Certifications

CITI (Human Subjects Research), University of California Berkeley, March 2013

## Interests

Photography, Data visualization, Travel & new places, Cooking & wine, Interior spaces

# INTRODUCTION

Young people today are highly adept and comfortable using the Internet (Flanagin & Metzger, 2008). Heavily immersed in digital media since childhood, young adults have learned to navigate the web as a "first language" for finding information pertinent to their lives. Media scholar danah boyd (2014) characterizes adolescents in the 21st century as "digital natives" highly skilled at participating in digital practices and as citizens in online communities. Adolescents (aged 12-17) and emerging adults (18-24) (Arnett, 2000; Steinberg, 2014) exhibit familiarity and comfort that is directly reflected in their reliance on the Internet for social interaction and everyday information, which they seek online in greater proportions compared to adults. A 2010 study found that 93% of adolescents visit one or more websites on a daily basis (Lenhart, 2010). In a follow up study by the same authors, 92% of adolescents reported going online daily, including 24% who say they go online "almost constantly" (Lenhart, 2015).

Adolescents rely on the Internet specifically for learning about sensitive health information topics, including sexual health and sexuality. Beginning in mid-teenage years, adolescents increase their use of the Internet to find information about pressing, personal health problems. While adults tend to use the Internet for medical information about disease or treatments, adolescents are more likely to seek information on health topics related to new life experiences, like sexuality and sexual activity (Eysenbach & Köhler, 2002). Information about developmental changes, including discovering sexual identity, and issues surrounding sexual initiation and expression, can be accessed easily and anonymously on the web. Emerging adults in particular, who are initiating lifetime health behaviors and regular clinical care, report feeling most comfortable accessing sexual health information from websites, even more than with a doctor (Lim, Vella, Sacks-Davis, & Hellard, 2014).

Using the Internet for sexual health information also suits adolescents' need for privacy and anonymity as they progress through development (Valkenburg & Peter, 2011). Adolescents are often reluctant to discuss sexually transmitted infections (STIs)[2] or other negative sexual health concerns face-to-face, even with trusted peers or health care providers. Particularly for potentially stigmatizing health issues, the web has great potential to provide information in an environment that reduces stigma (Boyar, Levine, & Zensius, 2011). The affordance of privacy online also allows young users to search for sexual health and sexuality information autonomously and with a sense of safety (Pascoe, 2011; Steinberg, 2014).

Web-based sexual health interventions are noted as one way to improve access to health knowledge while our policy advocacy work continues for universal,

[2] I use the term "STI" to describe sexually transmitted infections and disease. Some participants in this dissertation use the term "STD." Terms may be considered interchangeable.

comprehensive sexuality education for youth in the U.S. Recognizing the tremendous power of the web for delivering sexual health information, sexuality educators have focused programmatic efforts on the development of educational websites to reach young people online (Isaacson, 2006). Sexuality education websites (SEWs) are primary web interventions designed to improve knowledge and self-efficacy for health at the individual level (Bay-Cheng, 2001). Sexuality education websites can deliver more than just medical information. Many SEWs act as online extensions of classroom sexuality education programs, and contain links to finding a provider or teen-friendly clinic and appointment-making and health educator chat features. More comprehensive interventions also include interactive information on sexual identity, as well as learning modules and scenarios-based activities for sexual health skills development (Barak & Fisher, 2001; Goldfarb & Constantine, 2011).

Yet even high quality SEWs as intervention strategies have limitations. First, SEWs are rarely designed with underlying theoretical frameworks or usability testing (Noar, Clark, Cole, & Lustria, 2006) and may be created with an unsubstantiated assumption that adolescents will find them on the web and thus making an impact (Isaacson, 2006). Intervention websites for any health issue are only a small fraction of sites users may be exposed to when they go online. There is a strong possibility that intervention websites may not be found in the mix with other types of online information.

Second, online interventions for adolescents are limited by the nature of the digital environment. The Internet is an unregulated environment; inconsistencies, inaccuracies, and biases are common across websites with health information (Sillence, Briggs, Harris, & Fishwick, 2007). The process itself of using the Internet for health information carries risk for adolescents. Exposure to misleading, stigmatizing, or unhelpful information in the process of using the Internet for sexual health information may be compounded if the search is motivated by an imminent sexual health concern or is intended to be used to guide a health decision (Lim et al., 2014). Adolescents may also be at risk for breaches of online privacy when looking for health information, such as personal information unknowingly shared or sold to third parties (Gray, Klein, Sesselberg, Cantrill, & Noyce, 2003). There is also an abundance of user-generated health content on the web, which increases ambiguity for knowing and trusting the source of health information (Flanagin & Metzger, 2008).

The known risks associated with online health information seeking have prompted researchers in both health and information science fields to learn more about how people use the Internet to make health decisions (Sillence, Briggs, Harris, & Fishwick, 2006b). For example, web credibility researchers have investigated the believability of different kinds of online information or its source (Cheshire, 2011; Fogg et al., 2001). Credibility judgments can act as a filter to sift out inaccuracies and potentially harmful information, which may minimize risk to the user (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010). Relatedly, online trust research has focused on the specific psychological underpinnings that prompt consumers to trust online content, and how

trusting attitudes impact future online decisions and transactions. Trust is a salient concept for online resources of all forms (Briggs, Sillence, Harris, & Fishwick, 2007; Cheshire, 2011; Friedman, Khan, & Howe, 2000), and includes aspects of interpreting and internalizing information. Trusting attitudes may also be linked to behavioral intentions for health decision-making (Gray, Klein, Cantrill, & Noyce, 2002; Selkie, Benson, & Moreno, 2011). Trust in health websites develops in much the same way trust would with a face-to-face health provider or other source of offline information. While it may seem unintuitive to think of websites as trusted entities, forming a trusting relationship with specific online health resources can have lasting, positive effects on future behaviors.

Social psychology researchers have also begun to focus on how theories of cognitive information processing can be applied to the online health information context. Dual process theories (Wason & Evans, 1974) can be used to understand how people interact with online content in the face of uncertainty. In essence, dual process theories of judgment and decision-making (referred to throughout this dissertation as simply "dual process theories") posit that people rely on two distinct cognitive processes, explicit and implicit, that work in parallel for information processing (Chaiken, 1980; Chaiken & Trope, 1999). Dual process theories have particular applicability when individuals are tasked with making judgments in information-dense environments, including the Internet.

Research Gaps

Despite recent empirical and theoretical developments for understanding judgments and trust in online health resources, to date there is no application of these concepts to adolescents and sexual health information specifically. In order to inform efforts to most successfully reach adolescents with online sexual health interventions, three understudied aspects of how this population uses the Internet for sexual health information need to be addressed.

First, positive and trusting experiences with online sexual health information may play a part in behavioral intentions and possibly sexual health outcomes among adolescents related to their decision-making (Noar et al., 2006), yet very little is known about what adolescents find trustworthy or credible on the web. Part of the reason we have so little understanding of adolescents' trust online for sexual health content is because we do not have a clear understanding of how they seek this type of information. Given that the web is a vast, unregulated environment, it is important to understand the adolescent process of searching the web for sexual health information to more accurately gauge what they come across and what they find credible or trustworthy to help meet their informational needs.

Second, adolescents may be more likely to trust websites that can deliver tailored or personalized information to their unique health questions or circumstances, yet we

have little understanding of how tailored content may conflict with adolescents' need for privacy. Personalized website features may include tailoring information by location, gender or age, or prompting users to create accounts. Disclosing these personal details allows sites to tailor content accordingly and is a behavior that is likely to be linked to behavioral intentions for health decision-making (Gray et al., 2002; Selkie et al., 2011) and subsequent health outcomes. Yet adolescents are also concerned about breaches of privacy when looking online for sexual health information (Lerner & Steinberg, 2009). We have very little understanding of how perceived benefits of personalization interact with adolescents' developmental need for privacy and confidentiality, especially in the online environment.

The third research gap that needs to be addressed relates to theory. To date, no conceptual models exist that offers a way to understand how adolescents judge and interact with sexual health information online. Conceptual models are useful for predicting how web users may accept or reject online interventions, and can be used to inform the design and delivery of SEWs and other online interventions targeting adolescents. Specifically, models of online trust can be used to understand how adolescents come to trust specific resources over others, which may ultimately have a positive impact on their sexual health into adulthood.

## Dissertation Project

The goal of this dissertation is to help fill these three knowledge gaps, with each paper addressing a different yet related aspect of adolescent use of the Internet for sexual health information. The project as a whole is guided by three main research aims, each addressed in an individual paper in this dissertation. A brief description of my research aims and methods for each paper is presented here, and described in detail in the sections that follow.

Paper 1 Aim: Identify patterns for user process and trust and credibility perceptions adolescent users experience online when searching for and evaluating sexual health information.

In this portion of the dissertation, I observed late adolescents' process of searching the web for sexual health information and interviewed participants about what they found credible and trustworthy for this specific Internet task. My methodology placed individuals in late adolescence in a controlled yet ecologically valid context for observing how users search and evaluate online sexual health information. This qualitative, computer-based data collection effort included direct observation of participants' Internet behavior, "think aloud" interviewing techniques, and monitoring of web activity for 30 individuals in late adolescence.

Key concepts in Paper 1: Online trust, Web credibility, User experience, Websites

Paper 2 Aim: Explore adolescent perceptions about privacy and confidentiality online as it relates to searching for and evaluating sexuality education and other websites about sexual health.

As part of the qualitative, computer-based method described in the Paper 1 Aim, in this portion of the dissertation I observed adolescent interactions with online privacy and personalization features and interviewed participants about perceptions and attitudes of these website features. Methods for this aim are described above.

Key concepts in Paper 2: Online privacy, Personalization

Paper 3 Aim: Expand on existing theories of online trust for relevant applications for adolescents and online sexual health information.

In the final paper, I integrated concepts from the field of adolescent development, online trust and credibility, and psychology in order to propose a new theoretical understanding of how adolescents judge and interact with online sexual health information. This paper systematically reviews cross-disciplinary research, proposes a new conceptual model for adolescents and online sexual health information, and discusses implications of this literature for sexuality education.

Key concepts in Paper 3: Adolescent development, Online trust, Web credibility, Dual process theories

## PAPER 1: LATE ADOLESCENT USER EXPERIENCES WITH ONLINE SEXUAL HEALTH RESOURCES: A QUALITATIVE STUDY


### Abstract

Adolescents rely on the Internet as a primary venue for sexual health information, which exposes them on the web to a range of useful and harmful resources. Understanding adolescents' information-seeking processes and trust assessments of online information can inform effective online interventions. This study used qualitative methods to identify adolescent user process and salient attitudes for using the Internet to meet sexual health informational needs. We conducted an observational study of late adolescents (n=30) as they searched for sexual health and sexuality information and a "think aloud" protocol to concurrently capture user thoughts and perceptions of online content *in situ*. We tracked web navigations and participant verbalizations during searches. Interviews were audio-recorded and transcribed, and web recordings converted to video files. We analyzed datasets using a modified grounded theory approach. Results reveal a four-phased process that late adolescent users employ for searching and evaluating online information: 1) approach, 2) selection, 3) assessment, and 4) corroboration. Several themes regarding credible and trustworthy information also emerged. We observed implicit trust in resources that appear in top search results, which rarely include sexuality education websites. For learning about sexual identity, this age group sought first-person accounts through text and video blogs from online personalities. Users verified online information with additional research and by comparing information to personal experiences. Online interventions may not need to include information about sexual identity because adolescents sought that information elsewhere. Practitioners should prioritize online interventions for search engine optimization (SEO) and aesthetics that communicate credibility among adolescents.

## Introduction

Adolescents rely heavily on the Internet as a source of health information. More than 93% of adolescents report using the Internet daily for on-demand information about topics important to them (Boyar, Levine, & Zensius, 2011; Guse et al., 2012). Adolescents are adept at participating in digital practices (boyd, 2014), and using the Internet to find health information suits adolescents' need for privacy and anonymity as they progress through developmental stages (Valkenburg & Peter, 2011).

Content about sexual health and sexuality is an especially important type of health information adolescents seek out. The web has great potential to meet sexual health informational needs unique to this population, including the ability to confidentially view information about sexually transmitted infections (STIs) without the stigma that sometimes accompanies face-to-face conversations about negative sexual health outcomes (Gray, Klein, Sesselberg, Cantrill, & Noyce, 2003). Information about developmental changes, including discovering sexual identity and sexual maturation, can be accessed easily and anonymously. Additionally, adolescents value the ability to assess and navigate sensitive, potentially stigmatizing information on the web as autonomous agents (Gray et al., 2003; Lerner & Steinberg, 2009).

Late adolescence is a critical developmental stage for health. Individuals in late adolescence or emerging adults (ages 18-24) (Arnett, 2000; Steinberg, 2014) report that they feel most comfortable accessing sexual health information on websites, even more than with a doctor (Lim, Vella, Sacks-Davis, & Hellard, 2014). This developmental stage signals initiations into lifetime health behaviors and regular clinical care. In addition, late adolescents become more sexually active with higher numbers of partners and have more casual sex, putting them at higher risk for negative sexual health outcomes (Lefkowitz, 2005). Beginning in middle adolescence, adolescents steadily increase their reliance on the Internet into young adulthood to find information about pressing, personal health problems and initiating clinical services independently (Ybarra & Suman, 2008).

Given the widely accepted fact that adolescents use the Internet often as a first destination to help fulfil their sexual health informational needs (Rideout, 2002), public health practitioners have intervened online to improve sexual health outcomes. Sexuality education websites (SEWs) are considered interventions to improve knowledge and self-efficacy for health at the individual level (Bay-Cheng, 2001). Today there are little differences in Internet access and usage based on race, ethnicity, or gender, making SEWs a type of intervention with tremendous potential to reach broad numbers of young web users across different sociodemographic groups (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Pascoe, 2011). Sexuality education websites generally contain current and accurate information (Jones & Biddlecom, 2011), but a recent content analysis of 14 popular sexuality education websites by Marques et al. (2015) showed that SEWs typically overemphasize STI prevention and

management and pregnancy issues, and include little discussion of non-clinical topics like gender, sexual rights, or sexual diversity. Other studies demonstrate that SEWs exhibit variability in content, design, configuration, and usability, all of which impact the user experience (Whiteley, Mello, Hunt, & Brown, 2012).

Encouraged by the potential of online interventions for improved sexual health, organizations have created SEWs with the assumption that young people will actually find them on the web (Isaacson, 2006). Yet SEWs are only a fraction of sites late adolescents may be exposed to when they go online. Users seeking sexual health information on the web risk encounters with inaccurate, irrelevant, or misleading information, including pornography (Smith, Gertz, Alvarez, & Lurie, 2000). Risks may be compounded if searching the web is motivated by an imminent sexual health concern intended to guide a health decision or behavior (Levine, 2011). It is important to understand the adolescent *process* of searching the web for finding sexual health information so that we can more accurately gauge how visible online interventions are to young people using the Internet for this purpose. Understanding adolescent user process can help inform the design and placement of SEWs in the online environment to increase visibility of high quality, credible resources.

A second important aspect to the uptake of sexual health information online relates to trust and credibility. Trust is a salient concept for online resources of all forms (Cheshire, 2011; Friedman, Khan, & Howe, 2000; Sillence, Briggs, Harris, & Fishwick, 2006b). Trust includes aspects of interpreting and internalizing information, and is linked to behavioral intentions for health decision-making (Gray, Klein, Cantrill, & Noyce, 2002; Selkie, Benson, & Moreno, 2011). Positive and trusting experiences with online sexual health information may play a part in behavioral intentions and possibly sexual health outcomes among adolescents related to their decision-making (Noar, Clark, Cole, & Lustria, 2006). Yet, while previous studies have empirically investigated trust and credibility assessments for online information, little is known about how late adolescents approach the web for sexual health information specifically.

This qualitative study addresses visibility and trustworthiness of online sexual health information by empirically examining the behaviors and experiences of youth as they attempt to seek and use open, shared, online sexual health resources. Our methods place late adolescents in a controlled yet ecologically valid context for investigating how users search and evaluate online sexual health information. Our primary goals are to enhance our understanding of processes for finding and consulting sexual health and sexuality resources in this key age group, and uncover specific perceptions and beliefs related to trust and credibility for online sexual health information.

## Methodology

### Recruitment and Sample

We used purposive sampling at a large, public university in the U.S. to select individuals between 18 and 20 years of age. In partnership with an on-campus social science experiment laboratory (X-Lab), we recruited participants who met our selection criteria via an online announcement to X-Lab email subscribers. In order to ensure a diverse sample with broad representation of race and gender, we supplemented our purposive age sampling with snowball sampling to reach a higher number of under-represented minorities (URMs) and to recruit an equal number of men and women.[3] No one was excluded based on prior experiences with online sexual health information. Fifteen men and 15 women (n=30) comprised the final sample.

**In-depth Interviews with Web Observations**

The study author (SS) conducted in-depth interviews to assess participants' experiences while seeking and evaluating online sexual health and sexuality information. Our procedure included a web observation component consisting of three guided activities on a standard PC with a web browser: 1) warm-up to get familiar with the computer and setting; 2) observably searching the web for sexual health information according to a specific protocol (described below); and 3) reviewing an on-screen video recording of web searches just completed. During all activities, the interviewer instructed participants to think aloud and verbalize their thought process. Think aloud protocols help elicit underlying judgments when coupled with observable behaviors (Earle, 2004; Ericsson, n.d.; Rieh, 2002). Interviews consisted of thoughtfully probing participants' verbalized thoughts while also observing participants' online behavior (Liao & Fu, 2014).

All interviews took place in a quiet room with only the interviewer and participant at a private lab computer station. Participants first conducted a brief warm-up activity on the think aloud protocol, which consisted of searching online about possible flu symptoms. Next, we instructed participants to perform uninterrupted search tasks and were given four search prompts corresponding to diverse, but common sexual health topics: (1) safer sex, (2) sexual risks, including STIs, (3) sexual responsibility, and (4) sexual identity. For example, when prompted about sexual responsibility, participants were asked to imagine that they were in a new romantic relationship and wanted to go online to find information about how to be sexually responsible. After receiving prompts, the interviewer activated web recording and instructed participants to guide the conversation freely while searching the web.

We chose the four sexual health topics for prompts to allow participants to assess and discuss a range of sexual health information, rather than only negative aspects of sexual health (e.g., unwanted pregnancy or disease contraction). This broader set of

[3] This dissertation represents my copyrighted original research. However, I refer to my research team, which includes my dissertation committee and colleagues, when describing the collaborative data collection effort, analysis, and our interpretations and findings in all papers.

topics is more consistent with a comprehensive sexual health framework developed by sexuality educators (National Guideline Task Force, 2004). The interviewer phrased sexual identity and risk prompts in a hypothetical context to reduce respondent discomfort. For example, participants were asked to imagine that someone close to them is questioning his/her sexual identity and in need of trusted information. Research suggests that scenario-based prompts allow participants to be engaged in a more conceptual, less personal way, appropriate for questions about sexual activity or sexual health, and aid in eliciting honest responses (Bernard, 2011).

After the search tasks, the interviewer played back the participant's own web movements, with the participant watching, as screen-captured videos from their prior search activities (including typing, mouse trajectory and clicks). This final step combined real-time "think aloud" discussions (*in situ*) with reflective evaluations of prior search and selection activities, allowing for deep reflection on how they judged, selected, and avoided specific web resources. Together, the three parts of the interview did not exceed 90 minutes.

**Lab Computer Procedure**

Data was collected from December 2014 to February 2015. Audio was captured with a digital voice recorder; online search activities, web navigations and browser histories were captured using CamStudio. Users were paid $20/hour for their participation, and completed a brief questionnaire to conclude the session. Computers were connected to the Internet with a reliable private wired network. No user preferences were saved and search histories were deleted after each interview.

**Coding and Analysis**

We analyzed the transcripts of verbal data and video files of web navigations using a modified grounded theory approach, including two *a priori* constructs from relevant literature, online trust and web credibility. In addition to these two core themes, we identifying and coded emergent themes in an inductive, iterative fashion consistent with grounded theory methodology (Miles, Huberman, & Saldaña, 2013). We used MaxQDA (v. 11.2.2), a qualitative data management software program that allows researchers to code textual, video and audio data, for all coding and analysis.

The study author and two trained research assistants iteratively identified the two existing themes from the literature (online trust and web credibility), as well as emergent themes. First, team members reviewed all audio transcriptions for possible themes. Next, the team coded transcriptions in MaxQDA according to emergent themes identified through an iterative process. Using the resulting preliminary code list, the team used a subset of transcripts to code segments, discuss functionality of the codes, and revise the code list. We repeated this process by reviewing and discussing all transcripts. To address reliability, all discrepancies in interpretations of codes were

discussed and resolved between the three coders via consensus to reach full agreement for the final codebook. All audio transcriptions were then coded by the two research assistants according to the codebook. Finally, the first and second author then coded the video files using the final codebook.

We collated and analyzed browser histories separately in Excel. Numbers and domain names of unique web pages visited by each participant were tallied. We assigned codes to denote which prompt participants were responding to when visiting each web page. Search terms and search strings were extracted for keyword analysis. We also assigned codes to each search string to indicate whether it was used with the intention of finding a specific, targeted web resource. Targeted search strings were coded as such if they included a known resource, author, or entity along with other descriptive search terms. The study was approved by the University of California, Berkeley institutional review board.

## Results

We present three main findings in this paper. First, we characterize the adolescent user process of finding sexual health information online in four phases: initial approach, selection of web resources, assessment and evaluation, and corroboration (see Figure 1-1). Second, we identify seven distinct themes corresponding to the four phases (see Table 1-1). Phases and corresponding themes are defined and discussed below. Our third finding details the visibility of SEWs in participants' experiences of searching the web. Findings are based on the qualitative analysis of 26 video recordings of participants' search processes and web navigations and 28 corresponding interview transcripts; and the coded quantification of 30 browser histories. Four participants declined to have web activity recorded; two declined to be audio recorded.

Participants in our sample were 33% Latino/a (n=10); 30% Asian Pacific-Islander (n=9); 23% White (n=7); and 13% African-American (n=4). Mean age is 18.9 years. See Table 2-1 for details on sample demographics and characteristics on Internet use.[4]

### Phase 1: Initial Approach

When given prompts to find different types of sexual health information, participants first considered how to conduct a search strategy, what search engine to use, and whether the web would likely meet their informational needs. Before navigating the web, one quarter of participants expressed that the Internet is not the best place to seek sexual health information, either because they prefer to consult another source first or because the Internet would not be useful in certain circumstances. One 19-year-old (yo) female participant explains that for trying to find information about sexual identity, "*I feel like I wouldn't know what to Google search in this situation, like how to*

[4] Table 1-2 presents sample characteristics for both Papers 1 and 2 in this dissertation

*know if I am gay …*" Trusted peers or a health care provider were often named as the most appropriate personal resource to get offline information for all types of sexual health information. Some users also noted they would discuss this issue with a trusted peer over an online social media network, like Facebook, rather than searching the web.

***Theme 1. Untargeted web searching*.** In Phase 1, nearly all adolescent users in our sample began searches by conducting untargeted search strategies (USS), which we defined as opening preferred search engines (e.g., Google, Yahoo!, Bing) and typing in descriptive keyword search terms (i.e. "deciding to have sex") without a specific intended online destination. In less than 10% of instances users searched by typing in a specific web address, as opposed to using a keyword search strategy. Participants verbalized that their choice to conduct USSs was sometimes due to uncertainty about how to begin their search. An 18yo female participant comments, "*I guess I wouldn't really know where to start besides Googling 'sexual health'..."* Users routinely stated their preference for using Google to start their queries above other available search engines, which is consistent with known user preferences for Google in young adults (Bing et al., 2007). A 19yo female participant compared Google to other engines stating, "*[Google]'s so much easier. So much cleaner. I think about Yahoo and Bing, it's just not appealing to the eye, or at least to my eyes."* Strong preferences for Google as the specific search engine of choice and for untargeted searching behaviors have been verified in at least one other study of late adolescents and Internet use.[15]

Users sometimes deviated from using an USS when they wanted to consult a website they had already visited or knew about. In these instances, participants did a targeted search strategy (TSS), which we define as typing in descriptive keyword search terms together with the name of a particular website, organization, author, or online personality. For instance, one participant searched with the term "coming out youtube lacy" to find online educator Laci Green during the sexual identity prompt.

Targeted searching was done most often to find information about sexual identity (39% of targeted searches). In addition, thirty-four percent (34%) of targeted searches were to find websites run by health groups that offer "brick and mortar" health and wellness or clinic services or settings. The most common brick and mortar clinical entity participants searched for was Planned Parenthood: five out of 30 users included "planned parenthood" in their search terms to find this resource at the top of their results lists.

***Theme 2. Gender and searching differences for information about sexual responsibility*.** Search terms used for interviewer prompts on safer sex and sexual harms in Phase 1 were consistent between women and men. For learning about safer sex and condom use, participants of both genders preferred to go to YouTube first to find condom video tutorials. The only difference observed by gender was how men and women interpreted the sexual responsibility prompt, as reflected in their use of

different keyword search terms to find relevant information. For instance, women more often directed their searches towards information about contraception, STD prevention, and negotiating safety in sexual situations. Men more often wanted to find information about sexual communication, relationship advice, and navigating new sexual situations in the context of advancing intimacy (see Table 1-3).

***Theme 3. Searching about sexual identity topics*.** Participants approached learning about sexual identity in a way that was distinct from the other three prompts. When finding information on other prompts, adolescents often began search strings with "how to" (i.e. "how to put on a condom," "how to avoid STD," "how to have safe sex"). This approach consistently yielded more medically-oriented sites in search result lists, such as WebMD.com. In approaching the sexual identity prompt, almost a quarter (24%) of search terms used by participants related to identity through a first person or narrative lens ("am i gay," "i think my friend is gay," "coming out issues for latina," "queer stories") and less on a didactic instructional format. Six participants entered terms to find stories of coping with or preventing STIs, but the majority of users sought to find personal stories about knowing or questioning one's own sexual identity.

**Phase 2: Selecting Online Resources**

After searching the web for sexual health information using either an USS or a TSS, adolescents then reviewed search result lists for what they considered to be *credible* resources and resources they recognized. A total of 1,429 web pages were visited across the study sample.

***Theme 4. Reliance on top search results*.** Resources that appeared at the top of search results lists in Phase 2 were consistently selected and opened for all searches by all individuals. Users defined "top" results as those at the top of search results lists, including links inside preview boxes, but did not consider paid suggested links or link ads on the sides of the web page to be part of top results. Very rarely did any adolescent user consult search results on second or third pages of results lists; overwhelmingly, if a resource did not appear in the top third of results on the first page, it was not selected for further exploration.

When probed about why they did not visit second or third pages of search results, participants reported that resources near the top of search results lists were more likely to contain the most relevant, highest quality, and most accurate information.

> *"I think the first page of Google just seems more, has more of the stuff I'm looking for, like related to what I've been searching. I just know that if I can't find it on the first page, I'm not going to find it on the second page" (18yo female)*

As an 18yo male participant chooses a website to open, he says: *"Like this one, maybe, but this one has a lot of views. So, I trust that it's at least valid and it was also the top result which helps."*

Five out of 30 users directly expressed they knew that companies and sponsoring organizations could pay for top search results placement *("… companies pay big money so they are first in the search engine …"*), but this did not seem to detract from the habit of trusting and consulting top search results. Paid placements in main results lists (not sidebar advertisements) were thought among some users to confirm the legitimacy of top resources: *"So, if they are paying for the spot, then you feel like then they probably are going to have some good information." (19yo female)*

***Theme 5. Storytelling preference for learning about sexual identity online*.** Participants preferred narrative, storied accounts related to sexual identity in both Phase 1 and 2. To find web resources about sexual identity, participants used storied (more personal first-hand accounts and stories) search terms in Phase 1, which yielded more personally produced web pages. For selecting resources in Phase 2, adolescents then also selected links to blogs, forums, individual Tumblr and other social media pages, documentary links, and other online content published in the first-person narrative. Web pages that appeared to be socially conservative or focused on religion or news, including sites detailing social controversies around sexuality issues, were generally avoided for all prompts, but especially when selecting resources about sexual identity.

**Phase 3: Assessing Credibility of Selected Websites**

All Internet users assess websites for elements of credibility and reliability (Flanagin & Metzger, 2000). Website layout, appearance, color scheme and general organization influenced whether the resource was seen as credible in this assessment phase (Phase 3) (Fogg et al., 2001). A prominent code in our analysis centered on user stated aesthetic preferences for websites and overall web experience. Participants preferred clean, accessible layouts and sites with minimal advertisements, pop-ups, and unrelated images. Observations showed that participants stayed on a page and navigated within sites if they expressed a verbal preference for its visual presentation. Bulleted and expandable drop-down or collapsible styles of presenting information as well as photos were preferred for being able to skim and access information quickly. Content on sites styled with full paragraphs or blocks of text were generally avoided, although some users did read heavy text carefully.

***Theme 6. Aversion to "teen-friendly" styled resources*.** Across our sample of older adolescents, layouts perceived as overly "teen-friendly," as expressed by use of contrasting colors, visual volume, and an "*MTV*" quality, were thought to be outdated ("*they were designed in the 90s")* and less reliable for in-depth information about

sexual health topics in Phase 3. Respondents verbalized an aversion to the teen-friendly style of some SEWs they encountered.

Participants consistently expressed the need as a last step in Phase 3 to find and corroborate information across other resources, as described next in Phase 4. Users consistently said this was important even if a particular web resource contained what the user thought to be complete or satisfying information for the prompt.

**Phase 4: Corroborating Sexual Health Information**

In the last phase of observed web behavior, participants demonstrated and verbalized that confirming or corroborating what they examined online was an important step for reaching a "satiated" point for learning about sexual health. Users corroborated information in one or more ways: with other online resources, with offline resources, or through personal experiences.

> *"I mean let me try another [site]. I just want to see which one gives more information or if all the pages say the same thing. So I want to look for consistency in my answers I guess. I mean if I look at some page and it says like totally something different I'm like, that's one I might avoid." (19yo female)*

The act of online corroboration – opening new tabs, conducting new USSs, toggling between open web pages to compare information – was observed during the search process for all participants. The most common strategy for corroborating found information elsewhere online was to conduct a second parallel USS using the same search engine, and click into one to four websites found on the first page of search results to verify information, or opening hyperlinks on a current page to view substrate website content.

***Theme 7. Online information checked for consistency in other contexts*.** When corroborating online resources with offline information and lived experiences, four participants did so by noting whether what they read online was consistent with what they learned in classroom-based sexuality education. One participant recognizes online information from the same group that gave a sexuality education seminar at his high school:

> *"In our health class we were to like fill out their worksheets and stuff, and so since the school recommended it, I thought is should be useful" (18yo male)*

Four additional users also noted when information was verifiable from experiences with health care providers or in clinical settings. One 19yo male participant explains how he looks for STI treatment information online from his doctor's website, and compares information from a prior conversation with his doctor:

> *"Yeah like looking for how I am going to be treated and not have this happen again, like just what to expect, because I am going to be going to* [large HMO]*. They are going to supply like me, like the information I need. So I think, there's some identification there, because my doctor is from there and he said basically like what's here. … it's like kind of couple the two together."*

To a lesser extent, some participants also gauged quality or accuracy of online information by whether it was congruent with their personal experiences.

**Scope of Reviewed Web Resources**

Our third finding relates to the representation of sexual health interventions across all web pages visited by participants' search process in our sample. Using a recent study on current offerings for online sexuality education, Marques et al. (2015), we compare known, popular SEWs in the Marques study with those our participants encountered as part of their self-directed web searches. Our results show how often adolescent computer users are visiting SEWs for a range of sexual health information.

Six out of the 14 SEWs assessed in the Marques et al. study were opened and viewed by users in our sample, and accounted for only 8% of the total number of web pages viewed by the entire sample. The most common website from Marques et al. (2015) study list of popular sexuality education websites was plannedparenthood.org, whose sponsored content appeared frequently. Planned Parenthood links were selected by 18 out of 30 users, only four of whom also visited any of the remaining five sexuality sites from the Marques et al. study that our participants viewed.

## Discussion

This study established a four-phased framework for understanding how late adolescents find and evaluate online sexual health information as an important subset of web content. Themes outlined in this study point to three key implications for how sexual health and sexuality educators may better maximize online sexual health knowledge portals to reach this population.

First, considering how our results compare to 14 well-known, acclaimed sexuality education websites, it was unexpected that adolescents viewed so few of these available on the Internet. Exposure to SEWs and other forms of high quality resources may be limited for users searching the web of their own accord if these resources do not appear at the top of results lists. Interventions designed to deliver comprehensive online sexual health information to adolescents may not reach their intended audience unless they appear early in search lists.

Therefore, quality online interventions must not only present valuable, relevant, and accurate content, but also must prioritize their placement on search engines and web

rankings. Sexuality education website designers and program professionals must consider how readily their online interventions may be reached when evaluating impact. Programmers for intervention sites should invest in search engine optimization (SEO), which includes adding relevant keywords and phrases on the website, and editing image tags to improve the chances that the website will be indexed by search engines. An SEO strategy will help interventions appear in the top of results lists, and can be informed by our findings on the different search terms used by this age group.

Given the sentiment against teen-friendly website designs among older adolescents, designers may also want to conduct user focus groups or otherwise assess how the design of their specific website may be perceived by older youth (McCarthy et al., 2012). Attempts to design SEWs for "youth" or "adolescents" as a blanket demographic may in fact result in negative credibility assessments of the content they see. Older adolescents' informational needs about sex and sexual health are likely to reflect their increase in sexual activity and number of sexual partners as they develop into emerging adults, making a dismissal of accurate but poorly framed content a significant opportunity lost for knowledge uptake. Furthermore, this is particularly significant given the strong emphasis in many youth health resources on tailoring online information based on perceived accessibility for target demographics.

Second, it is not surprising that adolescents consistently judged websites for their utility based on initial impressions about aesthetics and ease of use. Non-content cues about the quality and accuracy of a site, like design features, basic functionality, and presence of advertisements and pop-ups, were also part of their process for deciding whether to spend more time on a particular site, confirming key findings about web credibility assessment by Fogg et al. (2001), Sillence et al. (2004), and other researchers. Extraneous imagery and visual "noise" tempered the initial impressions our users had of what they hoped to glean from a particular site. Again, not surprisingly, dot-org, dot-edu, and dot-gov websites were considered more credible for reviewing sexual health information compared to dot-com sites, in line with research on how users assess the source of information as part of their credibility assessment thinking (Beldad, de Jong, & Steehouder, 2010).

However, in a departure from this research, we observed that the credibility assessments of resources about *sexual identity* were distinct from other sexual health topics, which was an interesting theme that emerged unexpectedly from the data. Adolescents were sometimes more liberal or tolerant of errant displays or extraneous information on websites if the focal content of the site related to sexual identity confusion, the "coming out" process, sexual prejudice, or personal conflicts with one's own sexual identity (Sulfridge, 2013). Professional, authoritative design layouts with digestible text formats were valued for communicating credibility for most of the sexual health information users sought and found, but for sexual identity information, users seemed to tolerate more uncertainty when learning about other web users' experiences. Rather than becoming impatient and closing the site, users were more

tolerant and ignored (clicked away) pop-up ads and filtered through extraneous text in order to read and evaluate posted content about sexual identity. Users were more likely to abandon sites with similar levels of visual noise that instead focused on STIs or contraception.

Many SEWs do not discuss sexual development or sexual expression, which has been noted as a deficit of these interventions (Smith, Gertz, Alvarez, & Lurie, 2000). Yet our findings suggest this may not ultimately matter to this age group. When users wanted to find information about understanding sexual identity, they are not consulting SEWs. Instead they search for vloggers, bloggers, and other individuals in the online community with strong reputations around sexuality issues. Sources of information about sexual identity will likely have more uptake among adolescent audiences if they are framed with stories and first-hand adolescent accounts of what sexual maturation entails in their social networks and communities. Additionally, SEWs may more effectively address sexual identity by referring users to other online personalities.

Finally, the consistency with which adolescents in our sample corroborated information across various sources (personal experience, peers, offline information) draws attention to the need for reliable access to comprehensive sexuality education throughout adolescence and into emerging adulthood. The older adolescents in our study tended to try to corroborate online sexual health information with offline sources, including previous classroom sexuality education and information from peers and health providers. Corroboration has been noted as a common evaluation strategy for assessing web content when the truth of the information may be either in dispute or unable to be verified objectively (Meola, 2004). It is highly likely young people have difficulty gauging quality and accuracy of sexuality and reproductive health information, given the inconsistent exposure and variation in quality of sexuality education in the United States. Sexual health intervention developers in good faith have attempted to "meet young people where they are" by creating quality online destinations with sexual health information for adolescents and promoting traffic to those sites in recent years.

Yet SEWs should not be viewed as a panacea to reach adolescents on the Internet nor a stopgap measure as advocates push to expand classroom sexuality education. The need among this age group to corroborate sexuality information is high. As a result, sexual health content on general and commercial sites warrants scrutiny and attention. Often adolescents consulted a mix of general and commercial sites, SEWs, and websites run by health and clinical service providers to make ultimate judgments. Practitioners working with young adults and advocates for clinical services for this age group can also use these key findings to highlight the importance of providing high-quality, accurate information through conventional means that adolescents may recognize or corroborate in their private online searches.

**Limitations**

Findings should be considered in light of several limitations. First, participants were instructed during interviews to search for information on topics that were predetermined by the author for the purposes of internal validity and comparison versus their own informational needs. Prompts were open to interpretation, but no topics outside of the four prompts were covered. It is unknown if participants in this study would have directed their own searches around different topics critical to adolescent development, including sexual pleasure.

Second, the sample in this research is an educated group of young adults who may be more likely to have adept online research skills than younger adolescents or those with less education. Corroboration (Phase 4) may be an artifact of a highly educated sample of late adolescent users.

Lastly, the lab where this research took place is arguably not a “natural” environment. Lab stations, while private, do not naturally mimic the conditions and settings of participants’ own computers. However, in order to approximate a natural process, we ensured a private and unfiltered web searching experience. Additionally, with regards to data safety, conducting this study at an official lab provided safeguards for data security and ensured consistency of the research context across all participants.

**Conclusion**

Despite these limitations, this is the first known study to examine how adolescents find sexual health information using open, observational methods on the web, a platform we know they use and trust. By articulating the process of young users online for this specific subset of health information, we may apply these findings to increase the visibility and ultimate impact of online interventions. The findings reported here have potentially important implications for the sexuality education advocacy arena and for those developing online sexual health interventions and educational websites.

Table 1-1. Main study findings

| **Four phases of interaction with the Internet for sexual health information, late adolescent users** | **Seven corresponding key themes in phases** |
|---|---|
| (1) Approach<br><br>*Adolescents consider whether the Internet is the best starting place for sexual health informational needs, whether to consult a search engine or social media* | (1) Untargeted web searching |
| | (2) Gender differences for finding information about sexual responsibility |
| | (3) Targeted searching for sexual identity |
| (2) Selection<br><br>*Adolescents make selection choices from search results lists for websites to evaluate* | (4) Reliance on top search results |
| | (5) Storytelling preferred for resources about sexual identity |
| (3) Assessment<br><br>*Adolescents make judgments and evaluations of resources selected, including what to read carefully and what to avoid* | (6) Aversion to teen-friendly styled resources |
| (4) Corroboration<br><br>*Adolescents check information with other online resources, and reference online information to offline and personal experiences* | (7) Online sexual health information checked for consistency in other contexts |

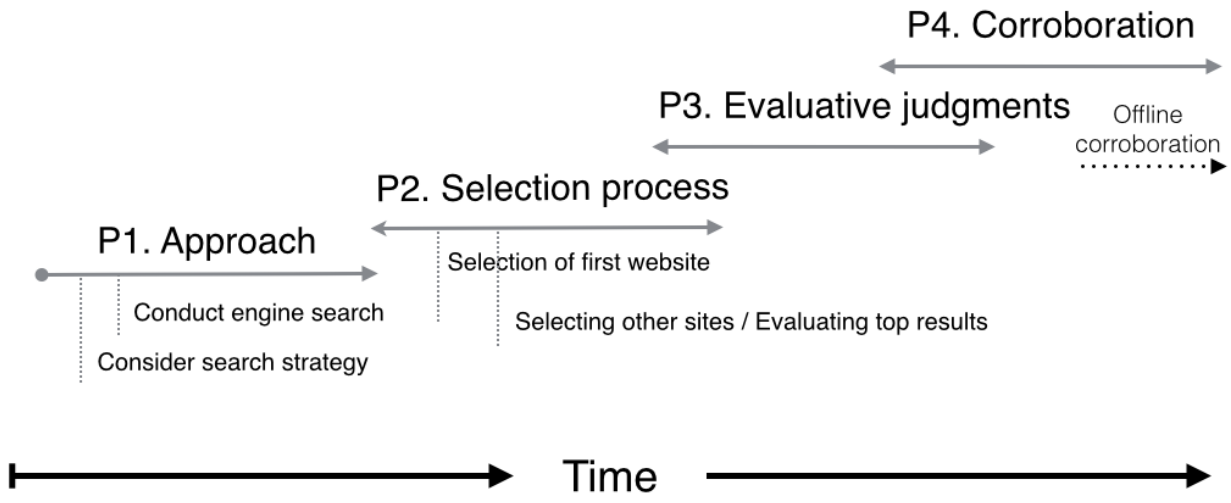
Table 1-2. Sample characteristics (n=30)

| Characteristic | Percentage or mean |
|---|---|
| **Gender** | Women (50%) n=15 |
| | Men (50%) n=15 |
| **Ethnicity** | Latino/a (33%) n=10 |
| | Asian Pacific Islander (30%) n=9 |
| | White (23%) n=7 |
| | African American (13%) n=4 |
| **Age** | Average age, 18.9 years |
| | Age 18 n=9 |
| | Age 19 n=15 |
| | Age 20 n=6 |
| **Reliance on Internet for sexual health informational needs** | Use Internet regularly for this purpose (50%) n=15 |
| | Sometimes uses Internet (40%) n=12 |
| | Usually consult other sources (10%) n=3 |
| **Ever visited health provider for sexual health issue** | Yes (30%) n=9 |
| | No (70%) n=21 |

Table 1-3. Illustrative keyword search terms for finding information about sexual responsibility

| | Male participants | Female participants |
|---|---|---|
| Search queries | ways to make woman feel secure | types contraception |
| | ways to know if girlfriend wants to have sex with you | consent romantic sexual |
| | how know to go next level with partner | contraception option |
| | how to have safe sex | losing your virginity |
| | talk to girlfriend sex | how do i feel after losing virginity |
| | things to prepare before sex | new forms protection for sex |
| | would girls want guys put on condom during sex | why do guys like a girl |

Figure 1-1. Late adolescents' four phases of interaction (P1.-P4.) on the web with sexual health resources over time



# PAPER 2: RISKS AND REWARDS OF SEXUAL HEALTH INFORMATION SEEKING ONLINE: LATE ADOLESCENT USER VIEWS OF ONLINE PRIVACY AND PERSONALIZATION


## Abstract

The web allows adolescents to learn about sexual health and sexuality as autonomous agents in a comfortable environment. While the assurance of privacy motivates adolescents to seek sexual health information online, adolescents are concerned about breaches of privacy when looking online for sensitive health information. Sophisticated online sexual health interventions are often personalized, requiring the user to disclosure pertinent information, such as location, age, gender, or health symptoms, to generate tailored content. Personalization has been empirically linked to the formation of online trust, which may increase uptake and later use of health information found online. Adolescents may value receiving personalized health information, but may perceive it in conflict with their need for privacy. We conducted an observational study of late adolescents (n=30) as they searched for sexual health and sexuality information and a "think aloud" protocol to concurrently capture user thoughts and perceptions of privacy and personalization features online. We tracked web navigations and participant verbalizations during searches. Interviews were audio-recorded and transcribed, and web recordings converted to video files. We analyzed datasets using a deductive, thematic analysis approach driven by our interests in privacy and personalization. Twenty-seven of our 30 participants encountered at least one of seven types of personalization features identified. We observed normalized attitudes towards seeking sexual health information online, while simultaneously, a high prevalence of discreet precautionary actions taken by participants, including history and cookie deletion. Making clinical appointments online carried low perceived risk. Disclosing age and gender is acceptable, but more personal disclosures amount to a violation of privacy, except in sexual health emergencies. Our findings suggest strong acceptability for using the Internet for sexual health information and clear boundaries for more personal disclosures among late adolescent web users.

## Introduction

Adolescents rely on the Internet as a source of health information. More than 93% of adolescents report using the Internet on a daily basis (Guse et al., 2012). At any given time, adolescents have access to an estimated ten to twenty thousand health-related websites available on the Internet, many of them geared toward young users (Sillence, Briggs, Fishwick, & Harris, 2004). Adolescents are adept at participating in digital practices (boyd, 2014), and using the Internet to find health information suits adolescents' need for privacy and anonymity as they progress through development (Valkenburg & Peter, 2011).

This study investigates views and online experiences with privacy protections and personalization features among late adolescents in their process of finding sexual health information online. In an effort to understand how successful online sources of health information are in communicating trustworthy interactions and information, we need to understand adolescent perspectives as they interact and make decisions with available online resources. The key premise of the problem addressed in this study is the fact that adolescent computer users seeking sexual health information online likely value personalization but may perceive it in conflict with their desire for privacy (Kobsa, Cho, & Knijnenburg, 2016). The guiding principles behind online personalization are reviewed below for its applicability to online sexual health information, a critical subset of online health information available to young people.

Sexuality and sexual health information is an important type of health information adolescents seek online. Information about developmental changes, including discovering sexual identity and sexual maturation, and information about safer sex practices can be accessed easily and confidentially online. Adolescents are often reluctant to discuss sexually transmitted infections (STIs) or other negative sexual health outcomes face-to-face, even with trusted peers or health care providers. The web has great potential to provide information about sexual risks and harms, including STIs, in an environment that reduces stigma (Boyar, Levine, & Zensius, 2011). Qualitative and recent survey research suggests that adolescents value the ability to assess and navigate the web with regard to sexuality topics as autonomous agents, especially when reviewing potentially stigmatizing information (Gray, Klein, Sesselberg, Cantrill, & Noyce, 2003; Lerner & Steinberg, 2009; Youn, 2009).

Late adolescence or emerging adulthood (ages 18-24) is a critical development period for older adolescents/young adults (Steinberg, 2014). At this stage, late adolescents become more discerning about whether a source of health information can assure their privacy, as well as the quality of their health information (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005). Individuals in late adolescence report feeling most comfortable accessing sexual health information on the Internet, even more than with a doctor, in part because of increased perception of privacy (Lim, Vella, Sacks-Davis, & Hellard, 2014). Late adolescent users (LAUs) begin to increase their use of the Internet

for health information as early as middle adolescence to find information about pressing, personal health problems and initiative clinical services independently (Ybarra & Suman, 2008).

While accessing person health information on the Internet is largely private and developmentally appropriate, it carries risks to the LAU. Users seeking sexual health information on the web risk encounters with inaccurate, irrelevant, or misleading information, including pornography (Cheshire, 2011; Smith, Gertz, Alvarez, & Lurie, 2000). These risks may be compounded if searching the web is motivated by an imminent sexual health concern intended to guide a health decision or behavior (Levine, 2011). Adolescents are especially concerned about breaches of privacy and confidentiality when looking online for health information, such as personal information shared or sold to third parties, making compromises in privacy a prominent risk (Gray et al., 2003; Lerner & Steinberg, 2009).

Publishers of online content can minimize user risks by including website privacy assurances. Privacy assurances on websites may include published privacy statements describing their policies regarding collecting user information, or displaying privacy seals issued by independent third parties (Hui, Teo, & Lee, 2007). Websites designed specifically to deliver sexual health information can implement many of the same assurances to site visitors as commercial and general websites.

A second way websites with sexual health information can minimize risk and increase benefit to the user is by personalizing content. Personalization website features are design elements tailored for an individual user, and may include tailoring information by location, age or gender, prompting users to log in or create accounts, or storing previously viewed topics or searches to tailor what is displayed. Personalization features typically require user disclosure of pertinent information to generate tailored content.

Both privacy and personalization features are important when using the Internet for health information because they communicate trust. Trust is an important aspect to the uptake of sexual health information, and is a salient concept for sexual health resources in all forms (Briggs, Burford, De Angeli, & Lynch, 2002; Sillence, Briggs, Harris, & Fishwick, 2006a). Trusting attitudes may intensify or diminish based on how well a website is able to protect a user's privacy, which could impact whether they continue to consult a particular website for health information (Cheshire, Antin, Cook, & Churchill, 2010; Selkie, Benson, & Moreno, 2011). Similarly, personalization of online resources aid in the development of trust, and may increase uptake and later use of health information, especially among adolescents (Gray et al., 2003). Trusting experiences on websites providing sexual health information, moderated by privacy and personalization features, may play a part in behavioral intension about possibly sexual health outcomes among adolescents related to their decision-making (Noar, Clark, Cole, & Lustria, 2006). Yet, little is known about specific perceptions and

experiences about privacy and personalization from the adolescent user perspective. This study aims to explore adolescent perceptions about privacy and personalization features specifically when interacting with online sexual health resources.

## Methodology[5]

### Recruitment and Sample

We used purposive sampling at a large, public university in the U.S. to select individuals between 18 and 20 years of age. In partnership with an on-campus social science experiment laboratory (X-Lab), we recruited participants who met our selection criteria via an online announcement to X-Lab email subscribers. In order to ensure a diverse sample with broad representation of race and gender, we supplemented our purposive age sampling with snowball sampling to reach a higher number of under-represented minorities (URMs) and to recruit an equal number of men and women. No one was excluded based on prior experiences with online sexual health information.

### In-depth Interviews with Web Observations

The study author (SS) conducted in-depth interviews to assess participants' experiences while seeking and evaluating online sexual health and sexuality information. Our procedure included a web observation component consisting of three guided activities on a standard PC with a web browser: 1) warm-up to get familiar with the computer and setting; 2) observably searching the web for sexual health information according to a specific protocol (described below); and 3) reviewing an on-screen video recording of web searches just completed. During all activities, the interviewer instructed participants to think aloud and verbalize their thought process. Think aloud protocols help elicit underlying judgments when coupled with observable behaviors (Earle, 2004; Ericsson, n.d.; Rieh, 2002). Interviews consisted of thoughtfully probing participants' verbalized thoughts while also observing participants' online behavior.

All interviews took place in a quiet room with the interviewer and a participant at a private lab computer station. Participants first conducted a brief warm-up activity on the think aloud protocol, which consisted of searching online about possible flu symptoms. Next, participants were instructed to perform uninterrupted search tasks and participants were given four search prompts corresponding to diverse, but common sexual health topics: (1) safer sex, (2) sexual risks, including STIs, (3) sexual responsibility, and (4) sexual identity. For example, when prompted about sexual

[5] Methods described in Paper 2 are the same as described in the first paper for in-depth interviews and lab computer procedures. However, coding and analysis procedures are different according to the separate aims of the two studies.

responsibility, participants were asked to imagine that they were in a new romantic relationship and wanted to go online to find information about how to be sexually responsible. After receiving prompts, the interviewer activated web recording and instructed participants to guide the conversation freely while searching the web.

We chose the four sexual health topics for prompts to allow participants to assess and discuss a range of sexual health information, rather than only negative aspects of sexual health (e.g., unwanted pregnancy or disease contraction). This broader set of topics is more consistent with a comprehensive sexual health framework developed by sexuality educators (National Guidelines Task Force, 2004). The interviewer phrased sexual identity and risk prompts in a hypothetical context to reduce respondent discomfort. For example, participants were asked to imagine that someone close to them was questioning his/her sexual identity and in need of trusted information. Research suggests that scenario-based prompts allow participants to be engaged in a more conceptual, less personal way, appropriate for questions about sexual activity or sexual health, and aid in eliciting honest responses (Bernard, 2011).

After the search tasks, the interviewer played back the participant's own web movements, with the participant watching, as screen-captured videos from their prior search activities (including typing, mouse trajectory and clicks). This final step combined real-time "think aloud" discussions (*in situ*) with reflective evaluations of prior search and selection activities, allowing for deep reflection on specific web resources. Participants were prompted to discuss their impressions of personalization features when they appeared on the videos. We also probed about perceptions related to privacy as videos were displayed. Together, the three parts of the interview did not exceed 90 minutes.

**Lab Computer Procedure**

Data was collected from December 2014 to February 2015. Audio was captured with a digital voice recorder; online search activities, web navigations and browser histories were captured using CamStudio. Users were paid $20/hour for their participation, and completed a brief questionnaire to conclude the session. Computers were connected to the Internet with a reliable private wired network. No user preferences were saved and search histories were deleted after each interview.

**Coding and Analysis**

We analyzed the transcripts of verbal data and video files of web navigations using a deductive, thematic analysis approach, driven by our specific analytic interests in online privacy and personalization. Thematic analysis approaches typically include a detailed analysis of a specific aspect of the datasets, and thus was an appropriate analysis strategy to address our research aims (Braun & Clarke, 2006). We used

MaxQDA (v. 11.2.2), a qualitative data management software program that allows researchers to code textual, video and audio data, for all coding and analysis.

The study author and two trained research assistants iteratively identified themes of interest for this study related to online privacy and personalization. First, team members reviewed all audio transcriptions for codes of interest in a systematic fashion. Using a preliminary code list, the team used a subset of transcripts to code segments, discuss functionality of the codes, and revise the code list. Next, the team collated codes in MaxQDA according to potential themes. Themes related to online privacy and personalization were defined through a process of reviewing and discussing all transcripts. Themes and corresponding codes were iteratively refined and included in a final codebook. To address reliability, all discrepancies in interpretations of codes and themes were discussed and resolved between the three coders via consensus to reach full agreement. All audio transcriptions were then coded by the two research assistants according to the codebook. The first and second author then coded the video files using the final codebook. The study was approved by the University of California, Berkeley institutional review board.

## Results

Fifteen men and 15 women (n=30) comprised the final sample. Participants in our sample were 33% Latino/a (n=10); 30% Asian Pacific-Islander (n=9); 23% White (n=7); and 13% African-American (n=4). Mean age is 18.9 years. See Table 1-2 for details on sample demographics and characteristics on Internet use. Findings are based on 26 video recordings of participants' web searches and 28 corresponding interview transcripts. Four participants declined to have web activity recorded; two declined to be audio recorded.

Twenty-seven (27) out of 30 participants encountered a personalization feature during their searches for sexual health information. Participants encountered seven types of personalization features across the dataset. In order of most common to least common, users were prompted to: 1) sign in or create account to view additional sexual health content; 2) confirm age or gender to receive tailored content; 3) share location to locate the nearest health center; 4) make a clinical appointment online; 5) use an online STI symptom checker; 6) chat with a health provider online; and 7) use an online contraceptive decision tool. See Table 2-1 for details on personalization features.

Across the two types of data analyzed, five major themes emerged.

### Theme 1: Seeking Sexual Health Information Online is Normal, But Warrants Precautions

Participants in our study described searching online for sexual health information as a generally normalized, private experience. An 18yo male sums, "*… I mean everyone does it, it's natural*." Participants described low levels of personal concern about Internet privacy generally: "*I wouldn't say online privacy is much of a thing anymore…*" (18yo male), "*I feel like the Internet is private. If I want to find out information, I can and nobody will really know*" (19yo female). One participant equated searching online for sexual health information as a type of self-education that carried no shame:

> "*… it's a serious thing and I think everyone takes it seriously … few people, even if they saw me [searching] they would be like, 'Oh, well at least he's trying to get educated about it,' you know. It's not really something you can make fun of someone for …*" (18yo male)

While participants expressed that the Internet is generally a private place to learn about sexual health broadly, they also described specific protective web actions that are appropriate to take when searching specifically about sexual risks. Participants explicitly mentioned STIs as a topic they worried about being stored in search histories. A 19yo female explains:

> "*I would say, you know, privacy matters … specifically more for STDs but I would say overall general … I'd look at Instagram, maybe even Twitter, like I'd check those, maybe not STDs because … I wouldn't want that in my search history*."

Another 19yo male participant said he is less concerned about topics other than STIs in his search history. He says he may be worried "*not in terms of sexual identity, it would be like the condoms and all that … the STDs and all that like I don't want it to be misunderstood that I have an STD or something, and that's connected back to me*."

Five of 30 participants mentioned deleting their search history (and/or stored cookies) or switching to incognito browsing to protect their privacy. Incognito browsing mode erases search histories and erases tracking cookies activated during an incognito Internet session (Paul, 2014). One 19yo male participant explains that he would "*probably just delete my history and see if that worked, but I mean just to make sure whatever I do, it's not going to end up on some social media site* …" Participants mentioned deleting history and/or cookies both on shared computers and personal machines, such as personal laptops.

Some users qualified the protective actions they took on the web with normalizing statements about using the Internet for sexual health information. One male 18yo participant reiterated that he does "*not necessarily think that this topic is that controversial or 'out there'* " that he would "*need to conceal searches for any reason*." Yet he speculated that, "*maybe if I had an STD and I was embarrassed by it then I would use incognito browsing*." Similarly, another male, 19 yo participant said, "*of*

*course it's a good topic, how to have safe sex, it's not bad or anything, but it's still something you'd like to keep to yourself*," and as such, indicated that "*if I was using my browser, I'd probably do it in incognito mode or something*."

**Theme 2: High Receptivity, Low Perceived Risk in Making Appointments Online**

Eight out of 30 users in our sample clicked on site features to make appointments online for sexual health clinical services. All noted their likelihood to use this feature because of the additional privacy it offers as compared to calling to make an appointment and discussing symptoms or reasons for the visit over the phone. One participant explains, *"…this is something, I don't know, people don't want to necessarily be talking to a receptionist about. It's nice that that's an option*" (20yo female). Online appointment features were favored for their anonymity ("*I think I'm probably more likely to make [appointment] online than if I had to call because there's like a little more discreetness*") and safety *("[sites with online appointment features] they have enough backing or legitimacy for me to be able to feel comfortable doing that … I wouldn't have any concerns*") (18yo male and 19yo male, respectively).

All eight participants who clicked on online appointment features did so when searching for information about sexual risks, and discussed the likelihood of using online appointment makers for clinical appointments for STI testing.

**Theme 3: Acceptable to Disclose Age and Gender Online, but Not More Personal Information**

Participants were often prompted to sign in or log in to sites they visited, either to access additional site content or verify age. Some sign in boxes also asked participants to specify their name, gender, or email address, to create a website account or receive personalized content. Participants commonly felt this step took more effort than they wished to expend. Three participants briefly stated, "*I don't want to sign in* (19 yo female)," "*the signing in is a lot of work* (18yo male)," and "[*signing in] just seems like more effort and I was like I can find something else* (18yo female)." However, participants also expressed that if the sexual health content they wished to view was of enough interest to them, they would benefit directly from the extra effort. One 18 yo female explains:

> "*… if it was a website that was specifically for sexual health, if it was just a really great website that had a lot of information, and maybe you could talk to a helpline or something through the website then I would say, 'Yes I would definitely, signing up would be a benefit' and worth it*."

Inputting their age was not seen by participants as a major detractor for accessing sexual health information, if prompted to do so. Participants empathized with site creators like YouTube for creating age controls on sites,

and felt this was generally appropriate for preventing very young Internet users from reaching inappropriate content.

However, some participants were also outspoken that sexual health information should be accessible to users of different ages without restrictions. A 19yo female expressed frustration at the 18 and over policy on YouTube for condom videos, "…*people who aren't 18 need to know how to use a condom, and they wouldn't be able to watch information because YouTube has this age thing*." One 20yo female user also noted that inputting her gender when prompted is more likely to create a gender-specific online environment she feels is more comfortable and safer for exchanging sexual health-related information.

Sign in features asking participants to disclose real names and/or email addresses (other than for the purposes of making online appointments) were met with skepticism and reluctance by participants. Providing their real names to sign in to a particular sexual health website carried participant fears that this personal information could be traced back to them, particularly for information searches about STIs. An 18yo male said not wanting to input his name is "*a privacy reason. I feel this topic is sensitive and I like don't want to have my name or have people record my information …*"

Participants noted that creating a user name or a screen name to sign in to a particular website is less risky than using real names. When prompted on sexual health website to input a screen name to chat with a health educator, one 18 yo male discussed his preference to fill in a screen name, but not a real name:

> *"…when I go into live chat, only use a screen name … I don't want to provide [my real name] directly without talking to the person and making sure they've not going to use my information in a way that hurts me*."

**Theme 4: Reluctance to Share Location, Except in Sexual Health Emergencies**

Prompts to share user locations, often on sites that offer "brick and mortar" clinical services to assist users in identifying health centers closest to them, was the third most common type of personalization feature. Ten of 30 participants verbalized any reactions to share location features, and unanimously regarded these features as pop-ups similar to unwanted ads online. Users noted that their reluctance to share their locations was not necessarily because they were searching for sexual health information, but something they would not do as general web practice. When a share location feature popped up during her search about contraception options, an 18yo female participant immediately closed the feature and indicated she would have done so with "*anything on the Internet … I didn't even notice what it said, I was just like gotta close this*." Another user described the action of closing a sharing location box

immediately as an action he takes "*across the board with everything*," and not just because he was on the website plannedparenthood.org (19yo male).

Participants expressed that sharing your location compromised online privacy, specifically when they were on sexual health-specific sites. One participant explained that while he does not consider browsing a sexuality education website to be shameful, he worries that sharing his location may mean someone would discover he is searching for sexual health information:

> "*I wouldn't really want people to know that I would be searching on sites like this. Not sites like this, because it's not a bad site or anything, but just with a subject like this. If it was any site, I wouldn't even do that, Facebook or anything*" (19yo male)

However, users also stated that in some instances, such as experiencing a sexual health crisis, sharing location could help them seek medical care. A 19yo male commented:

> *"… I just assume [the sharing location feature] was like, you know, like a popup or something … but if sharing my location could give me better information, then I mean, yeah especially if it was a pressing issue, like you know, having an STD, maybe that can help … like if my health was at stake."*

While skeptical of sharing their locations, other participants noted that this feature could be useful for finding health centers ("… *it's probably just to get me to my closest center, you know*") and making appointments with local providers confidentially.

**Theme 5: Underlying Fear of Behavioral Profiling and Tracking**

Participants attempted to create anonymous web experiences either by taking specific protective web actions (Theme 1) or by selectively disclosing personal information (Themes 3 & 4). Yet their attempts to protect their privacy are limited by what participants described as monitoring bodies that traced or recorded their online behaviors. Tracking entities mentioned by participants included "*the NSA*," "*companies*," "*Google*," and "*big corporations*"; without naming specific groups recording their web behavior, one participant summarized by saying "*everything is being monitored now*" (18yo male).

A 19yo female user echoed this idea by stating "*everything ends up in a file*," and a second 19yo female participant expressed direct concern about her STI searches "*getting back to me*." Two participants interpreted the presence of ads on websites they visited as a signal their activity on that site was being monitored. One participant said "*it would be nice to not have ads tailored around sex health popping up on my*

*computer*" but expressed skepticism that this would ensure privacy ("*I would feel more privacy I guess, not that, really, I don't think there is any privacy* …" (18yo male).

Some users held suspicious attitudes that protective actions they took on the web (Theme 1) could ensure privacy from entities tracking them. After saying he would delete his history after searching for sexual health information, an 18yo male user then commented this "*just gets rid of history and cookies and stuff … but big corporations can still see what you are searching*." Another user commented that achieving privacy online, even with protections, takes personal investment: "*… if you really want to make yourself private, you would really have to spend a lot of time*" (18yo male)

**Limitations**

Our study has three important limitations to disclose. First, participants were instructed during interviews to search for information on topics that were predetermined by the authors for the purposes of internal validity and comparison versus their own informational needs. Prompts were open to interpretation, but no topics outside of the four prompts were covered. It is unknown if participants in this study would have directed their own searches around different topics, particularly if a prompt on sexual risks (STIs) was not included.

Second, the sample in this study is an educated group of young adults who may be a more adept and discerning population for online skills than younger adolescents or those with less education. Higher levels of education may make participants in this study more comfortable or more practiced with disclosing online information. For instance, more educated young adults may have more positive experiences with online appointment making and using the Internet for health information. Future research is needed for younger adolescents and more representative samples of young people to explore these differences.

Lastly, the lab where this research took place is arguably not a "natural" environment. Lab stations, while private, do not naturally mimic the conditions and settings of participants' private computers. However, in order to approximate a natural process, we ensured a private and unfiltered web searching experience. Additionally, with regards to data safety, conducting this study at an official lab provided safeguards for data security and ensured consistency of the research context across all participants.

## Discussion

In this qualitative, observational study of older adolescents, our aim was to explore late adolescent attitudes and experiences about privacy and personalization on websites when searching online for sexual health information. Themes illustrate a persistent fear of stigma among late adolescents surrounding STIs, and protective actions users may take to ensure their privacy online specifically when searching about STI information.

Participants set boundaries for what they perceive to be acceptable levels of personal detail they are willing to disclose, based on benefits they see resulting from specific disclosures. They identified these benefits as being able to access clinical services more privately and confidentially, and being able to leverage the Internet for faster responses to a sexual health emergency. Participants also emphasized the limits of using the Internet to meet their sexual health informational needs while remaining truly private from ambiguous tracking parties.

In our first theme, participants expressed that searching online for sexual health information is largely socially normalized. Yet searching for information about STIs warranted an extra layer of protection, for fear that people may see or discover their search histories, which presents a paradox. LAUs emphasized the normalcy of informing oneself about sexual health issues using the Internet, yet still took discreet actions to prevent others from somehow discovering they were doing so. The Internet has been lauded as a way for young people to learn about sexuality and sexual health without the fear of stigma associated with STIs that often arises from face-to-face conversations. This theme suggests that while adolescents may fear a stigmatizing response from an in-person conversation about STIs, that fear may also be present in the online environment. Further research is encouraged to understand social norms specifically around finding STI information online.

Our second theme focused on the receptivity of online appointment making features, and our third and fourth themes on the boundaries of informational disclosure. Participants were in agreement about the positive attributes of online appointment features for enhancing their ability to seek care, especially during times of health crisis or heightened concerns about STIs. One of the central questions of computer-mediated communication (CMC) applications for adolescent health is whether CMC can provide added benefits to adolescent computer users for better health beyond conventional ways to reaching this population. Our findings in Theme 2 point to clear perceived benefits – added privacy and convenience – for making sexual health clinical services on websites that offer this feature. Participants did not perceive their ability to make appointments online as being *without* risk, but as an online action that carried an *appropriate* amount of risk for the payoff of confidential, fast access to clinical care. The receptivity of making online appointments was closely connected to LAUs being able to control how much personal information they disclosed as a way to first engage with health providers. We saw a similar threshold in participant attitudes about sharing their locations. Users acknowledged this action elevated their risk for privacy invasions, but identified an acceptable benefit that would make the increased risk a worthwhile trade.

In our third and fourth themes, we elaborated on the boundaries of personal disclosure for perceived benefits. Our participants were searching the web for sexual health information, and expressed discomfort in providing personal information other than their age and gender. It is possible this discomfort stemmed from the perception that

providing more personal information would not result in anything more useful than what they were able to view just from general web searching and browsing. Research has noted the promise of online health services in improving physician access, physician-patient relationships, and continuity of care in adults, with promise for adolescents (Katz & Moyer, 2004; Moreno, Ralston, & Grossman, 2009). Practitioners interested in establishing ongoing online communications with adolescents for health services, such as maintaining a physician-patient line of communication in an online system, may be successful in doing so by using online appointment making features as points of entrance for adolescent patients.

Finally, our fifth theme included views about limits of online privacy for Internet users in late adolescence. Specifically, this theme uncovered an attitude that personal Internet activity is tracked, and computer users have little control over this fact. Participants expressed that the Internet is generally a private place, but again, paradoxically, all information is somehow recorded and stored. Interacting with peers is a large part of what adolescents do online generally, and is appropriate for social development (Borca & Bina, 2015).

From an adolescent development perspective, one may expect that heightened concerns about privacy online during adolescence would center around peers monitoring each other's sexual health searching and sharing with others without permission. Interestingly, this theme suggests that *extra*personal privacy violations, from tracking or corporate entities, are more concerning to this age group than *inter*personal violations from parents or peers. Participants were not clear about how exactly companies or the National Security Agency (NSA) would use their histories, or why they would be interested in tracking them. While it is unlikely that Internet providers or other companies are covertly recording web traffic of individual users with identifiable information, our findings indicate that this belief among young people is still quite active (Moreno, Kelleher, Ameenuddin, & Rastogi, 2014). It is possible that the 2009 news of the NSA access to phone and online data (Lichtblau & Risen, 2009), and subsequent revelations about data collection of social interactions online (Risen & Poitras, 2013), has shaped the way computer users in late adolescence today think about the outer bounds of their personal privacy online.

The LAUs of today (aged 12-14 in 2009) may have just begun to search for sexual health or sexuality information online at that time in their development. Abundant research in the public health field has documented the Internet to be one of the top places adolescents go to find sexual health information, but this could be shifting. Further research is warranted to understand how extrapersonal privacy concerns moderate adolescents' health information seeking behavior in online environments.

Table 2-1. Personalization features encountered by users in sample

| TYPE OF FEATURE | ACTION / FEATURE | USER ACTIONS / DISCLOSURES |
|---|---|---|
| PERSONALIZATION | Sign in / Create an account | Name or username, Email |
| | Confirm age or gender | Age, Gender |
| | Share location / Find or locate nearest health center | Zip code, Geo locator on computer |
| | Make clinical appointment online | Name, Phone number, Zip code or physical address |
| | Online STI symptom checker | Experienced symptoms |
| | Chat with health provider online | Username |
| | Online contraceptive decision tool | Contraception preferences |

# PAPER 3: CONSTRUCTING A THEORY-DRIVEN MODEL FOR ADOLESCENTS' JUDGMENT AND TRUST IN ONLINE SEXUAL HEALTH INFORMATION: A SYSTEMATIC LITERATURE REVIEW


## Abstract

Adolescents are prolific and skilled seekers of health information in the digital environment. Yet unregulated, biased, or user-generated content increases ambiguity for young users for knowing what to trust for the right health information. Adolescents are also disadvantaged in their ability to accurately assess online health information because their cognitive skills are still being developed. Dual process theories offer insight into how people make judgments in information-dense or uncertain environments like the web. Online trust and web credibility researchers have applied dual process theories to understand how people assess what is valuable and trustworthy on the web, including using heuristics. Yet no known extant literature has applied dual process concepts to adolescent judgments of online sexual health information. We conducted a systematic literature review of studies published since year 2000 in English that conceptually overlap between two of our three fields of interest: adolescence, online trust or credibility, and dual process theories. We reviewed 22 empirical, qualitative, and theoretical studies. Results reveal three main findings. First, heuristics are framed in the adult credibility research reviewed here as necessary adaptive strategies, while researchers focused on adolescent information processing characterize use of heuristics as the result of limited cognitive maturity and lack of experience. Second, two aspects of online behavior, personalization and online disclosures, were key facets of building online trust for adolescents. Third, studies reviewed drew conclusions about web users of all ages despite older adolescents comprising the overwhelming majority of participants across studies. Newer conceptual models focused on adolescents should account for an increased reliance on heuristics among this age group, and how using the web to find sexual health information is likely to be highly motivated. Adolescents are also likely to use specific types of heuristics related to their need for social inclusion, yet intentionally limit their involvement with specific web resources over time. A new dual process conceptual model is presented to explain adolescents' judgments and trust in online sexual health information. Future research should employ methods for measuring heuristics that are less susceptible to validity problems, including eye-tracking. Sexuality education programs should incorporate digital credibility, literacy and skills-building into curricula to equip adolescents with skills for making judgments about quality and accuracy of sexual health information online.

## Introduction

The Internet is a powerful source of health information. The availability of diverse websites and resources, speed of access to information, and privacy and anonymity in the online environment make the Internet a popular destination for health advice (Sillence, Briggs, Harris, & Fishwick, 2006a, 2006b). Particularly for finding information about sensitive or specialized health issues and topics, the Internet is a widely consulted medium. Yet not all people have the same comfort levels or personal objectives when they go online. Adolescents (aged 12-17) and emerging adults (18-24 years) consume a greater proportion of their everyday information through digital media compared to adults. Heavily immersed in digital media generally since childhood, young people today are highly adept and comfortable using the Internet (Flanagin & Metzger, 2008). The skills young people develop searching for information online are positively linked to aspects of adolescent development, including the development of autonomy and critical thinking (Pascoe, 2011; Steinberg, 2014).

Adolescents also have different health information-seeking goals online compared to adults. While adults tend to use the Internet for medical information about treatments or disease, adolescents are more likely to seek information on health topics related to their development, like sexuality (Eysenbach & Köhler, 2002). Sexual health and sexuality information is an especially sensitive subset of health information, for which the Internet is well-suited to deliver to this age group. For example, adolescents have the option to confidentially view information about sexually transmitted infections (STIs) without the stigma that sometimes accompanies face-to-face conversations; and they report feeling most comfortable getting sexual health information on websites, even more than from a doctor or a parent (Boyar, Levine, & Zensius, 2011; Klein & Wilson, 2003; Lim, Vella, Sacks-Davis, & Hellard, 2014; Sillence, Briggs, Harris, & Fishwick, 2007).

However, the Internet is an uncertain environment and carries risks to the user seeking health information and advice. Inconsistencies, inaccuracies, and biases are common across websites with health information (Sillence et al., 2007). Users will be exposed to a diverse range of viewpoints and opinions related to health topics, mostly uncensored, and sometimes coupled with agendas that could be at odds with healthy decisions. It is increasingly difficult to distinguish between informational and commercial content online; examples of hard-to-distinguish content include sponsored and unsponsored links on search engine result pages and ads embedded in website content (Burbules, 1998). The digital environmental generally lacks “gatekeepers” or formal quality control standards, especially for unregulated user-generated content, which increases ambiguity for knowing and trusting the source of health information (Flanagin & Metzger, 2008). These realities of online health information seeking have prompted researchers to learn more about how people use online content to make health decisions (Sillence et al., 2006b).

Dual process theories (Wason & Evans, 1974) offer a useful way to think about this problem. Rather than regulating the web environment, *dual process* theories and concepts can be used to understand how people interact with online content in the face of uncertainty. In essence, dual process theories of judgment and decision-making (referred to here as simply "dual process theories") posit that people rely on two distinct cognitive processes, explicit and implicit, that work in parallel for information processing (Chaiken, 1980; Chaiken & Trope, 1999). While there are many adaptations of this model, such as the Elaboration-Likelihood Model (Petty & Wegener, 1999), the Heuristic-Systematic Model (Chen & Chaiken, 1999), and "staged" models (Briggs, Simpson, & Angeli, 2004), all dual process models theorize how people judge and interpret information, and in what contexts one style of information processing may be employed over another (Petty & Cacioppo, 1986; Evans & Stanovich, 2013).

In essence, dual process theories specify two ways individuals process information, referred to as "routes." A systematic, analytic, rational, central, deliberative, explicit, or "System 2" style of processing involves slow, intentional, and effortful processing (Evans, 2011). Central route processing takes time, and constitutes deliberate evaluation of information (Gibbons, Houlihan, & Gerrard, 2009). The tandem processing route, referred to variously as heuristic, peripheral, affective, reactive, "System 1," or experiential, is faster than central route processing, and involves making judgments quickly. Peripheral route processing is largely based on cognitive heuristics. Use of heuristics in the context of the online environment has been an emergent research focus in recent years. Cognitive heuristics, information-processing strategies belonging to the peripheral route, are mental short cuts, rules-of-thumb, or repeatedly employed assumptions about the message or information being assessed that reduce the need for more extensive mental effort (Metzger, Flanagin & Medders, 2010). Within information-saturated environments, such as the web, heuristics are a frequent way of coping with information overload and uncertainty (Gigerenzer & Todd, 1999; Sundar, n.d.). Using heuristics may directly avert potential harm to the user in the online environment, directing them away from inaccurate or potentially harmful information.

Dual process models have been used to explain how people assess what is credible on the web, given the variable reliability or credibility of the content available online. *Web credibility*, also referred to simply as credibility, is the believability of online information or its source (Cheshire, 2011; Fogg et al., 2001). Credibility rests largely on perceptions of the trustworthiness and expertise of the information source, as interpreted by the individual (Metzger, 2007; Metzger & Flanagin, 2013). Credibility assessments can act as a filter to sift out inaccuracies and potentially harmful information (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010). Because credibility assessments typically happen quickly, sometimes without careful examination of information sources, mounting evidence suggests that online credibility assessments are likely to be done using heuristics. As such, several web credibility scholars have applied dual process constructs and models to demonstrate routes of information processing for

assessing credibility among users of the Internet (Bhattacherjee & Sanford, 2006; Hsu, 2008).

To a limited extent, dual process theories have also been used to understand how and under what circumstances people engage more deeply with web resources, and may continue to visit the same useful website repeatedly over time. People may not often think of websites as something they trust, but forming a trusting relationship with specific online health resources can have lasting, positive effects on future behaviors. Trust in health websites develops in much the same way trust would with a face-to-face health provider or other source of offline information. Corritore, Kracher, and Wiedenbeck (2003) describes exchange on the part of both entities (in this instance, the web user and the website) as the common denominator for online trust, involving risks and complexities similar to in-person relationships. *Online trust*, while related to credibility, is distinct and is rather an extension of the psychological experience of trust in the online setting. Trust development in human-computer interactions involves acceptance of uncertainty or risk, coupled with an expectation for positive benefit (Cheshire, 2011; Rousseau, Sitkin, Burt, & Camerer, 1998). While some studies exist that use dual process frameworks to investigate online trust, the majority of online trust empirical research has tested potential associations between trust and its antecedents, such as dispositional trust of individual users, perceived security, reputation of website host, or content quality and accuracy, yet primarily in the context of e-commerce (Yi, Yoon, Davis, & Lee, 2013). For a comprehensive review of online trust antecedents, see Beldad, de Jong, and Steehouder (2010). Trust is also a salient concept for sexual health resources of all forms. In the online context, trusted websites tend to mirror more closely the positive experiences associated with communicating with a trusted healthcare provider face-to-face and can contribute to a multi-pronged health advice strategy that adolescents may come to rely on as they mature (Sillence et al., 2007).

Faced with unique health challenges and health informational needs, adolescents are equipped to different degrees to resolve the complex task of information evaluation online (Flanagin & Metzger, 2008). There is precedence for using dual process theories to understand how adolescents interpret and react to the perception of risk and risk-taking behaviors in offline or “real world” situations (Halpern-Felsher, 2011; Reyna, 2004; Rivers, Reyna, & Mills, 2008). Dual process models have only recently been applied to understand adolescent information processing (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). The inclusion of heuristics in dual process research, which are cognitive tools well-suited for use in information-dense environments, have special implications for adolescents in the online context. Newer research on adolescent brain development suggests that the brain adapts to match the environmental demands and opportunities presented to the adolescent (Marques, 2014). As they mature, adolescents tend to rely more on heuristics-based reasoning faculties (Reyna & Farley, 2006). Finally, use of heuristics is considered to be a central aspect of cognition during adolescent development (Albert & Steinberg, 2011).

Up to 92% of adolescents (aged 13-17) go online daily, including 24% who say they go online "almost constantly" (Lenhart et al., 2015), yet we have very little understanding about how adolescent web users assess information online for credibility, and how they may form online trust in specific sexual health resources. Dual process models and theories have been applied to many aspects of information processing among adults, and in some instances in regard to online health information (Gibbons et al., 2009), but no known extant literature has applied these concepts to adolescent judgments and information processing of online sexual health information. Understanding online trust and credibility specifically for sexual health information is paramount, given that adolescents have relied for much of the 21st century on the Internet to meet their informational needs.

The concepts described here – adolescence, online trust and credibility, and dual process theories – represent three different research areas that are siloed in human development, psychology, and computer-mediated communications literature, respectively. This systematic review has four primary objectives, all oriented toward bridging these research areas for insights into adolescent judgments of credibility and trust in online sexual health information. First, we describe our approach for locating studies and articles that address at least two of our three research areas of interest. Second, we present results on the focus and design of those studies meeting our cross-disciplinary criteria for inclusion. Third, by identifying theoretical constructs with high relevance and applicability to adolescents, we propose a dual process model of online trust tailored to adolescents' interaction with sexual health information. The intent of this third and main objective is to extend existing dual process theory to capture how adolescents form trusting relationships with online resources. Our fourth and final objective is to outline key implications this paper offers for future research directions and sexuality education.

## Methods

### Search Strategy

We conducted a systematic review of the literature published in English between January 1, 2000 and March 30, 2015 using the PRISMA Statement as a guide, a tool which outlines precise steps and necessary features of systematic literature reviews (Moher, Liberati, Tetzlaff, & Altman, 2009). In accordance with our cross-disciplinary research objectives, we searched in the following six general and social science, information sciences, public health, and psychology databases: Google Scholar, Academic Search Complete (ASC), Library and Information Science Abstracts (LISA), Web of Science (WoS), PubMed, and PsychINFO. We searched databases for studies related to three distinct research areas: 1) adolescents or adolescent development, 2) online trust or web credibility, and 3) dual process or heuristic-systematic models or frameworks. Search parameters were set to only include articles published since year 2000.

We conducted Boolean searches for entries focused on these areas of interest using combined keyword search terms. To locate entries relevant to adolescence, we used search terms: adolescence, adolescents, adolescent development, adolescent cognitive development, adolescent cognition, adolescent health, teen, youth, and young adult. To locate entries relevant to online trust and web credibility, search terms used included: online trust, web credibility, online assurances, website, human computer, and health website. Lastly, we located entries focused on dual process models or frameworks using search terms: dual process, dual process model(s), dual process theory, heuristic systematic, heuristic systematic model, cognitive process, judgment and decision, judgment and decision making, system 1, system 1 thinking, system 2, and system 2 thinking. Search terms were entered in multiple combinations to yield cross-disciplinary search results. (Example: “online trust” AND [adolesc* OR “adolescent devel*” OR "adolescent health" OR "adolescent cogn*" OR teen* OR youth OR "young adult"]).

**Inclusion and Exclusion Criteria**

Based on our cross-disciplinary research aim, we assessed entries based on the authors’ stated research objectives to investigate or explore questions related to a minimum of two out of our three research areas of interest: 1) adolescents or adolescent development, 2) online trust or web credibility, and 3) dual process or heuristic-systematic models or frameworks. For example, an article that investigated adolescent health risk behavior from a dual process perspective would meet inclusion criteria because it had conceptual overlap with research areas 1 *and* 3, but an article about teens and the Internet would not because it only focused on adolescents and neither of the other two research areas. Entries also met the inclusion criteria if their objectives included exploring controversies between two or more of the areas of interest.

We included entries if they 1) had the necessary conceptual overlap with a minimum of two out of our three research areas, 2) were published in an established setting for research dissemination, including but not limited to academic and web-based publications, conference proceedings, or academic theses, and 3) published in English since year 2000. As described, we excluded entries if they focused on a singular research area only. We also excluded entries if they focused only on adolescent sexual health or were published prior to year 2000.

Our initial search strategy yielded 946 entries. Duplicate citations across databases were identified and excluded (n=15). The first author then conducted a title and abstract scan, followed by a full article scan of all results. During the title/abstract scan phase, 219 articles did not address any research area of interest and were coded for exclusion (NA). Also entries with only one research area of interest were coded for exclusion: 418 entries focused only on computer-mediated communications topics,

including online trust and web credibility (CMC); 135 only on topics related to the Internet as an intervention platform for health promotion (EHEALTH); 78 on topics only related to adolescents' use of the Internet or online interventions targeting adolescents (ADOL); 44 focused on applications of dual process models and related psychological frameworks without overlap with other research areas (PSY); and one entry focused only on sexual health (SH). In total, the title/abstract scan phase narrowed the sample to 36 entries. When no abstracts were available, full articles were reviewed instead.

In the last phase, ten entries were coded PSY, and two CMC, totaling 12 for exclusion during article scanning. Two articles were not able to be retrieved. The final collection for review included 22 articles that met our other criteria. The diagram in Figure 3-1 details the process and results of the literature search.

### Data Extraction, Synthesis, and Presentation

We extracted the following information from each article, as applicable: type of study (quantitative, qualitative, theoretical), methods or approach (experimental, observational, etc.), sample size, age of participants, primary outcome, outcomes relating to adolescents (i.e. sensation seeking), online context the article focused on (i.e. e-commerce, health advice), type of dual process framework employed (i.e. Elaboration-Likelihood Model), intended applications of the framework (i.e. message testing with adolescents), whether the authors proposed a new or elaborated dual process model, and study results or main points.

Using a combination of the Matrix Method of concept mapping (Garrard, 1999) and Whittemore and Knafl's (2005) guide for data reduction and synthesis for literature reviews, we populated a matrix with extracted data to map consistencies and discrepancies in meanings of concepts discussed across the sample of reviewed articles (hereafter referred to as "our sample" for this review). The matrix was also used to assess the degree to which combinations of the three research areas converged around specific concepts, such as use of heuristics to gauge credibility on advice websites. Narrative summaries and analytic memos were drafted to interpret the concept matrix and overall results. We used qualitative software package MaxQDA (version 12.0.1) to code articles according to types of data extracted, write memos, and organize summaries. Our final stage of data synthesis was a presentation stage, where we integrated relevant constructs as they apply to adolescents and emerging adults into a new dual process model of adolescent trust in online sexual health information.

## Results

The articles meeting our inclusion and exclusion criteria (n=22) were diverse in their study designs, settings, and approach to the areas of research interest. See Table 3-1 for key details of each article. The majority of reviewed articles sampled participants

from the United States (n=13). Three articles shared a dataset (Sillence et al., 2006a; 2006b; 2007) and sampled participants from the United Kingdom (n=3). Two studies were conducted in the Republic of Korea (Koh & Sundar, 2010; Yi et al., 2013), and one in each of the following countries: Netherlands (Briggs et al., 2004); Belgium (Heirman, Walrave, Ponnet, & Van Gool, 2013); Australia (Hsu, 2008); and Finland (Salo & Karjaluoto, 2007).

Sixteen of the 22 studies we reviewed employed empirical data collection and analysis methods, including both quantitative and qualitative research designs. Half (n=11) of the 22 studies were quantitative and five studies employed qualitative methods. Quantitative designs included web-based experiments, online and traditional surveys or questionnaires, or a combination of both. Qualitative approaches included media diaries, focus groups, interviews, and observations. All empirical articles in our sample were based on cross-sectional data none were longitudinal. Finally, six articles were considered theoretical papers, which included literature reviews and conceptually-driven papers. No studies employed a mix of quantitative and qualitative methods.

The reviewed studies and articles varied in the extent to which they addressed the three research areas and related constructs of interest, reflected in our aims and search strategy (adolescence, online trust and credibility, and dual process theories). Results of this systematic literature review are presented below. See Table 3-2 for a summary of review findings.

**Quantitative Studies**

Of the 11 quantitative studies we reviewed, 7 conducted web-based experiments to investigate outcomes relating to judgments invoked through the use of websites. The most common design for the experimental studies was a factorial between-subjects design, where participants were assigned to treatment groups and asked to interact with websites displaying different attributes.

Two experimental studies investigated factors that influence credibility perceptions online. Huerta and Ryan (2003) used a factorial design with five factors considered to be of high importance for people interacting with online information, including quality of content, attractiveness of the message, and reputation of the website owner. This experiment manipulated five independent variables to produce 32 different treatments to measure credibility of web messages among adults. Quality of content and reputation of website owner were found to be significant in this study. Participants exposed to a message of high quality and to messages with reputable website owners found these web messages to be more credible. Kayhan and Bhattacherjee (2011) similarly manipulated different travel websites to test credibility perceptions and intentions to use information on the sites among young adults. In this study, Kayhan and Bhattacherjee created four treatment groups according to how websites communicate quality, either through external management of website content (such as

a site published and monitored by a ministry of tourism), or through community-oriented ways of recommending and ranking website content (such as Trip Advisor). Both types of governing styles on websites were found to be significant for participants' intentions to use information, and positively associated with their perception of website quality. Even though effect size varied widely, Kayhan and Bhattacherjee found that judgments about quality based on who governs website content, called "governance credibility" by the authors, was a salient construct in online information processing.

Two experimental studies investigated trust in online advice websites. Briggs et al. (2004) presented participants with travel websites treated to display high and lower levels of personalization or tailoring, and tested whether highly personalized websites were linked with trust in online advice about travel to new destinations. Findings revealed that high levels of personalization on websites had only a modest impact on trusting attitudes, yet yielded more positive perceptions about travel sites than those with low personalization. In addition to conducting this experiment, a main objective of this article was to build and propose a new model of online trust for e-commerce that accounts for both initial and ongoing relationships with specific websites. Briggs et al. distinguished between initial trust users may place in websites early in their web navigations, and sustained engagements with commercial sites over time. The authors described a reliance on particular websites over time as a stage of "relationship development" with online vendors, and proposed a model with three unique stages of trust development. The three stages of the Briggs' model correspond to 1) first impressions and initial interactions with sites, 2) further engagement and first transactions on commercial websites, and 3) subsequent relationships with websites people come to trust over time, involving repeated commercial transactions.

While Briggs et al. (2004) examined trust in travel advice sites and effects on personalization, Yi et al. (2013) focused on health advice sites. Similar to Huerta and Ryan's (2003) factorial design investigating quality and reputation, Yi et al. (2013) manipulated online health advice websites to test differences in trusting attitudes depending on quality and source expertise, a concept similar to source credibility. In this experiment, source expertise was defined as the extent to which a source of a message is perceived to be capable of making accurate claims (see Petty et al. [1981] and Pornpitakpan [2004] for thorough reviews on source expertise). For this study, source expertise was based on whether the websites displayed health information from medical experts (high source expertise) or people who suffered from the same symptoms and posted online about their experiences (low source expertise). Low-quality treatment conditions were made with websites providing basic health claims only, without supporting data or endorsements by healthcare experts. High quality conditions included supporting data, references, and official seals. Yi et al. constructed six treatment conditions and found that both quality and source expertise are significantly linked to trusting attitudes for health websites.

Two additional web-based experiments examined differences in use of heuristic information processing, as opposed to systematic processing, when completing web-based tasks or interacting with specific websites. Koh and Sundar (2010) used a between-subjects experimental design related to an online shopping task to test when website viewers use heuristics to complete transactions. The conditions differed in specialization, or relevance to the specific tasks. Koh and Sundar asked participants to self-assess how much systematic versus "gut level" thinking they reported during an experiment to test the effect of highly specialized media sources for e-commerce. Specialized media provides tailored, expert advice on websites. Results asserted that specialization was significantly correlated with quick, positive heuristic evaluations, and leads to increased trusting attitudes in specialized websites. Yang (2012) also relied on self-assessments to measure participants' heuristic information processing in an experiment related to online privacy. This study connected the presence of a privacy seal on websites with users' ability to quickly evaluate privacy protections using heuristics. Privacy seals are visual representations of site privacy policies, and are designed to help consumers make more accurate assessments of the risks involved with personal disclosures on that particular website. Yang hypothesized that in the absence of a privacy seal, users would be more likely to use heuristics to assess privacy policies presented by websites. Yang conducted a between-subjects experiment similar in design to Koh and Sundar's to manipulate familiar and unfamiliar social media websites, and sites with and without privacy seals. Findings demonstrated support for the research hypothesis, concluding that users are likely to use heuristics to assess privacy protections on social media websites.

No experimental studies focused on adolescents, with one exception. Reimer (2009) focused explicitly on adolescent information processing and behavioral intentions, though the average age of study participants was 20 among her sample group of undergraduate students. Participants were instructed to interpret information using "gut level reactions" or "logical reasoning," with the intent to estimate heuristic versus systematic processing. In this study, route of processing and behavioral intention for two high-risk health behaviors (having casual sex and getting drunk) comprised the between-subjects design. Reimer's findings supported prior research suggesting that riskier behavioral intentions are the result of more affective, less reasoned information processing and decision-making (gut level reactions).

Four studies relied on survey data. Two of these focused on adolescents and were the only studies in our sample that included participants younger than age 18. In the first study, Greene and colleagues conducted a three-part study examining cognitive attributes considered important in adolescent development (egocentrism and sensation-seeking) to determine associations with health message processing (Greene, Krcmar, Rubin, Walters, & Hale, 2002). Drawing on developmental psychology and research on adolescent cognition, this study posited that how deeply a health message "elaborates" on its main message may affect how adolescents interpret the message. The degree of elaboration reflects how much interpretation an adolescent must do to

understand the health message. Deep elaboration messages require very little effort to interpret, whereas shallow messages encourage adolescents to reach their own conclusions. Greene et al. recruited a range of younger adolescents and emerging adult participants (ages 11-29) and focused on safer sex messages. Using age as a proxy for cognitive development, this study found that younger (presumably less cognitively advanced) adolescents who read deep-demand messages were less likely to report risk-taking intentions and rated safer sex messages as more realistic as compared to older adolescents. Results pointed to the effectiveness of exposing adolescents to sexual health messages that require more interpretation, or are more open-ended and less prescriptive, especially for adolescents who are at the height of egocentrism and have high interest in sensation-seeking.

In a second survey study, Heirman et al. (2013) assessed online behaviors among grade-school students (ages 12-18) and their willingness to disclose personal information on websites. This study examined online disclosures from a web safety perspective, while Briggs et al. (2004) focused on personalization and disclosures as they relate to online trust. Heirman et al.'s study reported significant correlations between adolescents' willingness to disclose personal information on websites, including personal identity information, location, and contact information, as well as self-reported trust in a general website. There was no significant relationship between adolescent reports of prior privacy violations online and future willingness to disclose personal information, which the authors attributed to the low percentage of adolescents (7.4%) in their sample ever experiencing an online privacy infringement. The measure of trust in the Heirman study (a six-point Likert scale) was weaker than others in this review that measured trust over time (Briggs et al., 2004).

The final two survey-based studies focused on how likely participants were to use heuristics as a strategy for evaluating specific websites. Lim et al. (2013) surveyed undergraduate students about the credibility of Wikipedia. To set up their web-based survey about credibility and use of heuristics, survey respondents reviewed one of two versions of a Wikipedia article with different numbers of references (one with a high number and one with low number). Lim and colleagues constructed each version of the Wikipedia articles to contain some degree of controversy, inaccuracy, and incompleteness, to assess the degree that participants would rely on heuristics to make credibility judgments. Findings from this survey concluded that people engage in heuristic processing to assess credibility of Wikipedia entries, which can be viewed as a proxy for the plethora of uncertain information that can be found on the web. Although not an experiment, Lim et al.'s measurement of the degree to which participants used heuristics-based thinking relied on self reports like the experimental designs used by Koh and Sundar (2010) and Yang (2012).

Similarly, Tang, Jang, and Morrison (2012) investigated levels of participant motivation to assess routes for information processing (heuristic or systematic). Using a multi-phased survey tool, these researchers investigated whether higher levels of

involvement with travel websites affected perceptions of website quality and cognitive processing style. The authors defined involvement as a scored measure for intention to seek out information to use for future travel planning. Results from the Tang et al. study confirmed that highly motivated and involved participants were inclined to carefully read and assess information using the central route. In contrast, participants who reported low involvement in the study topic were more likely to rely on peripheral cues or heuristics to assess information provided compared to highly involved participants.

**Qualitative Studies**

Three of the qualitative articles we reviewed were based on the same data collection and analysis effort and represent the only group of longitudinal studies. Sillence et al. (2006a) devised an innovative research protocol to investigate web users' engagement with health websites over time and whether their continued use of specific websites fostered trust in those resources. In this larger study, a total of 40 adults took part in separate studies focusing on four different health topics: hypertension, menopause and hormone replacement therapy (HRT), the MMR vaccine, and healthy living. The methodology was the same for each study. Participants consulted websites about their designated health topics, and were guided through focus group discussions in four weekly sessions. In two weekly sessions participants searched the web freely for health advice on their assigned topic; in the other two sessions they reviewed specific health websites preselected by the researchers. Participants then kept media diaries for six months to assess their continued engagement with health sites. In the web observation period of the studies, heuristic and systematic assessments were gauged according to the amount of time participants spent on each website.

Results from the Sillence et al. (2006a) study showed that after conducting web searches to find health information, participants used heuristic screening to reject several websites within the first ten seconds. Participants most often named the reason for quick rejection of sites to be because of the poor design. To a lesser extent, participants reported quick rejection of sites based on irrelevant or inappropriate content. After this initial heuristics-based screening phase, participants chose sites to open and read carefully. Sites chosen for careful evaluation most often had appealing content features, including expert or personalized information, clear language, and relevant illustrations. Media diaries showed very few participants maintained ongoing relationships with any health websites beyond six months.

Sillence and colleagues adapted the staged model framework used by Briggs et al. (2004) (detailed in this review and in Figure 3-2) specifically for health advice information online. Drawing on dual process constructs for information assessment, the authors characterized Briggs et al.'s first stage of website interaction as primarily a heuristics-based stage. Further engagement (the second stage of the Briggs et al. model) was interpreted as analogous to systematic evaluation of site content. Briggs et al.'s third stage involving trust and relationship management was presented by Sillence

et al. as a two-pronged relationship stage, whereby users integrate sources of information from different websites and interact with health websites in personalized ways. Sillence and colleagues then tested these concepts by evaluating specific user behaviors in each stage of the methodology for assessing health advice online. This dual-process model for trust in online health advice first appeared in this study publication (Sillence et al., 2006a), and was validated in the other two studies (2006b, 2007).

Two other articles in this review by Sillence and colleagues reported findings from this larger study. Sillence et al. (2006b), focused on hypertension among 13 adults, reported findings similar to the larger study. This study detailed a more sophisticated analysis of the timing of heuristics-based screening of initial hypertension advice websites, and reported that participants usually returned to health advice sites in the 6-month longitudinal period of the study in response to symptom or medication changes. For the study on hormone replacement therapy (Sillence et al., 2007), findings from the larger study were again confirmed. In this study, 15 female participants reported that in the 6-month follow-up period, they revisited HRT websites to be able to cross-check information they recently learned.

Metzger et al. (2010) investigated how heuristics may be used for online credibility assessments by conducting eleven focus groups with adults in 10 U.S. states. In this study, participants elaborated on their perceptions about the concept of heuristics and other strategies for evaluating information. Grounded in the theory of bounded rationality, most recently studied in the context of the Internet by Gigerenzer and Todd (1999), Metzger and colleagues conducted their qualitative study on the premise that rather than representing cognitive limitations, use of heuristics are effective, adaptive cognitive strategies that are equally as effective as more cognitively demanding strategies like systematic processing. For a review of the origins and newer applications of bounded rationality, see Simon (2000). Results demonstrated the high degree that social aspects factor into individuals' credibility assessments in the online environment. Participants reported using social information pooling strategies and sharing tools like feedback systems, testimonials, or rating systems to make credibility assessments. Reading other people's reviews and testimonials was a common strategy for evaluating online claims and verifying information. Another strategy participants reported for using social ways of assessing credibility was by taking advice posted online by "enthusiasts." Enthusiasts, or non-credentialed experts, publish advice on blogs, forums, wikis, and testimonials pages, and were consulted as a means of social corroboration among participants.

Metzger et al.'s results also detail different types of cognitive heuristics employed by participants to assess credibility, including reputation, endorsement, and consistency heuristics. The reputation heuristic was defined similarly to how Huerta and Ryan (2003) operationalized reputation (detailed in this review) and signals a tendency to make credibility judgments based on the name recognition of website owners, as

opposed to making a judgment after close inspection of site content. The endorsement heuristic suggests that people find something credible if other social actors do also, without careful scrutiny of site content. The consistency heuristic is a common strategy for judging what can be trusted, and simply means employing a fast way of checking to see if information across sources is consistent.

The last qualitative study also investigated mechanisms by which people make credibility assessments. Hilligoss and Rieh (2007) collected 10-day media diaries from 24 undergraduate students and collated 245 information seeking activities from the diaries. These researchers then conducted interviews about credibility of information, including online information. While the 10-day diary component was able to capture a range of media use, it does not suggest a longitudinal data collection effort because participants use of media they routinely visit is likely to be consistent over a 10-day period. Using grounded theory analysis, the authors developed a framework for credibility assessment with three levels similar to an ecological framework (Bronfenbrenner, 1977). Beliefs about information, which Hilligoss and Rieh labeled "constructs," are at the top of the framework, and include individual beliefs about the veracity and objectivity of the information they are judging. Heuristics is the next level, where the authors detailed types of heuristics individuals use. Hilligoss and Rieh named endorsement-based heuristics as a key type of heuristic their participants used in this level, and defined it in similar language to how Metzger (2010) defines endorsement heuristics. The last level of the framework presented in these results was an interaction level, where participants react to specific content found in messages.

Despite the fact that no qualitative studies focused specifically on adolescents, the qualitative studies had the widest age range of participants (18-68) across those studies we reviewed, as well as wide age ranges within the individual studies. Both Hilligoss and Rieh (2007) and Metzger et al. (2010) included emerging or young adults in their sample (ages 18-25) along with older adults.

**Theoretical Studies**

We reviewed six articles that specifically focused on conceptual contributions or theory development in their aims. Literature reviews were the most common approach in theory papers (n=4). One article provided commentary surveying known types of heuristics that may be used in the online environment (Metzger & Flanagin, 2013). The commentary echoed most of the types of heuristics detailed in Metzger et al. (2010) (detailed in this review). The sixth theoretical article proposed a new theoretical framework to explain online consumer trust, grounded in brief review of the Elaboration-Likelihood Model, a dual process framework (Hsu, 2008). Key points of the literature reviews are presented below. See Table 3-2 for main points presented by Metzger and Flanagin (2013) and Hsu (2008).

None of the four reviews employed systematic methods for finding and reviewing literature. Key points made by authors of literature reviews are noted here. Metzger (2007) highlighted the conceptual similarities between known research about credibility assessments in the online environment and dual process models of credibility assessments. The review proposed a dual processing model of web credibility assessment for adults that includes motivation and cognitive ability as individual attributes that impact what evaluation strategy they may employ (heuristic or systematic). Metzger also outlined alternative ways to communicate credibility in online settings, including creating credibility seal programs, rating systems, and digital signatures to assure reputable authorship.

Salo and Karjaluoto (2007) proposed a model for understanding online consumer trust by reviewing known studies about trust in e-commerce. Through a review of 12 studies relating to trust in the online environment, these authors grouped factors influencing trust into internal and external categories. Examples of external factors included consumer characteristics, culture and communities, while internal factors included consumers' prior experiences with specific vendors and disposition to trusting attitudes.

Two reviews discussed adolescents specifically, although with different degrees of depth. Gibbons (2009) reviewed key adolescent cognitive attributes for information processing, including context, affect, and experience, and integrated them into the prototype willingness model, another dual process framework. This review identified common health behavior theories used to understand adolescent decision-making and presented evidence that adolescent decision-making about risky behaviors, such as binge drinking or engaging in casual sex, involves both analytic and heuristic processing. In this review of ten articles, the authors argued that age and life experience are likely to influence reasoned decision-making among adolescents, and including heuristics in expectancy-value models of adolescent decision-making increase their predictive value.

In contrast, Flanagin and Metzger (2008) discussed the history of credibility research in the digital environment and highlighted ways that adolescents today are well-equipped to find information online. The authors discussed ways adolescents are faced with complex cognitive tasks online, and youth at different developmental stages are equipped differently to resolve risks and dilemmas using heuristics and social-based approaches to credibility. This review concluded with recommendations for how to teach credibility assessment for improved digital literacy training among youth.

## Discussion

This review represents the first known effort to examine the intersections between dual process frameworks and online trust and credibility to inform theoretical development for adolescent users. From a broad view, all of the studies presented here provide

insights about how individuals behave and react when presented with different kinds of information, predominantly in the online environment. Our aim was to closely examine a narrowly-scoped body of research that integrated principles of how people interact with online information using cognitive strategies, which are embedded in dual process theories: use of heuristics and systematic evaluation. In addition, we examined research that applied these principles specifically to adolescents as a special population that use the Internet daily for a range of purposes. From these three disciplinary perspectives, our goal was to inform theoretical understanding of how adolescents may judge and interact with sexual health information in the online environment to inform future testable models and ultimately intervention strategies with youth.

By examining how studies intersected conceptually, we observed three notable areas for discussion. These observations are elaborated to inform the development of a conceptual model specifically for adolescents and their interactions with sexual health information in the online environment. First, we observed differences in how researchers focused on information and adolescence define and investigate the use of heuristics within dual process frameworks. Second, two aspects of online behavior, personalization and disclosures online, were key facets of building online trust for adolescents. Finally, the studies in our sample tended to draw conclusions about web users of all ages, even though older adolescents comprised the overwhelming majority of participants across studies.

First, our review revealed that the tenants of dual process theories (heuristic and systematic processing) were characterized in online trust and credibility studies as cognitive *strategies* and conversely, as cognitive *deficits* in those focused on adolescents. There appeared to be a growing body of work that applies dual processing theories for understanding online trust and credibility but does not take into account specific developmental considerations for adolescent interactions with online information or adolescent information processing strategies. In fact, 17 of our 22 interdisciplinary studies used dual process frameworks to explore questions related to online trust or credibility, yet most did not highlight or consider important aspects of adolescence. Of the 17 studies we reviewed that addressed online trust or credibility using dual process theories, eight used a dual process framework to investigate adults' use of heuristics to make credibility assessments on the web. The implications of heuristics were characterized differently between web credibility researchers and those studies in our review (n=5) that focused on adolescents. Web credibility researchers tended to characterize heuristics as adaptive strategies to help web users make credibility assessments in an environment saturated with competing information. Using heuristics for credibility assessments was framed as strategic cognitive reactions in response to features of the web environment, including website content quality, design, and visual cues (Briggs et al., 2004; Hsu, 2008; Huerta & Ryan, 2003; Kayhan & Bhattacherjee, 2011; Tang et al., 2012; Yi et al., 2013), presence of authority or privacy protection cues on websites (Lim et al., 2014; Yang, 2012), type of media including

specialized media (Hilligoss & Rieh, 2008; Koh & Sundar, 2008), or social endorsements like comments or rating systems (Metzger et al., 2010).

In contrast, the studies that discussed adolescents characterized use of heuristics as a natural consequence of adolescents' limitations in some capacity, either by age (Gibbons et al., 2009; Greene et al., 2002), life experience (Gibbons et al., 2009), cognitive maturity (Flanagin & Metzger, 2008; Greene et al., 2002), lack of prior experience with the web (Heirman et al., 2013), or propensity for affective reasoning (Reimer, 2009). In the adolescent-focused studies that used dual process frameworks, heuristics were described as a process that reflects adolescents' limited ability to process information using more complex cognitive strategies given their developmental stage.

Second, we observed that of the nine studies that used dual process frameworks to explore how trusting attitudes are formed in the digital environment, three emphasized the benefits of users disclosing personal information online to receive tailored, personalized information (Briggs et al., 2004; Sillence et al., 2006b, 2007). Personalized website features are design elements tailored for an individual user, and may include tailoring information by location, age or gender, prompting users to log in or create accounts, or storing previously viewed topics or searches to tailor what is displayed. Personalization and online disclosure was also the focal topic for one of the five studies focused on adolescents and online trust (Heirman et al., 2013). While this was only one study, it represented one of the only conceptual "crossovers" between the development of online trust and adolescence. Divulging personal details, such as age, gender, or health concerns to sites that use personal information to tailor content accordingly, is a behavior that is likely to be linked to behavioral intentions for health decision-making (Gray et al., 2002; Selkie et al., 2011) and subsequent health outcomes. Personalization and disclosure online has particular importance for health decision-making. The act of disclosing personal information and receiving helpful content may lead to more positive and trusting experiences with online sexual health information. Most importantly, positive and trusting experiences with online interventions may play a part in behavioral intentions and possibly sexual health outcomes among adolescents related to their decision-making (Noar et al., 2006).

Third, we observed that the majority of empirical studies reviewed sampled older adolescents and emerging adults but made inferences about adults. Of the 11 quantitative articles we reviewed, seven presented their findings as applicable to adults in general, even though their sample consisted only of undergraduates (presumably ages 18-22) and/or included late adolescents (ages 18-24). Only one of the studies that included late adolescents did not recruit undergraduate students to serve as participants and instead used a more representative sampling strategy. And in contrast, one study specifically set out to understand adolescent health decision-making, yet did not recruit any participants younger than 18 years old. Few studies overall, and no empirical studies, considered the developmental characteristics of

being a user in this late adolescent age group, which is different from younger adolescents and distinct from adulthood, and may have implications for how they assess credibility or interpret online information.

## Towards a Conceptual Model for Adolescent Web Users

To help develop a stronger adapted model specifically for adolescents, we used a positivist research approach that speaks to the unique attributes of adolescents. To do this, we built on the three observations discussed above and integrate key ideas into an existing model of online trust. We used the staged model of online trust developed by Briggs et al. (2004), which was also employed by Sillence et al. (2006b, 2007), as a focal model for adaptation to adolescents for two reasons that became clear during the review.

First, the Briggs/Sillence model draws on work by Corritore et al. (2003, 2012) on trust cues and Fogg and colleagues' (2001) studies on web credibility, two preeminent scholars in this area. The Briggs/Sillence model goes beyond explaining how people make judgments about what is credible on the Internet to also focus on longer-term, trusting relationships with online health resources. Second, the Briggs/Sillence model was empirically tested in two longitudinal studies reviewed here (Sillence et al., 2006b, 2007), underscoring the model's utility to predict trusting relationships with online resources over time.

In the following sections, we propose modifications and additions to the Briggs/Sillence model to create a new model with applicability for adolescents' online trust in sexual health information (ASHI). In each section we highlight the area of the Briggs/Sillence model we intend to adapt, and then detail additions or changes toward the construction of a new model. We refer to the model being adapted as the "Briggs/Sillence model" depicted in Figure 3-2, and our proposed model, shown in Figure 3-3, as the ASHI model for its adaptation to adolescents and sexual health information.

**Increased use of heuristics.** The Briggs/Sillence model posits that Internet users quickly screen websites using heuristics (Figure 3-2, Box 1), and suggests that heuristic processing occurs in equal measure as more analytic, subsequent consideration of information. All of the online trust studies reviewed with dual process frameworks included a heuristics level for information processing, and those focused explicitly on heuristics use for credibility assessments on the web highlighted that use of heuristics is a universal strategy for Internet users of all ages. However, adolescents appear more likely to use a variety of kinds of heuristics to assess initial credibility and trustworthiness of websites as a result of their developmental maturity.

All adolescent-focused studies in this review noted that reasoning capabilities increase with age and experience. Cognitive ability was shown in several studies to be among

the most important criteria for assessing the credibility of online health information, and is theorized to be linked to type of processing route used in evaluation (Chaiken, 1980; Eysenbach & Köhler, 2002; Hsu, 2008; Metzger, 2007). As such, our review supported including *cognitive ability* in the ASHI model as a requisite for systematic processing, and an increased use of heuristics as a strategy when cognitive ability may be limited by developmental stage. While this is a subject of debate, the ratio of heuristic to analytic thinking is thought to decrease as an individual nears adulthood (Reyna & Farley, 2006). Cognitive changes occurring in adolescence, including development of advanced reasoning and abstract thinking skills, and the capacity for thinking about one's own thinking (metacognition), make reliance on affective, intuitive judgments more likely in this age group in the online environment (Keating, 2011). For example, limitations imposed by stage of cognitive development may make it difficult for adolescent Internet users to distinguish between commercial and non-commercial health information, or think about how they are discerning between conflicting content on health websites (Flanagin & Metzger, 2008).

In addition to limitations imposed by cognitive maturity, gaps in subject and experiential knowledge may inhibit adolescents' ability to evaluate health information for accuracy or personal relevance, leading them to rely more heavily on heuristic assessments. Although adolescents today have grown up in a saturated digital environment, strategies and skills to critically evaluate different kinds of information evolve and become more sophisticated with knowledge and life experience. *Subject knowledge* about sexual health may be limited, depending on exposure and access to venues of sexuality education. Additionally, *experiential knowledge* or life experiences will range widely for young people in this arena. Relatively small amounts of experience with a particular behavior, such as consulting the web for sexual health information, may lessen their ability to deliberatively process information (Gibbons et al., 2009). However, there remains some debate about whether adolescents' immersion in digital technologies may relieve some of the tension between adolescents' inherent cognitive limitations due to their developmental stage, and their skill and comfort in using technologies for a range of information (Flanagin & Metzger, 2008).

Adolescents may also use heuristics to assess the authority of information if they are unable to recall any impressions of what is authoritative for content they are reviewing online. Several of the studies reviewed identified the *authority* of the information provider as a key criterion when assessing information usefulness in healthcare-related online contexts (Eastin, 2001; Hesse, Nelson, & Kreps, 2005; Stvilia, 2009; Yi et al., 2013). Authority is often referred to in credibility and online trust literature as *source expertise* or *source credibility*. A well-studied dual process model, ELM, stipulates that people use the central or systematic route of processing more than a heuristics-based route when they believe they are evaluating a message from an authoritative source (Petty & Cacioppo, 1986; Yi, 2013). Newer research on authority heuristics suggests that in lieu of effortful processing for authoritative information, *authority* or *reputation heuristics* are used to quickly assess whether the source is an "official" or easily

recognized source or not (Hilligoss & Rieh, 2008; Metzger & Flanagin, 2013; Sundar, n.d.). In contradiction to ELM, some credibility researchers have noted it may be an assumption that people engage in more effortful processing to be certain of source credibility, and propose instead that heuristics are likely to be employed for assessing authority (Koh & Sundar, 2010; Metzger et al., 2010). Younger or less cognitively mature adolescents may use authority and reputation heuristics, but the conclusions drawn about the authority of those sources may be inaccurate. Flanagin and Metzger (2008) also note that digital technologies complicate traditional notions of hierarchy and authority structures, given that the vast majority of web content is unregulated and may be user-generated. Adolescents who are assessing health information online may not believe that useful information needs to be authoritative, or may place more value in community governance of websites rather than expert governance (Kayhan & Bhattacherjee, 2011). As such, we note that adolescents are likely to be using these types of heuristics as part of their reliance on affective information processing in the first stage of the ASHI model.

**Context-specific use of systematic thinking.** According to the Briggs/Sillence model, a heuristics screening stage leads to systematic evaluation of site content (Figure 3-2, Box 2). Systematic evaluation requires a higher level of responsiveness and more effortful engagement with website content (Chen & Chaiken, 1999; Sillence et al., 2007). The Briggs/Sillence model shows that once a user expends effort to systematically evaluate information, they no longer rely on heuristics for subsequent stages of trust development (Briggs et al., 2004; Sillence et al., 2006a, 2006b, 2007). In the ASHI model, we suggest that adolescents will systematically evaluate content on a case-by-case basis if they are sufficiently motivated and have cognitive ability able to do so, and if not, will continue to develop trusting relationships through an extended use of heuristics.

Motivation and involvement were discussed in just four studies we reviewed, including two quantitative studies with emerging adults, despite being well-established dual process constructs to help explain when people engage in more systematic processing. Dual processing models of online credibility, based on both ELM and the Heuristic-Systematic Model, theorize that online information seekers will undergo more rigorous, effortful evaluations of web content when highly motivated, compared to when motivation is lower (Chaiken, 1987; Metzger, 2007; Metzger & Flanagin, 2013; Petty & Cacioppo, 1986). Degrees of user motivation depend on what is happening in the moment or preceding a person's decision to look online for information. Motivation may also stem from the consequentiality or fear of receiving low-quality or inaccurate health information, or health advice that is difficult to "act on" (Metzger, 2007).

While the situation largely determines if information seeking is more casual or purposeful in motivation (Metzger, 2007), involvement is a user's subsequent investment in the outcome of their web searches (Sillence et al., 2007). The Briggs/Sillence model, drawing on heuristic-systematic models previously adapted to

understand involvement in online commercial exchanges, suggests that when the task is particularly important to the Internet user, they are likely to use cognitively intense analytic processing to make trust judgments (Albarracin & Tarcan, 2003; McAllister, 1995; Petty & Wegener, 1999; Sillence et al., 2006a, 2006b).

Looking for health information online, particularly sexual health information, may be precipitated by a highly motivated mental state. These constructs are integrated into the ASHI model on the path to systematic evaluation. For adolescents, specifically, who are especially concerned about interpersonal privacy and social reputation, sexuality and sexual health is a highly personal health issue. Searching online for sexual health information would be considered a special context, which is theorized to increase motivation and involvement (Metzger et al., 2010; Taraborelli, 2008). The immediacy and privacy of the Internet for finding information on these subjects is broadly appealing to adolescents, which motivates use of the Internet for this purpose.

The Internet is a likely destination for obtaining sexual health information when the "stakes are high" or the timing is essential for finding and using this health information, such as locating nearby clinics or arranging for testing (e.g., STI, pregnancy) or medical treatment (e.g., STI treatment, obtaining contraception). Additionally, for sexual minority youth in many parts of the digitized world, the Internet can be a "lifeline" for not only accurate sexual health information, but social connections to online communities that accept people of all sexualities or those facing homophobic violence or discrimination (Sulfridge, 2013). For adolescents who are searching for health advice online because of serious health risks, such as an unplanned pregnancy, sexual violence, or concerns about STIs, their motivation and involvement will be high and careful evaluation of information highly likely.

However, even in the context of sexual health information seeking where motivation and involvement are high, the ASHI model illustrates how systematic evaluation is done on a case-by-case basis, depending on an adolescent's cognitive ability. There is current debate about the degree to which cognitive control or affective reasoning exerts more cognitive influence for adolescent decision-making. Emerging work on adolescent brain development suggest that adolescents have a higher degree of cognitive flexibility and ability to recruit cognitive control mechanisms than previously thought (Crone & Dahl, 2012). Yet researchers and theorists agree that high levels of motivation lead to more systematic and central route processing, and ability is necessary for this stage (Hsu, 2008). It is possible that adolescents may limit, truncate, or skip systematic evaluations entirely, even if highly motivated. As such, in our adapted model we account for adolescents' potential use of systematic evaluation, depending on motivation and ability, with the continued option for use of heuristics when they lack motivation or capacity to critically analyze health information (Petty & Wegener, 1999).

**Use of consistency heuristic, social endorsement heuristic to integrate sites and sources.** Two aspects of the Briggs/Sillence model show the formation of a trusting relationship with online health resources: 1) integration between sites and sources and 2) longer term consultation and self-disclosure. The Briggs/Sillence model also shows that systematic processing is required to reach these deeper stages. Trusting attitudes are more likely to develop after careful consideration of a range of resources, rather than quicker heuristic assessments. We illustrated in the ASHI model that systematic evaluation of site content is possible but not consistent for adolescents based on cognitive ability, motivation and involvement. We have also proposed that heuristics will be used often due to both an innate cognitive proclivity for affect-based reasoning among adolescents, and a possible lack of sufficient ability to use strategies other than heuristics for assessing information. We now suggest two types of heuristics that are particularly applicable to adolescents with regard to their integration of online information.

Integrating information between sites and sources (Figure 3-2, Box 3) builds trust in online health information because the act of checking and validating information by different authors increases the user's exposure and subject and experiential knowledge about the topic (Briggs et al., 2004). Yet because adolescents have an increased use of heuristics, integration may not happen through careful evaluation. The *consistency heuristic* is a common strategy for judging what can be trusted, and simply means employing a fast way of checking to see if information across sources is consistent (Metzger et al., 2010; Metzger & Flanagin, 2013). Using the consistency heuristic means comparing websites to each other in a practical way to "get a feel" for the different kinds of information across sources (Meola, 2004). Metzger et al. (2010) noted that the consistency heuristic is at the same time one of the more cognitively effortful heuristics available to web users, but it nonetheless functions as a relatively fast way of arriving at a credibility or trust assessment.

We included the consistency heuristic as a pathway to integration and trust formation in the ASHI model because at least one recent study has demonstrated *corroboration* to be an important activity for adolescents searching online for sexual health information specifically (Starling, Cheshire, Nuru-Jeter, & Deardorff, 2016a). Echoing Meola's concept of corroboration (2004) as a way for web users to integrate information on a given topic located in a broad social context, Starling et al. (2016a) observed adolescents corroborating sexual health information quickly across websites, in addition to cross-checking sexual health information found on the web with offline sources such as previous classroom sexuality education experiences. In Starling et al. (2016a), corroboration and consistency heuristics was the third observed stage late adolescent users underwent in evaluating sexual health information related to sexual identity, sexual risks like STIs, and safer sex topics. These findings suggest that consistency heuristics are a likely strategy for adolescents to save time and build experiences with important health topics.

A second heuristic that adolescents likely use in their process of integrating information between sites and sources is an extension of the endorsement heuristic, which we label the *social endorsement heuristic*. The endorsement heuristic is based on Chaiken's "consensus heuristic" (1987) and more recently iterated as the "bandwagon heuristic" by Sundar (2008) and suggests that people are inclined to believe information and sources if others do also. Endorsement heuristics operate in a way that accepts or believes quickly and without scrutiny of the content or source, and are thought to be used in affective processing by most people (Hilligoss & Rieh, 2008).

The ASHI model contends that for adolescents, information endorsements are likely to be more meaningful if they resonate according to their emerging social identity. Social identity is developed within adolescents' immediate social context (Tarrant et al., 2002), which includes their online community, family ties, peer groups, and social settings where they spend time, such as school (Ito et al., 2009). Social comparisons increase during adolescence, and peers temporarily exert more influence over adolescents' decisions and behaviors (Eisert & Kahle, 1982; Steinberg, 2014). While learning to express thoughts and feelings within their social contexts, sexuality identity is developing as well (Diamond & Savin-Williams, 2009). Young people receive social cues in the online environment to signal the identification of groups or users like themselves, including graphics or photographs, mission statements on websites, or specific use of language that point to group identity. Social cues relevant to adolescents are visual cues that the site they are visiting may also be visited by people who are like them or in their peer groups (Sillence et al., 2006a). Testing of the staged model indicated that adults trusted those health sites that reflected their social identity, and so for adolescents, this is likely to be even more pronounced.

Newer thinking about the Internet as a "vigorously social" medium (Metzger et al., 2010) lends further support to socialized aspects of endorsement cues. Adolescents' social community extends into the online realm to include participation in online forums, broad social network engagement, and boundary-less information sharing (Flanagin & Metzger, 2008). For adolescents "growing up digital," the socially integrative aspects of the web logically extend to their use of heuristics for assessing credibility and checking consistency across sources.

**Limited relationships with specific websites.** The Briggs/Sillence model (Figure 3-2, Box 4) combines two activities in the final stage of the model: consulting specific web resources routinely over time and divulging personal information on websites for more personalized health information. Together, these user activities point to an increase in behavioral intentions to act on the health advice provided by websites people trust (Briggs et al., 2004; Sillence et al., 2006b, 2007). The Briggs/Sillence model also operationalizes longer-term consultation as users' returning to specific websites and web pages repeatedly to satisfy their need for health advice over time.

Adolescents are less likely than adults to return to specific web pages over time to build trust, and instead build system trusts in the Internet as a catch-all resource for sexual health. For adolescents and trust in sexual health websites, longer-term consultation is less likely to be in the form of consulting one specific website consistently, but more practiced behavior for general web searching overall. In addition, self-disclosure decisions about sexual health information carry more potential stigma and privacy concerns among adolescents than other health topics among adults.

Two ideas support this adaptation of the Briggs/Sillence model for adolescents. First, adolescents exhibit comfort and extensive practiced behavior consulting the web for information, doing so largely using heuristics and without what Flanagin and Metzger (2008) call "top-down direction." Allegiance to specific websites is lower among young people, who are accustomed to evaluating, altering, remixing, and sharing content quickly and seamlessly across online social networks. Observational studies with adolescents using the web for health information note a consistent preference for finding relevant information by conducting "cold searches" on search engines (Bing et al., 2007). Rarely do adolescents begin looking for sexual health information online by typing in a specific URL; searching for sexual health information procedurally relies on untargeted searches using relevant search terms (Starling et al., 2016a). As such, we modify the notion of sustained consultation to specify the *practice* of finding information on the web at large, which may build trust once a young user recognizes information consistently. Adolescents are likely to build trust in this stage by returning back to the Internet repeatedly on a variety of devices for different sexual health informational queries at different times throughout development.

**Boundaries of personal disclosures.** The process of disclosing personal information, and the resulting personalized content available to the user, aids in the development of trust (Fogg et al., 2011; Sillence et al., 2006a) and may increase uptake and later use of health information, especially among adolescents (Gray et al., 2003). Yet the effects of personalization on trusting attitudes for adolescents is only just beginning to be studied. Adolescents may value personalized content, but the benefit may be outweighed by their desire for privacy. In a recent study investigating adolescents' thresholds for personalization and privacy for sexual health information seeking, Starling et al. (2016b) noted that disclosing age and gender online for more personalized sexual health content was met with wide acceptance, but other types of disclosures, including zip codes, health symptoms, names, and other potentially identifiable information, was met with reluctance among late adolescent users. Adolescents were particularly disinclined to share symptoms and their locations, unless the situation warranted a sexual health emergency. However, this study of older youth may not be generalizable to younger adolescents, who may be more inclined to disclose identifiable information. To account for the unknown degree to which adolescents of different ages may disclose personal information online for sexual health information specifically, we modified this web behavior in our model to

"*selective* self-disclosure" for adolescents. Increased motivation for online sexual health information seeking, such as an emergency, may be associated with types of information adolescents would disclose to receive tailored content.

In summary, results from our review highlighted that recent research about trust and credibility and adolescence, respectively, both draw on dual process constructs to understand how heuristics are used in the online environment, but frame the purpose of heuristics differently. Heuristics are framed in the adult credibility research reviewed here as necessary adaptive strategies, while researchers focused on adolescent information processing characterize use of heuristics as the result of limited cognitive maturity and lack of experience. When interacting with online sexual health information, adolescents are likely to use heuristics both as a result of limitations in cognitive ability, which may preclude them from analytically evaluating sensitive health information, and as a way to judge health information for which they may have little life experience to gauge its accuracy. Consistency and social endorsement heuristics are two types of heuristics that adolescents may use in order to determine whether information can be trusted. Adolescents seeking sexual health information online are likely to be highly motivated for this task, which may lead older adolescents to evaluate online content more systematically using the central processing route. Finally, adolescents may differ from adults in the actions they take towards building online trust with specific web resources. Adolescents may be hesitant about disclosing personal details related to their sexual health, and may not return to specific websites routinely over time as often as adults.

**Limitations**

A potential limitation of this review was that we employed a positivist approach, whereby the literature was evaluated through the lens of existing models for adults. Positivist approaches are subjective and susceptible to researcher bias. However, we did so in an effort to build on existing theory and models to make them more applicable to an adolescent population. Our inclusion criteria for the current review was purposely restrictive in order to examine intersections and new applications of interdisciplinary research, thus it is also possible we did not include prominent or highly relevant studies in the individual research areas we triangulated. As such, interpretive depth may be somewhat constrained. However, we felt that the importance of examining research that bridged disciplines was a priority because so few efforts have been made to date to critically apply theories of information processing to the digital environment, and even fewer attempts have been made to apply these concepts to adolescents. Moreover, the literature in each individual field was vast and therefore our approach allowed us to scope for exemplary intersections of the literature. Finally, the conceptual model proposed here has yet to be tested. Choosing to focus our objectives on theory-building is not without critique, and we recognize the limits of conceptual models without application and corroboration in empirical studies.

## Implications

Despite these limitations, this systematic review is the first to examine critical intersections of three key disciplines (adolescence, online trust and credibility, dual process theories) and provides a new perspective for how adolescents interact with online sexual health information. This is critical as youth have become the largest group of users and the earliest adaptors of Internet technology. Interdisciplinary research designs are made stronger when a transdisciplinary theoretical approach is employed (Abrams, 2006), yet this is often neglected when working across fields.

**Methodological implications & future research.** There are two main methodological implications from this review for future research on adolescents and credibility research on the web. First, participant self-assessments were used to measure the extent of heuristics-based reasoning in several studies. Alternatively, participants in other studies were directed to regard a website, treatment condition, or other type of content "using" one style of information processing over another. Both of these measurement approaches for heuristics are likely to introduce bias and lack of reliability, particularly for younger adolescents. Making post-hoc assessments about one's own thinking (i.e., thinking about thinking) requires metacognitive skills, which typically do not develop until later adolescence. Metacognition may also be required to "code-switch" between cognitive styles of information processing. Studies with adolescents measuring heuristic and systematic evaluation may be more successful if differences in the two processing styles were measured objectively, rather than subjectively. Eye-tracking and video recordings, as well as timed measures of how quickly content is assessed, are more reliable measures of heuristics or analytic processing among adolescents and are now being widely used in internet research.

Future research on adolescents and online trust should include younger people with clear delineations about their developmental stage. Given the developmental implications of different types of information processing styles, it will be important to investigate differences in circumstances surrounding the use of heuristics and online trust formation between younger and older adolescents. Longitudinal studies that follow adolescent participants through development and observe ways their use of the Internet for sexual health information are especially needed.

**Implications for sexuality education.** Our review suggests that heuristics are not only a cognitive strategy likely to be employed by adolescents as a characteristic of their cognitive developmental stage, but also as an effective strategy used by adolescents and adults alike for assessing vast amounts of information quickly in an uncertain environment such as the Internet. Online sexual health interventions and websites should capitalize on the types of heuristics adolescents tend to use. For instance, sexuality and sexual health websites should be designed with the assumption that some of their readership may have sufficient ability to interpret health information analytically, but the intervention in design should also be conducive to fast, intuitive

message processing for those who are either unable or unwilling to go deeper. Visual design elements that communicate positive sexual health or safer sex messages quickly through images, short vignettes, or video clips may engage users on a more affective level.

In line with adolescents' use of the consistency heuristic, sexual health websites should make it easy for users to click away from their website to check other sources, including other sexual health websites or general sites with valuable sexual health information. Online interventionists sometimes strive to build "one stop shops" for adolescents using their website for sexual health information, but our evidence pointing to the importance of corroboration suggests that interventions may be more trusted in the long term if they link out to other destinations. This logic also applies to the social endorsement heuristic. Future research is warranted to explore how the presence of social identity cues on sexuality education websites may help or hinder the formation of trusting attitudes for that intervention.

We also see tremendous value in teaching digital literacy skills as part of classroom-based sexuality education. Educators can simultaneous encourage the use of heuristics towards more positive engagement strategies in online information seeking, and validate adolescents' need to corroborate sexual health information with their social identity, in addition to providing more didactic forms of sexuality education. Evidence suggests that systematic evaluations of online sexual health content may not be feasible or common. As such, educators and practitioners can acknowledge this readily with adolescent learners and incorporate heuristics-based learning strategies for online skills-building. Credibility skills, or teaching young people how to recognize credible sources of health information quickly, will serve them greatly in the online environment for sexual health information seeking.

## Conclusion

This review examined intersections of research to determine how people, and particularly adolescents, make trust and credibility assessments in digital spaces. We examined aspects of adolescent cognitive and social development and emerging work on dual process theories as they relate to information processing. We also highlighted ways that adolescents are likely to be different from adults in how they assess online sexual health information and proposed an adolescent conceptual model that incorporated these facets. Our theoretical contribution in this paper can enrich the literature base for all three disciplines we explored, but particularly for adolescent research. Adolescent researchers who are interested in understanding how young people use the Internet for important health knowledge can draw on our model to inform studies that are not about sexual health but are similarly context-specific. For instance, adolescent health researchers focused on tobacco prevention, cessation, or nutrition for this population could apply this model to understand what types of online resources for these health topics are trusted, and what types of personal information

adolescents may want to disclose about themselves (smoking experimentation, eating habits, etc.) on intervention websites. In addition, a growing body of emergent research is focused on dual process theories for their relevance in understanding how people process information in online context. Following this trend, this is first known study to feature a dual process theory of online trust focused specifically on adolescents and sexual health information, which broadens the base of evidence for dual process applications. Future health research can build on this and other related studies to understand how health information is sought out, obtained, interpreted, and trusted in the long term for links to health behavior of all forms.

Table 3-1. Summary of 22 reviewed articles

| Study First Author and Year of Publication | Country of Study Setting | Type of Study | Methods or Approach | Sample Size[a] | Age of Participants[b] | Primary Outcome or Thematic Focus[c] | Outcome or Focus in relation to Adolescents |
|---|---|---|---|---|---|---|---|
| Briggs (2004) | Netherlands | Quantitative | Experimental<br>Survey | 107 | College students | C HS Ps T | n.a. |
| Flanagin (2008) | USA | Theoretical | Literature review | n.a. | n.a. | A AC AOB | C |
| Gibbons (2009) | USA | Theoretical | Literature review | n.a. | n.a. | AHB HS | HS |
| Greene (2002) | USA | Quantitative | Surveys | 87 (Study 1) | College students | AC | M |
| | | | | 749 (Study 2) | College students n=447<br>11-17 n=302 | AC | M |
| | | | | 532 (Study 3) | College students n=190<br>12-25 n=342 | AC | AHB |
| Heirman (2013) | Belgium | Quantitative | Survey | 1024 | 12-18 | AOB Pr T | Ps |
| Hilligoss (2007) | USA | Qualitative | Media Diaries<br>Interviews | 24 | 18-43 | C H | n.a. |
| Hsu (2008) | Australia | Theoretical | Conceptual framework development | n.a. | n.a. | HS MI T | n.a. |
| Huerta (2003) | USA | Quantitative | Experimental | 134 | 42 (av.) | C M | n.a. |
| Kayhan (2011) | USA | Quantitative | Experimental | 423 | College students | C H | n.a. |
| Koh (2010) | Republic of Korea | Quantitative | Experimental | 140 | College students | H HS MI T | n.a. |
| Lim (2013) | USA | Quantitative | Experimental<br>Survey | 138<br>(122) of n=138 | 19.28 (av.) | C H | n.a. |
| Metzger (2007) | USA | Theoretical | Literature review | n.a. | n.a. | C HS MI S | n.a. |
| Metzger (2013) | USA | Theoretical | Commentary | n.a. | n.a. | H | n.a. |
| Metzger (2010) | USA | Qualitative | Focus Groups | 109 | 18-55+ | C H S | n.a. |
| Reimer (2009) | USA | Quantitative | Experimental | 139 | 20.1 (av.) | AC HS | AHB |
| Salo (2007) | Finland | Theoretical | Literature review | n.a. | n.a. | HS T | n.a. |

| Study First Author and Year of Publication | Country of Study Setting | Type of Study | Methods or Approach | Sample Size[a] | Age of Participants[b] | Primary Outcome or Thematic Focus[c] | Outcome or Focus in relation to Adolescents |
|---|---|---|---|---|---|---|---|
| Sillence (2006a) | United Kingdom | Qualitative | Web observations<br>Focus Groups<br>Media Diaries | 40 | Not disclosed | HS T | n.a. |
| Sillence (2006b) | United Kingdom | Qualitative | Web observations<br>Focus Groups<br>Media Diaries | 13 | 33-68 | HS Ps T | n.a. |
| Sillence (2007) | United Kingdom | Qualitative | Web observations<br>Focus Groups<br>Media Diaries | 15 | 41-60 | HS Ps T | n.a. |
| Tang (2012) | USA | Quantitative | Survey | 221 | 18-23 | C MI HS | n.a. |
| Yang (2012) | USA | Quantitative | Experimental | 167 | College students | C H Pr | n.a. |
| Yi (2013) | Republic of Korea | Quantitative | Experimental | 300 | 20-45+ | HS T | n.a. |

*Note.* Studies are listed alphabetically by first author's last name. n.a. = Not applicable.

[a] Sample sizes provided are the size of samples used for data analysis in the respective study.

[b] Reported ages of study participants. If average age of participants was reported instead of a specific age range, we note (av.) and include the mean. If college or university aged adults was reported without specific ages, we note this with the term "college students."

[c] Outcomes or focal topics of each study noted here. When more than one topics are discussed, our table legend lists abbreviations in alphabetical order.

A = Adolescents as a general population; AC = Adolescent cognition and/or unique cognitive attributes of the adolescent developmental period, including development of capacity for analytic, systematic, rational thinking and decision-making; AHB = Adolescent health behaviors or behavior intentions; AOB = Adolescent online behaviors or behavior intentions; C = Individual judgments and assessments about credibility, including what users find credible online; H = Discussion of the use of heuristics, including heuristics in the online environment; HS = Heuristic and systematic information processing, including the ratio of heuristic versus systematic thinking or processing, and what influences use of one type of processing over another; M = Types of effects of different messages, including how messages are delivered in the digital environment; MI = Discussion of levels of motivation and/or involvement web users may experience in relation to their online behaviors; Pr = Online privacy; Ps = Personalization or tailoring effects on website user trust, including user willingness to disclose personal information online; S = Social aspects of the online environment, including social networks and social means of sharing information; T = Trust in the online environment, including the process of forming trusting attitudes towards specific websites and ongoing use of specific, trusted websites.

Table 3-2. Summary of results

| Study First Author and Year of Publication | Results or Main Points |
|---|---|
| Briggs (2004) | Personalized communication on websites has modest impact on trust judgments made in the early stages of e-commerce transactions. A model with three stages proposes that in addition to first impressions and transactions on websites, people also build trusting relationships with commercial sites over time through repeated personal disclosures and transactions. |
| Flanagin (2008) | Young people are uniquely suited to navigate the digital environment, but face special cognitive and developmental challenges for interpreting uncertainties. |
| Gibbons (2009) | Age and life experience are likely to influence whether adolescents engage heuristics or rational, analytic approaches to decision-making. Riskier health behaviors among adolescents may be the results of more heuristics-based reasoning. Incorporating heuristics into expectancy-value models of adolescent decision-making increase their predictive value. |
| Greene (2002) | Health messages that are more open to interpretation (with deep elaboration demand) are more effective at delivering health messages to adolescents. Younger adolescents who are less cognitively advanced and prone to egocentrism and sensation-seeking report lower risk-taking intentions when exposed to deep demand messages compared to messages that require low interpretation (shallow demand messages). |
| Heirman (2013) | Trust in a particular website is positively linked with the behavioral intention among adolescents to disclose personal information through that website. Prior privacy violations online may not dissuade adolescents from future self-disclosures on websites. |
| Hilligoss (2007) | A unifying framework with three levels is presented to model how people make credibility judgments across a variety of media. The framework includes a construct level that pertains to how people conceptualize credibility. A heuristics level details types of heuristics used for credibility judgments, including source-related and endorsement heuristics. An interaction level refers to credibility judgments based on the attributes of content and messages. |
| Hsu (2008) | The Elaboration-Likelihood Model (a dual process model) has applicability for how consumer trust is developed in online commercial interactions. Factors related specifically to how consumers trust online vendors are added to a new model. Factors include website quality, customer service, reputation of site authors, perceived privacy and security. |
| Huerta (2003) | Web messages with high quality of content and positive reputations of the website owner are more likely to find these messages credible than when quality or reputation of the website owner are low. |
| Kayhan (2011) | Judgments individuals make about website quality based on who governs a website (*governance credibility*) is significantly associated with intention to use information on websites. Governance credibility is a salient construct in online information processing. |
| Koh (2010) | Specialized media sources that provide tailored, expert advice on websites, is significantly correlated with heuristics-based judgments individuals make for purchasing decisions online. Specialization is a psychological cue that triggers quick, positive evaluations and lead to more trusting attitudes. |
| Lim (2013) | People reliably use heuristics in situations where information is abundant and quality of information is uncertain. Being highly knowledgeable about a topic may not decrease a person's use of heuristics to assess credibility of online information. |

| Study First Author and Year of Publication | Results or Main Points |
|---|---|
| Metzger (2007) | Dual processing models are under utilized for conceptualizing how people make web credibility assessments. Motivation and ability play a large part in which type of evaluation strategy (heuristic or systematic evaluation) an individual may use. Educators need to acknowledge heuristics assessments in digital literacy programs. |
| Metzger (2013) | Heuristics play an important role in credibility judgments. Common heuristics employed by individuals faced with abundant information include: reputation, endorsement, consistency, self-confirmation, expectancy violation, and persuasive intent heuristics. |
| Metzger (2010) | Socialization and social cues play a large role in how individuals make credibility assessments online. Cognitive heuristics, including reputation, endorsement, consistency, expectancy violation, and persuasive intent heuristics, are commonly employed by web users to make judgments about online information. |
| Reimer (2009) | The way adolescents process information, using either reasoned or affective processing, can be manipulated. Riskier adolescent health behavior, such as heavy drinking or engaging in casual sex, more often reflects affective information processing and decision-making. |
| Salo (2007) | Trusting beliefs for online consumers are likely to be influenced by both internal and external factors relating to the user's prior experiences and larger social context. |
| Sillence (2006a) | A dual-process informed framework explains how web users seek, interpret, and trust online health resources. The three-stage framework includes initial rejection of some health advice sites based on heuristic assessments, selection or initial trust in advice sites based on careful consideration, and longer term relationships with particular health advice sites. |
| Sillence (2006b) | Web users seeking advice about hypertension follow a staged model framework in assessing which health advice sites will be most useful, and which ones are most trusted. Advice seekers on the web initially reject websites based on design factors, and select sites to closely evaluate based on content factors and personalization. |
| Sillence (2007) | Web users seeking advice about hormone replacement therapy (HRT) follow a staged model framework for deciding whether or not to trust online advice. Users first engage in rapid heuristic screening to quickly reject sites they do not trust. Well-designed sites were then systematically evaluated to assess the level of detail in the content provided and how personalized the content was to them. Personalized content improved trust perceptions. |
| Tang (2012) | High involvement in a subject elicits systematic information processing. People with low involvement are likely to make judgments about information online using peripheral cues or heuristics. |
| Yang (2012) | Privacy seals on websites allow users to quickly assess confidence in sites. Individuals are more likely to engage in heuristic processing when exposed to a privacy policy presented by a frequently-visited social media website. |
| Yi (2013) | Quality of information and source expertise are significantly linked to the trusting attitudes on health advice websites. High quality information includes well-supported health claims; the professional status (medical expert versus non-expert) is an indicator of source expertise. |

Figure 3-1. Overview of literature search strategy

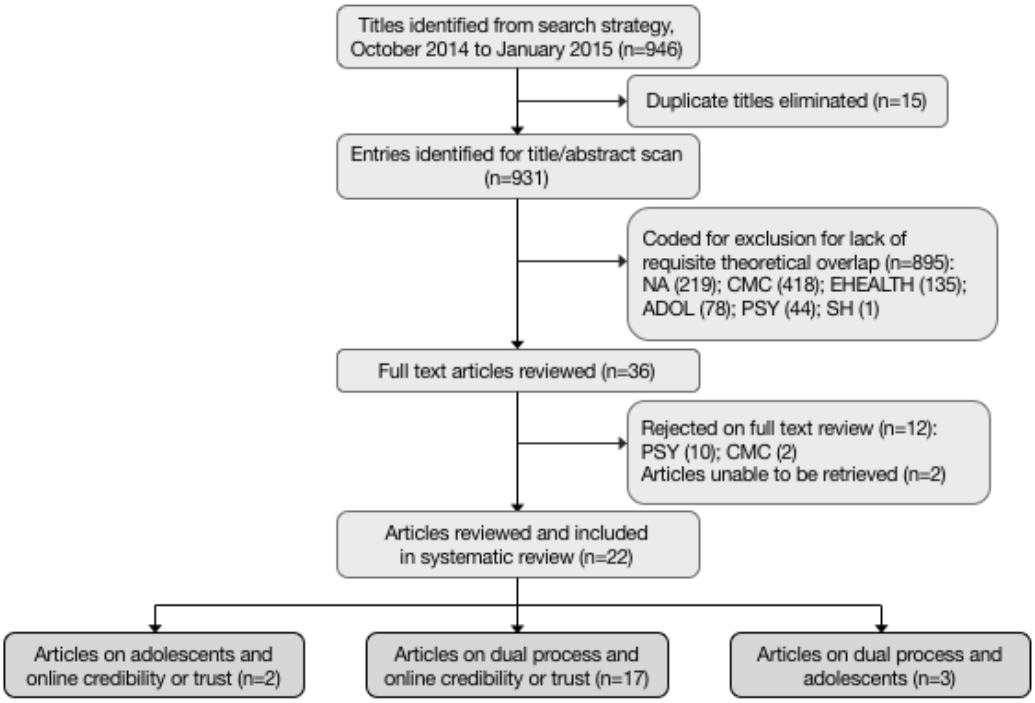


Figure 3-2. Staged model of online trust (Briggs et al., 2004; Sillence et al., 2006b, 2007)

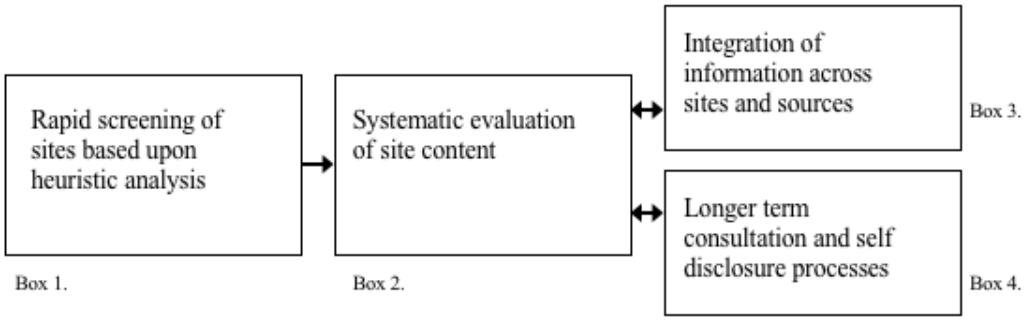
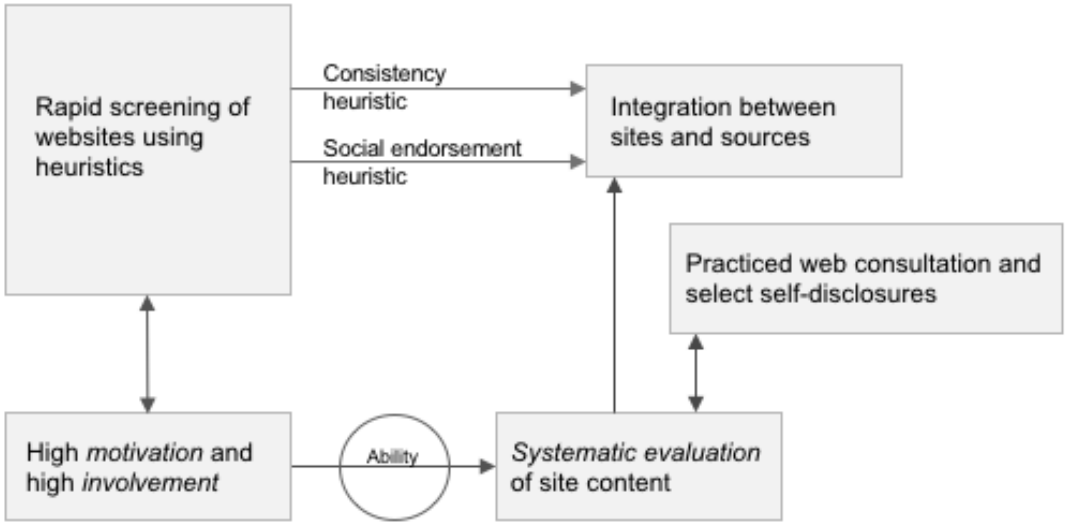



Figure 3-3. The heuristic-systematic model for adolescent trust in online sexual health information (The ASHI Model)



# CONCLUSION

The research project I presented here was developed to build our understanding of the adolescent user experience with web-based sexual health interventions. Our ultimate goal in choosing to focus on adolescent perspectives and experiences *in situ* with online sexual health information was to move away from a reliance on relatively rudimentary ways of measuring impact of online interventions, and tangibly recommend how to reach more adolescents with accurate, relatable sexual health information in the digital environment. This dissertation is a small contribution to a long line of projects and investigations dedicated to understanding how to harness the Internet for improved sexual health among young people in the United States. Each of the papers in this dissertation is intended to help the field build online interventions with more confidence that adolescents will engage with them meaningfully for their own sexual health.

In the first paper, I provided a qualitative analysis of observational interviews with late adolescents that captured unscripted web actions and movements in response to a range of sexual health information tasks, as well as verbal expressions of what participants found credible and trustworthy. A consistent framework for how late adolescents approaching the Internet for specific sexual health information emerged and includes four discreet phases: (1) considering the appropriateness of the Internet for sexual health information and conducting cold searches in an initial approach; (2) reliably selecting only top listed links and resources to open and look through; (3) making assessments about the credibility of the sites they selected, which included avoiding those sites they did not feel were age-appropriate; and (4) validating the information they found online in other places, including by recalling how the information confirms or disconfirms their personal experiences. One of the most revealing findings from this paper focused on how online information about sexual identity is treated differently from the user perspective than other kinds of sexual health information. Adolescents sought information about understanding their own sexuality in more targeted ways compared to information about condom use, STIs, or sexual communication. Storytelling was a preferred mode for learning about sexual identity, whereas for other sexual health information, adolescents found medically-oriented language and clinical websites to be most credible. The emphasis on storytelling is a clear note for intervention designers to include a range of storytelling elements on health websites, even if not explicitly about sexual health.

While the framework this paper presented is useful for understanding adolescent process for finding and evaluating sexual health information online, it is not known the extent to which this process differs from adult web behaviors or adolescent behaviors for other types of information searching. Because I observed such a strong propensity among our adolescent participants to only open and look at top search results, an appropriate next step for future researchers would be to investigate if this phenomenon is unique to adolescents for sensitive health information, or if this may be considered

general web practice. Future research will be extremely informative to understand how online interventions can be designed for maximum credibility in the types of content they deliver, as well as where they appear on the web as a result of user searches.

In the second paper, I presented themes on the boundaries of web personalization for adolescents seeking sexual health information. These findings led to some of the most practical implications in this project for SEW designers and program professionals. I reported high receptivity among adolescents for using online appointment making features and willingness to disclose age and gender through health websites. Adolescents voiced that the "pay off" for these disclosures were high, including the ability to make clinical appointments quickly and confidentially, and information tailored to them based on age and gender.

Notable for interventionists, however, was the skepticism and disinclination adolescents expressed for online health chat features and communication portals with doctors that required an email address, birthdate, or full name. While well intentioned, efforts to incorporate these kinds of features on SEWs or other health sites may not be utilized based on our observations and analysis. Future research is warranted to examine how sexual health websites can create pipelines to "brick and mortar" service centers for adolescent site visitors, without requiring them to input information they feel violates their online privacy.

In the last paper, I systematically reviewed intersections between three fields of literature (adolescence, online trust and credibility, and dual process theories) to uncover critical synergies that I believe have importance for understanding adolescent interactions with online sexual health information. The body of research I included around dual process theories is rich and vast, deeply rooted in social psychology literature and persuasion. Similarly, adolescent development is a topic that has been widely researched empirically. The inclusion and discussion of late adolescence or emerging adulthood in this dissertation project represents newer thinking on the outer limits of development in this age group. In contrast, online trust and web credibility literature, by nature of its focal topic, is the most recent research in the triad. As such, transdisciplinary research that speaks to adolescents' unique informational needs or information processing styles online for health information is an area only beginning to emerge.

As part of this last paper, I developed a conceptual model specifically for adolescents' interaction with sexual health information (ASHI) to help explain how adolescents may interact with online sexual health information. Conceptual models that are not yet empirically tested represent very modest contributions to the field. Nonetheless, the model is unique for its explicit focus on adolescents and sexual health information specifically. The review revealed many methodological designs for assessing online trust and credibility that have not yet been applied to adolescents, or to how the web may offer sexual health information. My hope in presenting a conceptual model based

in an interdisciplinary review approach was to allow future researchers to validate the model with other qualitative or mixed methods studies.

The goal of this dissertation is not to criticize the tremendous efforts put forth to reach adolescents on the web with critical sexual health knowledge, but instead to offer evidence-based recommendations for how we may move forward with improved online sexual health interventions. In the first two papers, our findings and discussion centered on adolescent experiences as web users, made possible by conducting interviews and web behavior observations. In the final paper, our findings focused on critical intersections between perspectives offered by health, information, and psychology theorists and researchers who are able to collectively inform a theoretical base for future studies on adolescents and online sexual health information. Many questions remain about how to best reach young people in digital spaces with sexual health knowledge. Specifically, I believe we may advance this work forward to more comprehensively understand the impact of online interventions, not just for improved sexual health outcomes, but also in terms of their meaning and significance for adolescents themselves as digital citizens.

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## APPENDIX A: PARTICIPANT CONSENT FORM

UNIVERSITY OF CALIFORNIA, BERKELEY
BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO
SAN FRANCISCO • SANTA BARBARA • SANTA CRUZ

SCHOOL OF PUBLIC HEALTH • EXPERIMENTAL SOCIAL SCIENCE LABORATORY

### CONSENT TO PARTICIPATE IN A RESEARCH STUDY

**Introduction**
My name is Summer Starling. I am a graduate student in the School of Public Health at the University of California at Berkeley. I am working with my faculty advisor, Dr. Julianna Deardorff, on a research study. I am using the Experimental Social Science Lab (aka Xlab) at the University of California at Berkeley to conduct my research. I would like to invite you to take part in my study that examines how people judge or evaluate information online about sexual health questions.

**Purpose**
The purpose of this research study is to better understand how individuals in late adolescence (aged 18 to 20) judge or evaluate information online about sexual health questions and topics. The goal of this study is to use this information to improve how sexuality and sexual health information is delivered online through websites and interventions. We are planning to talk with a diverse range of young people.

**Procedures**
If you agree to take part, I will conduct an interview with you at the Xlab that involves searching the Internet. First, you will complete a short questionnaire about your age, race/ethnicity, and gender. Second, you will be asked to sit with me at a computer station and search online for information. The information you will search for will be based on hypothetical prompts and will be about sexual health. Next, we will watch your web navigations. The interview will be about your judgments and decisions about the information you found. Even if you have not previously searched online for information about the topics, your opinion about what is credible is important. With your permission, I will audiotape and take notes during the interview. The recording is to accurately record the information you provide, and will be used for transcription and analysis purposes only. If you choose not to be audiotaped, I will take notes instead. If you agree to being audiotaped but feel uncomfortable at any time during the interview, I can turn off the recorder at your request. Or if you don't wish to continue, you can stop the interview at any time. The interview should last about 60 minutes (1 hour). I expect to conduct only one interview with you.

**Benefits**
There are no direct benefits to you from this research. It is our hope that the research will benefit the scientific community and lead to a greater understanding of how online sexual health information is perceived and may help the public health community build better online interventions aimed at young people. There is little risk to you from taking part in this research.

**Risks / Discomforts**

- Some of the research questions may make you uncomfortable. You may choose not to answer any questions, or to stop the interview at any time.
- There is a chance you may see content online that is sexually explicit. You may choose not to talk about any content you find distasteful or navigate the Internet as you decide.
- As with all research, there is a chance that confidentiality could be compromised; however, we are taking precautions to minimize this risk.

**Confidentiality**
The information you share will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used.

To minimize the risks to confidentiality, we will do the following:

- The data will be collected confidentially. We will not maintain a link between your name and the research data. A code will be given to your interview as soon as it is completed and your name will not be connected with the interview after this time. Each person will have his/her own code number.

- Your research records, including the audio recording, signed consents, and questionnaire, will be carefully stored and protected. Paper files will be stored in a locked cabinet in a secure location. Electronic files will be stored in an encrypted format, on a password-protected computer.

- Only Summer Starling, the Student Researcher, will have access to your study records.

When the research is completed, I may save the tapes and notes for use in future research done by myself. I will retain these records for up to 5 years after the study is over. The same measures described above will be taken to protect confidentiality of this study data.

**Alternatives to Participation**
Your participation in this study is voluntary. You do not have to take part in the interview if you do not want to. You can leave any time you want and for any reason.

**Compensation / Payment**

You will receive a variable payment in the amount of $15 per hour as a thank-you for participating in the study. Payment to you for participation in this experiment will be in the form of a check and arranged by the Xlab. However, you will not receive a check if you do not complete the study. We understand that if you participate in the study, you may refuse to answer any question(s) and still receive full credit.

**Rights**
Participation in research is completely voluntary. You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time. Whether or not you choose to participate in the research and whether or not you choose to answer a question or continue participating in the project, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

**Questions**
You can ask questions about this study at any time, now or later. If you have any questions or concerns about this study, you may contact the Student Investigator, Summer Starling, at (828) 243-4577 or summerstarling@berkeley.edu. Or you may contact Julianna Deardorff, PhD and Principal Investigator at (510) 642-7334 or jdeardorff@berkeley.edu.

If you have any questions regarding your treatment or rights as a participant in this research project, please contact the University of California at Berkeley's, Committee for Protection of Human Subjects at (510) 642-7461, subjects@berkeley.edu.

**CONSENT**
We will give you a copy of this form to keep for future reference.

If you agree to take part in the research, please sign and date below.

I certify that I am 18 years or older. I have read this consent form and I agree to take part in this research.

_____ _____
SIGNATURE DATE

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SCHOOL OF PUBLIC HEALTH • EXPERIMENTAL SOCIAL SCIENCE LABORATORY

**Study: Adolescent Evaluative Judgments and Trust in Online Sexual Health Resources**
**CPHS Approval: 2014-09-6704**

**Interview Guide**

*Thank you for taking the time to participate in this study. This interview should take about an hour. I'm interested in your thoughts about online information related to sexual health. Your perceptions and thoughts will be important to helping me understand how we can improve on sexual health websites and interventions aimed at young people. No information that attributes sites visited online or specific comments to individual participants will be included in my final report.*

*Is it ok if I record our interview?*

*The interview has two parts. First, I'm going to give you some prompts or hypothetical situations where someone would need to go online and find information. I'd like you to imagine that these prompts apply to you. I'll be observing what you do online to find information related to the prompt. Then, in the second part, we'll review what you did together and I'll ask follow up questions.*

*As you go through the process of searching, I'm going to ask you to think out loud about what you are doing and why. Thinking aloud simply means saying out loud what you are thinking as you perform this task. Don't worry about speaking in complete sentences. I'm just interested in some of your impressions on doing this task and what you find online. I may ask some clarifying questions as we go.*

Warm up activity and think aloud instructions

*Let's start with a warm up activity. I'd like you to pretend that this morning you woke up and worried you may have the flu. I'd like you to use the Internet to check symptoms and decide what to do. As you do this, try and say out loud what comes to mind as you work to complete this task.*

[Participant completes warm up task.]

*Now I'll give you some prompts for searches on health information. As you do these and think out loud, try to focus only on the task you are working on. Try not to think about how what you are saying "sounds" – just pay attention to verbalizing what comes to mind as it does. Speak in real life terms and do not worry about sounding correct. There will be time to discuss your decisions more also in the next part of the interview.*

*For each of the prompts below, you can get information you need in any way you'd like. For example, you can do a search using any terms you want, go to a website you know, go to YouTube, etc. The idea is to mimic what you would do if I were not here, like in a real life situation. For these scenarios, you may think of a time that this may have happened to you, or you can completely imagine it. It makes no difference to me because I won't be able to tell the difference.*

<u>Prompts for open web searches (prompts may be paraphrased and elaborated)</u>

1) I'd like you to imagine that you are in a new romantic relationship. You're thinking about becoming intimate with this person, and want to find some information on how to be responsible when it comes to sexual activity.
2) A friend comes to you distressed that they may have a sexually transmitted infection (STI). You want to find trusted information about this situation and how you might advise them to act on their concern.
3) You want to know how to properly use a condom. You've heard there are many steps involved with using condoms, and you want to make sure you have all the right information.
4) Another friend comes to you concerned because they are questioning their sexual identity. This could mean they are coming out, think they might be gay, or queer, or are just questioning sexual identity. You want to learn about sexual identity to be able to give your friend good information about what they're going through.

<u>Break</u>

*We'll take a few minutes here to break as the video file loads.*

*What was that like for you?*
*Did anything surprise you about thinking aloud?*
*What were your impressions of that process, or what you just did?*

*Did that feel somewhat true to real life? In what ways yes, or no?*
*Do you have any reflections on how you find trustworthy information about these topics that are helpful to you?*

Questions

Based on the Grounded Theory model, not all questions will be asked of all participants. Some questions may depend on search activities and think aloud utterances. Some questions may be in response to specific online actions. In addition, some questions that do not appear on this list may be included if relevant to the course of the interview. Questions may be asked during prompted searches, during the break, and during the post-search interview.

1. Tell me about how you chose to start the search process.
2. Why did you choose that specific search engine?
3. Can you tell me more about the search terms you used for this prompt?
4. Why did you follow that link?
5. What was it about this site that drew you to it?
6. Tell me about your decision to go to a specific site first. What is some of your previous experience with this site?
7. What kinds of information would you avoid? Why?
8. Why did you disregard that site or not look at that site closely?
9. What made you decide to stay on this website for longer?
10. What were your initial impressions of that site or source of information?
11. Have you seen this information represented elsewhere? If yes, where?
12. What stood out about this site from the others?
13. What about this information seems trustworthy to you? Not trustworthy?
14. Do you recognize the source of this information?
15. Do you believe that your privacy is protected during this process? Why or why not?
16. Do you think this site protects your privacy? How important is this to you?
17. Does this site seem confidential, like your searches or queries are safe?
18. What ways do you feel this site has been tailored to you specifically? Is this important to you?
19. Did anything surprise you about the decisions you made?

Probes may also be used to follow up on these questions.

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**Questionnaire**

Q1 How old are you?

- ❍ 18
- ❍ 19
- ❍ 20

Q2 What is your gender?

- ❍ Male
- ❍ Female
- ❍ Transgender
- ❍ Other: _____

Q3 What is your ethnicity? Check all that apply.

- ❑ African American
- ❑ Asian / Pacific Islander
- ❑ Latino / Latina
- ❑ White
- ❑ Other: _____

Q4 How would you describe your previous experience searching for sexual health information online or on the Internet?

- ❍ I would say I rely on the Internet to find sexual health information / use it regularly for this purpose
- ❍ Sometimes I will look online for sexual health information
- ❍ I usually consult other sources other than the Internet for sexual health questions

Q5 Have you ever been to a clinic or seen a doctor about a sexual health issue? An example would be getting an STD test.

- ❍ Yes
- ❍ No

Q6 If yes, how recently was that visit?

- ❑ Less than 3 months ago
- ❑ Between 3 months and 1 year ago
- ❑ More than 1 year ago