



# Exploring longitudinal associations between social determinants of health during adolescence and self-reported contraceptive use in young adulthood in the United States

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## ABSTRACT

**Objective:** Childhood environment and socioeconomic status influence adult health. Past research links early social and economic disadvantages to later-life diseases and substance abuse, but their effects on contraceptive use remain unexplored. This longitudinal study utilizes the Social Determinants of Health (SDH) framework to explore the associations between social domains in adolescence and contraceptive use in young adulthood.

**Study design:** Fourteen measures of the SDH domains were extracted from the National Longitudinal Study of Adolescent and Adult Health Wave I data (1994–95) to explore associations with reported ever-use and consistent use of contraception among young adults in the U.S (18–26 years) at Wave III (2001) using multilevel logistic regression.

**Results:** Among 11,172 participants, 87.60 % reported past-year ever-use of contraception, while 47.30 % were consistent contraceptive users. Measures significantly associated with the past year's ever-use of contraceptives in young adulthood included parents' high school graduation status (positive/+), volunteering experience (+), history of foster care (negative/–), and parental reporting a trash problem in the neighborhood (–) during adolescence. For consistent use of contraception in young adulthood, parent high school education (+), volunteering experience (+), higher social cohesion scores (+), access to health care (+), receiving family planning counseling (–), parental receipt of public assistance (–), non-English language spoken at home (–) and the number of neighborhood crimes (–) during adolescence were found to be significant.

**Conclusions:** A favorable environment during adolescence provides a foundation for positive health behaviors. Interventions aimed at improving contraceptive use in young adulthood should consider creating supportive environments for adolescents.

## 1. Introduction

Childhood environment and socioeconomic status during adolescence influence health into adulthood (Cohen et al., 2010; Pollitt et al., 2007; Greenfield et al., 2021; Pudrovskaya and Benedicta, 2014). Recent research suggests that early life social conditions and neighborhood environment influence various health behaviors linked to adult health outcomes, such as cardiovascular diseases (Cohen et al., 2010; Pollitt

et al., 2007) and dental diseases (Poulton et al., 2002). Adolescence is a critical period of the individual's life. Life course theory explains that adolescents' backgrounds and social structures continuously impact their choices and actions in their later lives (Elder et al., 2015; Elder et al., 2003). The experiences, socio-economic background, and upbringing during adolescence are related to their health behavior and health outcomes. These early life circumstances also build the foundation for adult sexual behaviors and outcomes. For example, girls exposed

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to neighborhood poverty during adolescence are at increased risk of sexually transmitted diseases, such as chlamydia, during young adulthood (Ford and Browning, 2014). However, limited knowledge exists on how adolescent social conditions shape adults' reproductive health choices and behaviors associated with safe sex practices.

Public health experts advocate the consistent use of contraception to prevent adverse sexual health outcomes, such as unintended pregnancies and transmission of sexually transmitted diseases (Centers for Disease Control and Prevention (CDC), 2021). Yet, data from the 2015–2017 National Survey of Family Growth show that approximately 60 % of 15–19 years adolescents and 40 % of young women aged 20–29 years do not use any method of contraception (Center for Disease Control and Prevention (CDC), 2018). Additionally, the rate of unintended pregnancy is consistently highest among women aged 20 to 24 years (81 pregnancies per 1000 women), followed by 18–19 years women (71 pregnancies per 1000 women) and 25–29 years women (66 pregnancies per 1000 women) (Finer and Zolna, 2016). To reduce the risk of unintended pregnancies, which are associated with numerous mental health conditions, financial problems, and behavioral disorders among young mothers (Furstenberg Jr, 2003; Logan et al., 2007; Nelson et al., 2022), it is necessary to understand why young adults use or do not use contraception or fail to use contraception consistently.

Most prior studies have utilized cross-sectional analyses to explore associations of intrapersonal factors on the use or non-use of contraception. Most commonly, researchers have explored the impact of beliefs, knowledge, relationship status, and family dynamics on an individual's use of contraception (Amialchuk and Gerhardinger, 2015; Kao and Manczak, 2013; Kwon et al., 2021; Manlove et al., 2008). Although this research helps identify numerous intrapersonal and interpersonal factors, there is a lack of information about community and social factors related to neighborhood or health care associated with contraceptive use among young adults. Given that socioeconomic advantages or disadvantages in adolescence influence much of adults' physiological and psychological aspects, there might be early-life determinants of adult contraceptive use. Thus, there is a need to explore the effects of social conditions and background during adolescence on contraceptive use and consistency among young adults.

To address this gap, we used a Social Determinants of Health (SDH) framework to investigate the longitudinal association between various social determinants during adolescence (early life circumstances) and contraceptive use in young adulthood. SDH framework integrates the vital determinants that affect a wide range of health indicators and quality of life outcomes. This framework is endorsed by Healthy People 2030 and comprehensively covers five distinct domains. Each specific domain further includes several key issues (Table 1). We can assess many factors within a single study by utilizing this framework and associated key areas of each domain.

Therefore, this study aimed to identify (1) the SDH key issues at adolescence that are significantly associated with young adults' use of contraception and (2) the SDH key issues at adolescence that are significantly associated with consistent use of contraception among young adults.

## 2. Method

### 2.1. Sample

We utilized the National Longitudinal Study of Adolescent Health data, commonly known as Add Health. The Add Health study collected school-based, multi-wave data to understand the causes of adolescent health and health behavior by emphasizing multiple contexts associated with adolescent and adult life (Chen and Chantala, 2014). Since 1994–1995, Add Health has gathered five waves of data, the latest in 2016–2018 when the cohort was between the ages of 31–42 (Chen and Chantala, 2014). From these data, we used the two waves of data that matched the age group of adolescents and young adults. We utilized the Wave I data collected in 1994 to explore the early life circumstances of participants enrolled in grades seven through 12. To acquire the data related to young adults who have persistently high rates of unintended pregnancy rates (Center for Disease Control and Prevention (CDC), 2018; Finer and Zolna, 2016), we utilized Wave III data collected in 2001–2002 when participants were 18–26 years old. Participants were asked about various characteristics describing social, economic, environmental, psychological, and physical health measures (Harris et al., 2019). The University of Oklahoma Institutional Review Board (IRB) determined that the present analysis was exempt from federal regulations requiring IRB review.

With the study focus on contraceptive use, we restricted our sample to respondents who reported being sexually active in the 12 months prior to data collection at Wave III ( $n = 11,575$ ). Next, we removed 403 respondents who did not have valid sampling weights. Thus, the analytic sample comprises 11,172 sexually active individuals (73.65 % of the Wave III sample).

### 2.2. Measures

#### 2.2.1. Dependent variable

In the Wave III survey, contraceptive use among young women was measured using one question, “In the past 12 months, did you or your partner(s) use any of these methods for birth control or disease prevention?” with options “birth control pills,” “an implant,” “birth control shot,” “a diaphragm,” “emergency contraception or the morning after pill,” “natural family planning (safe periods by temperature, cervical mucus test or calendar)” and “female sterilization.” For young men, options of “condom” and male sterilization” were added. If the participant selected any contraception method, the response was coded as “yes—used contraceptive methods,” or else it was coded as “no.” Additionally, for consistency of contraceptive use, participants were asked, “On how many occasions of vaginal intercourse in the past 12 months did you or your partner use some form of birth control or pregnancy protection?” Response options were “none,” “some,” “half,” “most,” and “all” with the additional options of “refused,” “legitimate skip,” “don't know” and “not applicable.” Following the protocol outlined by Morrison et al. in their 2016 study, (Morrison et al., 2016) we coded participants who indicated using some form of contraception all the time as consistent contraceptive users. Those who selected never, some, half, and most of the time as their response options were categorized as

**Table 1**

United States office of health and human services, healthy people 2030, social determinants of health framework.

Social Determinants of Health					
Determinant areas	Economic Stability	Education	Social and Community Context	Health and Healthcare	Neighborhood and Built Environment
Critical components /key issues	<ul style="list-style-type: none"> <li>Poverty</li> <li>Employment</li> <li>Food Insecurity</li> <li>Housing Instability</li> </ul>	<ul style="list-style-type: none"> <li>High School graduation Rates</li> <li>Enrollment in Higher Education</li> <li>Language &amp; Literacy</li> <li>Early Childhood Education and Development</li> </ul>	<ul style="list-style-type: none"> <li>Discrimination</li> <li>Social Cohesion</li> <li>Civic participation</li> <li>Incarceration</li> </ul>	<ul style="list-style-type: none"> <li>Access to health care</li> <li>Access to primary care</li> <li>Health literacy</li> </ul>	<ul style="list-style-type: none"> <li>Quality of housing</li> <li>Crime and violence</li> <li>Environmental conditions</li> <li>Access to foods that support healthy eating patterns</li> </ul>

inconsistent contraceptive users.

### 2.2.2. Independent variables

We utilized measures related to all five Healthy People 2030 SDH Framework areas. Based on the SDH framework, proxy measures were chosen from the survey that best described key areas included under each SDH domain. Specifically, we extracted measures related to social domains from the Wave I adolescent in-home survey and Wave I parent in-home survey. Since few measures related to adolescence were retrospectively reported in Wave III, items were extracted from Wave III to reflect the social domains during adolescence. For example, a question asked in Wave III was worded as “How many times were you arrested before you were 18?” A complete list of proxy measures used to assess the key areas of five SDH domains are included in Table 2.

### 2.2.3. Covariates

We included the age, sex, and race/ethnicity of the participants as demographic variables. Combining the response options for race and ethnicity, participants were categorized into four distinct categories: Non-Hispanic White, Hispanic, Non-Hispanic Blacks, and Other. Additionally, we controlled for participant's/their partner's pregnancy status at Wave III data collection.

### 2.3. Statistical analysis

Descriptive statistics were analyzed, including basic frequencies and weighted percentages for all contraceptive behaviors and key issues extracted from Wave I and III. Using the Variance Inflation Factor (VIF), we assessed collinearity among independent variables. The VIF was less than ten for all the independent variables, suggesting no collinearity issue. Bivariate correlations were explored between all dependent and independent variables as shown in Supplementary Table (S1).

We employed two separate multi-level logistic regressions to explain the associations of SDH key issues with the ever-use and consistent use of contraception. We controlled for age, race/ethnicity, sex, time lapse between Wave I and Wave III, and pregnancy status of the participants at Wave III. We utilized Stata v. 16.0 for descriptive statistical analysis (Corp, 2016) and Mplus 8.7. for logistic regressions incorporating Add Health sampling weights, adjusting for the complex sampling design and treating for missing values.

## 3. Results

Table 3 shows the characteristics of the study sample. The mean age of the sample at Wave III was 22.88 years (range: 18–28; SD: 1.84). Most participants were White (65.4 %) and not pregnant (96.1 %). There was a fairly even split between male (46.2 %) and female (53.8 %) participants. Of the 11,172 participants, 87.6 % reported ever-use of contraception in the past year, while 47.3 % used some form of contraception consistently. The bivariate correlations between key variables measured under the five distinct domains of SDH and ever-use and consistent use of contraception are presented in Supplementary Table (S1).

Four measures related to economic stability, education, social and community context, and neighborhood and built environment were significantly associated with young adults' ever-use of contraception (Table 4). Living in foster care and having a trash problem in the neighborhood during adolescence decreased the odds of using contraception in young adulthood. Alternatively, adolescents whose parents had a high school degree and were involved in civic participation had increased odds of using contraception in young adulthood.

As depicted in Table 5, access to health care and higher social cohesion as an adolescent were found to be a significant and positive predictor of young adult's consistent use of contraception. Additionally, living in a neighborhood with more crimes during adolescence and speaking a non-English language at home decreased the odds of consistent use of contraception in adulthood. Interestingly, going for

**Table 2**

Survey questions extracted from the national longitudinal study of adolescent to adult health (Using Wave I, 1994–1995 & Wave III, 2001–2002) for use as proxy measures of social determinants of health related to contraceptive use among a sample of U.S. young adults.

Economic Stability	Response Options
Poverty *	
Are you currently getting AFDC <sup>a</sup> , public assistance, or welfare?	Yes/No/Don't know/refused/N/A
Coded as: Yes/No	
Employment Status*	
Do you work outside the home?	Yes/No/Refused/missing
Coded as: Yes/No	
Housing Instability*	
Did you ever live in a foster home?	Yes/No/Refused/Don't know/missing.
Coded as: Yes/No	
Education	
High School Graduation *	
What is the highest grade or year of regular school you have completed?	8 <sup>th</sup> grade to professional training
Coded as: High school graduate (Yes/No)	
Higher education enrolment*	
What is the highest grade or year of regular school you have completed?	8 <sup>th</sup> grade to professional training
Coded as: some college and above (Yes/No)	
Language and Literacy	
What language is usually spoken in your home?	English/Spanish/other/refused/don't know.
Coded as: English/Non-English	
Social and Community Context	
Incarceration*	
How many times were you arrested before you were 18?	0-30, refused, skip, don't know, not applicable, missing.
Coded as: continuous variable	
Civic Participation*	
At any time during your adolescence, when you were between 12 and 18 years old, did you regularly participate in volunteer or community service work?	Yes/No/refused/don't know/not applicable.
Coded as: Yes/No	
Discrimination	
How much do you agree or disagree with the following: Students at your school are prejudiced?	Strongly agree – Strongly disagree, refused, skip, don't know.
Coded as: Likert scale (strongly agree-strongly disagree)	
Social Cohesion	
Indicate whether the following statement is true for you: (You know most of the people in your neighborhood, In the past month, you have stopped on the street to talk with someone who lives in your neighborhood, People in this neighborhood look out for each other, Do you use a physical fitness or recreation center in your neighborhood?, Do you usually feel safe in your neighborhood?)	True/False, Yes/No
Coded as: Sum of the scores	
Health and Health Care	
Access to Health services	
Has there been any time in the past 12 months when you thought you should get medical care, but you did not?	Yes/No/Refused/Don't know.
Coded as: Yes/No	
Access to Primary Care	
In the past year, have you had a routine physical examination?	Less than a year ago, 1-2 years ago, more than 2 years ago, never, refused, don't know, N/A.
Coded as: Yes/No based on 12 months as cut off	
Health Literacy	
In the past year have you received family planning counseling services?	Yes/No/Refused/Don't know
Coded as: Yes/No	
Neighborhood and Built Environment	
Crime and Violence	

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**Table 2** (continued)

Economic Stability	Response Options
Which of the following things happened in the past 12 months? (Stab/shoot, pulled a gun, pulled a knife....)	Never, once, more than once, refused, don't know, N/A.
Coded as: never (0), once or more (1); sum of the scores	
Environmental conditions <sup>a</sup>	
In this neighborhood, how big a problem is litter or trash on the streets and sidewalks?	No problem at all, a small problem, a big problem, refused, missing.
Coded as: no problem at all, a small problem, a big problem.	

Note:

<sup>a</sup> Adolescent Wave III survey.

a Aid to Families with Dependent Children (AFDC).

Those that are not indicated are extracted from the Adolescent Wave I survey.

\* Parent Wave I survey.

family planning counseling as an adolescent decreased the odds of consistent use of contraception as an adult.

#### 4. Discussion

Utilizing a nationally representative sample, we explored the association of social determinants during adolescence and contraceptive use during young adulthood. Adolescents' family and environmental experiences shape their health behaviors and outcomes over time (Ford and Browning, 2014; Hertzman, 1999). Our recently published cross-sectional study found that economic stability, employment, education, language, civic participation, and access to primary care at young adulthood were significantly associated with contraceptive ever-use, while consistent contraceptive use was also linked with incarceration history and healthcare access (Bhochhibhoya et al., 2025). These findings provide valuable insights into the immediate relationship between SDH and contraceptive behaviors, however, cross-sectional data cannot capture how these associations manifest over time. Building on this, our longitudinal analysis reveals that economic stability, parental education, and social context during adolescence are linked to ever-use of contraception in young adulthood. Additionally, consistent contraception use in adulthood is associated with healthcare and neighborhood factors from adolescence, suggesting that early-life environments play a long-term role in shaping preventive sexual behaviors.

We found that parent's receipt of public assistance is significantly and negatively associated with the consistency of contraceptive use in young adulthood. Similar associations have also been found in prior cross-sectional research where higher family income is linked with a greater likelihood of reporting the use of birth control (Kao and Man- czak, 2013) and dual methods of contraception among adolescents (Guzzo and Sarah, 2018; Guzzo et al., 2021). Living in foster care during adolescence is an important factor associated with the ever-use of contraception among young adults. Although this association was not significant for consistent use of contraception, it is understandable that adolescents in foster care may have missed out on sexual health education opportunities, (Combs et al., 2018) which might be associated with noninvolvement in preventive behavior in young adulthood. Formal sex education is significantly associated with contraceptive use at sexual debut, effective method use, and frequent use (Kwon et al., 2021; Manlove et al., 2008; Jaramillo et al., 2017). Given the risks of inadequate sex education, this finding supports integrating sex education and pregnancy prevention interventions into child welfare programs, particularly for marginalized youth in foster care.

Prior cross-sectional studies have mixed findings on parental education and contraceptive use. One research study found no significant association between parental education and contraceptive use among male adolescents, (Nelson et al., 2022) while others report higher contraceptive use among adolescents whose parents have over 12 years of

**Table 3**

Descriptive statistics of variables associated with social determinants of health during adolescence (Wave 1, 1994–1995) and self-reported contraceptive use measured in young adulthood (Wave III, 2001–2002) of the National Longitudinal Study of Adolescent to Adult Health ( $N = 11,172$ ) survey collected among U.S young adults.

Variable	N (M)	% (SD)
Age at Wave III	(22.9)	(1.8)
Race/ethnicity		
White	7307	65.4
Hispanic	1307	11.7
African American	1763	15.8
Other	795	7.1
Sex		
Male	5565	49.8
Female	5607	50.2
Dependent variables		
Past-year ever use of contraception		
Never used	1383	12.4
Used	9752	87.6
Consistency of use		
Inconsistent users	5831	52.7
Consistent users	5235	47.3
Economic Stability		
Poverty (Parent)		
Did not receive assistance	8863	90.8
Received assistance	893	9.2
Employment (Parent)		
Not employed	2579	26.4
Employed	7193	73.6
Lived in foster care		
No	10,952	98.1
Yes	211	1.9
Education		
High school graduation		
Not Graduated	1586	16.3
Graduated	8146	83.7
Language spoken at home		
English	10,443	93.5
Other	729	6.5
Social and Community Context		
Incarceration		
Number of times arrested	(0.1)	(1.0)
Civic participation		
Did not volunteer	6640	59.7
Volunteered	4485	40.3
Discrimination	(2.8)	(1.2)
Social Cohesion	(3.4)	(1.1)
Health and Health Care		
Access to health care		
Poor access	2290	20.5
Good access	8877	79.5
Access to primary care		
More than 1 year ago	3571	32.1
Within the last 1 year	7548	67.9
Family Planning counseling		
No	10,504	94.2
Yes	650	5.8

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**Table 3** (continued)

Variable	N (M)	% (SD)
Neighborhood and Built Environment		
Crime and violence	(0.8)	(1.3)
Environment (Trash problem)	(1.5)	(0.6)
No problem at all	5146	52.7
A small problem	4025	41.2
A big problem	587	6.0

Note: All n and percentages are weighted.

education (Isley et al., 2010; Ford and Forthofer, 2010). Notably, increased maternal education fosters a family environment that supports parent-child communication about sex, promoting connectedness, decision-making skills, delayed sexual debut, higher contraceptive use leading to lower adolescent pregnancy risk (Longmore and DeMaris, 1997; Miller et al., 2009). Like previous studies on preventive behavior, (Thompson et al., 2019) the language spoken at home influences contraceptive use. It affects participation in school-based family planning programs and may reflect acculturation challenges, particularly for non-English-speaking adolescents reconciling beliefs about contraception (Sterling and Sadler, 2009). Tailored educational interventions could improve contraceptive use in these populations.

Health and healthcare determinants during adolescence were not significantly associated with the past year's ever-use of contraception among young adults. However, having access to health care whenever they thought they needed it during adolescence had a significant association with using contraceptives consistently among young adults. Access to health care as per their needs could be associated with good health insurance coverage (Hoffman and Julia, 2008) and better socioeconomic conditions when compared to individuals who did not have access to timely health care. These health insurance coverages matter more for the consistent use of contraception as people rely on steady income or health insurance coverage to pay for their effective contraception over time (Kerber and Pinchak, 2022). Additionally, family planning counseling during adolescence was also significantly associated with consistency of contraceptive use in adulthood, but not in a direction that was expected. This study used family planning counseling as a proxy measure for health literacy. Although only a small percentage (6.11 %) of the participants reported receiving family planning counseling during adolescence, counseling during adolescence was found to have a significant negative association with the consistent use of contraception in young adulthood. While prior studies suggest counseling improves positive attitudes toward sex, self-efficacy, and safe sex behaviors (Bonny, 2021; Dahl et al., 2018), this finding may reflect differences in adolescents who sought counseling, such as earlier sexual debut or misinterpretation of the survey question. Future research should investigate how counseling content and delivery impact contraceptive use in adulthood.

Two key issues related to social and community context were found to have significant associations with consistent use of contraception in young adulthood. Adolescents' involvement in unpaid volunteer work often indicates a stable socioeconomic background and thus can be used as a proxy for economic status. Past research has also confirmed that involvement in unpaid volunteer work in a community during adolescence signifies greater perceived belongingness to the community (Brown et al., 2012). This type of community harbors less stressful situations for adolescents while growing up, where risky behaviors such as unprotected sex and violent activities are discouraged (Miller et al., 2001). This supportive social context during adolescence promotes preventive behaviors, including contraceptive use, into adulthood.

Parental report of trash problems was associated with participants' ever-use of contraception in young adulthood. Still, the number of crimes observed in the neighborhood was unrelated to the use of contraception. It is plausible to assume that neighborhoods with litter or trash problems are economically disadvantaged and medically

**Table 4**

Multi-level logistic regression predicting self-reported ever use of contraception among a sample of U.S. young adults in Wave III (2001–2002) of the national longitudinal study of adolescent to adult health using measures associated with social determinants of health during adolescence (Wave I, 1994–1995) (N = 11,172).

Variables	B	S.E	OR (95 % CI)
Economic Stability			
Poverty (Ref. Did not receive assistance)			
Received assistance	−0.2	0.1	0.8 (0.61, 1.05)
Employment (Ref. Not employed)			
Employed	0.0	0.1	1.0 (0.83, 1.24)
Housing instability (Ref. Not lived in a foster care)			
Lived in a foster care	−0.7	0.3	0.5 (0.31, 0.85) **
Education			
High school graduation (Ref. Not Graduated)			
Graduated	0.6	0.1	1.9 (1.43, 2.46) **
Language spoken at home (Ref. English)			
Other	0.0	0.1	0.9 (0.76, 1.23)
Social and Community Context			
Incarceration (Ref. Not arrested)			
Arrested	0.0	0.0	1.0 (0.93, 1.08)
Civic participation (Ref. Did not volunteer)			
Volunteered	0.5	0.1	1.6 (1.33, 1.89) **
Discrimination			
Discrimination Score	0.0	0.0	0.9 (0.92, 1.06)
Social Cohesion			
Social Cohesion score	0.1	0.0	1.1 (0.98, 1.14)
Health and Health Care			
Access to health care (Ref. Poor access)			
Good access	0.0	0.1	1.1 (0.92, 1.35)
Access to primary care (Ref. more than 1 year ago)			
Within the last 1 year	0.0	0.1	1.1 (0.94, 1.24)
Family Planning (Ref: No counseling)			
Counseling	0.2	0.2	1.2 (0.88, 1.63)
Neighborhood and Built Environment			
Crime and violence			
Crime score	0.0	0.0	0.9 (0.90, 1.02)
Environmental conditions			
Trash problem	−0.2	0.1	0.8 (0.72, 0.93) **
Control Variables			
Age	−0.1	0.0	0.9 (0.87, 0.95) **
Race/ethnicity (Ref. White)			
Hispanic	−0.3	0.1	0.8 (0.72, 1.02) *
African American	0.0	0.1	1.0 (0.8, 1.21)
Other	0.0	0.2	0.9 (0.50, 1.03)
Sex (Ref. Male)			
Female	0.1	0.1	1.1 (0.93, 1.16)
Pregnancy Status (Ref. Not pregnant)			

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**Table 4** (continued)

Variables	B	S.E	OR (95 % CI)
Pregnant	−1.1	0.2	0.3 (0.90, 0.95) **
Time lapse Time between Wave I and Wave III	0.0	0.0	1.0 (0.99, 1.00)

Note: The age, race/ethnicity, sex, and pregnancy status of the respondents were controlled for.

\*  $p \leq 0.05$ , \*\* $p \leq 0.01$ ; Ref: Reference category; B = unstandardized coefficient. Results are weighted to adjust for sampling.

underserved neighborhoods where people might not have adequate knowledge, positive attitudes, and self-efficacy toward contraceptive use (Xu et al., 2020). These neighborhoods might have had access to Planned Parenthood facilities that intentionally served lower-resourced neighborhoods during the early 2000s (Smith et al., 2022). However, the difficulty in accepting positive social norms around preventive health behaviors in neighborhoods with concentrated socioeconomic disadvantage may have discouraged protective behavior, such as contraceptive use among young adults (Fagan et al., 2014). We also identified that adolescents who grow up in a neighborhood where crimes are common are less likely to use contraception consistently in adulthood. Prior research explains this association between neighborhood disorder and crimes and adolescent risky sexual behavior via stressors that stem from living in poverty (McLaughlin et al., 2010). Additionally, multiple studies have confirmed the association between crimes and decreased neighborhood safety with engagement in risky sexual behavior, such as earlier sexual initiation and adolescent pregnancy (Minnis et al., 2022; Decker et al., 2018). Additional longitudinal studies are warranted to explain the causal link between neighborhood factors and contraceptive use behavior.

#### 4.1. Strengths and limitations

This is the first longitudinal study with a large sample to use a comprehensive SDH framework to identify key SDH domains affecting contraceptive use. These findings can enable public health authorities and healthcare providers to identify and intervene in key areas of SDH, enhancing access and use of contraception among young adults. The use of a nationally representative sample and appropriate sampling weights for the analysis are the additional strengths of this study. However, there are numerous limitations to be noted. There might be a possibility of social desirability bias as participants might have answered in a more acceptable way than what reflects their reality. Additionally, it should be noted that the measure of contraception ever-use variable asked about conception use for both birth control and disease prevention purposes, whereas the measure for the use consistency variable only asked about contraception for birth control purposes. Due to the wording difference, there could be differences in participants' responses as participants may not report their consistent contraception use if it was for disease control purposes only. Specific types of contraception were not explored when assessing consistency. It is possible that women consistently using effective contraceptive methods (e.g., implants) may differ significantly from those using less effective contraceptive methods (e.g., withdrawal) in terms of social domains. Because participants who used any contraception will be combined into a homogenous group representing consistent users, the association between social domains and consistent contraceptive use could be underestimated. Also, the secondary data we used did not fully examine the relationship between participants who had same-sex partners and were not at risk for pregnancy and the intentional trying for the pregnancy. Future research should consider incorporating these factors to better enhance the comprehensiveness of the analysis.

Another limitation is using proxy measures to represent key issues

**Table 5**

Multi-level logistic regression predicting self-reported consistency of contraceptive use among a sample of U.S. young adults in Wave III (2001–2002) of the National Longitudinal Study of Adolescent to Adult Health using measures associated with Social Determinants of Health during adolescence (Wave I, 1994–1995) (N = 11,172).

Variables	B	S. E.	OR (95 % CI)
<b>Economic Stability</b>			
Poverty (Ref. Did not receive assistance)			
Received assistance	−0.3	0.1	0.8 (0.61, 0.96) **
<b>Employment</b> (Ref. Not employed)			
Employed	−0.1	0.1	0.9 (0.82, 1.09)
<b>Housing instability</b> (Ref. Not lived in a foster care)			
Lived in a foster care	−0.3	0.2	0.8 (0.51, 1.13)
<b>Education</b>			
High school graduation (Ref. Not Graduated)			
Graduated	0.3	0.1	1.3 (1.07, 1.58) **
<b>Language spoken at home</b> (Ref. English)			
Other	−0.3	0.1	0.7 (0.58, 0.94) *
<b>Social and community context</b>			
Incarceration (Ref. Not arrested)			
Arrested	0.0	0.0	0.9 (0.91, 1.05)
<b>Civic participation</b> (Ref. Did not volunteer)			
Volunteered	0.2	0.1	1.3 (1.13, 1.41) **
<b>Discrimination</b>			
Discrimination Score	0.0	0.0	1.0 (0.96, 1.05)
<b>Social Cohesion</b>			
Social Cohesion score	0.1	0.0	1.1 (1.02, 1.13) **
<b>Health and Health care</b>			
Access to health care (Ref. Poor access)			
Good access	0.2	0.1	1.2 (1.07, 1.37) **
<b>Access to primary care</b> (Ref. more than 1 year ago)			
Within the last 1 year	0.1	0.1	1.1 (0.99, 1.26)
<b>Family Planning</b> (Ref. No counseling)			
Counseling	−0.3	0.1	0.8 (0.63, 0.93) **
<b>Neighborhood and built environment</b>			
Crime and violence			
Crime score	−0.1	0.0	0.9 (0.88, 0.96) **
<b>Environmental conditions</b>			
Trash problem	0.0	0.1	0.9 (0.90, 1.08)
<b>Control Variables</b>			
Age	0.0	0.0	0.9 (0.95, 1.01)
<b>Race/ethnicity</b> (Ref. White)			
Hispanic	−0.3	0.1	0.8 (0.64, 0.96) *
African American	−0.5	0.1	0.6 (0.51, 0.69) **
Other	−0.2	0.1	0.9 (0.65, 1.13)
<b>Sex</b> (Ref. Male)			
Female	0.1	0.1	1.1 (0.94, 1.17)
<b>Pregnancy Status</b> (Ref. Not pregnant)			

(continued on next page)

Table 5 (continued)

Variables	B	S. E.	OR (95 % CI)
Pregnant	−2.6	0.3	0.6 (0.04, 0.12) **
Time lapse Time between Wave I and Wave III	0.0	0.0	1.0 (0.99, 1.00)

Note: Age, race/ethnicity, sex, and pregnancy status of the respondents were controlled for.

\*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ ; Ref: Reference category; B = unstandardized coefficient. Results are weighted to adjust for sampling.

under SDH domains. Proxy measures selected may or may not have been asked in a manner that best describes the SDH key issues. Though the proxy measures used in the study have been previously used in similar studies published using SDH (Thompson et al., 2019; Maness et al., 2022), the variables may not completely measure how the domains have been described in the Healthy People 2030 SDH framework. Past research has used family planning counseling as a measure to quantify adolescents’ knowledge and use of contraception (Pritt et al., 2017). Additionally, because Add Health data incorporated a few questions/items related to adolescence in Wave III, items from Wave III have been used to reflect social domains of the earlier wave – Wave I. This could have brought along some recall bias in the data. Despite the longitudinal nature of the study, contraceptive use at baseline (Wave I) was not controlled for when analyzing the link between Wave I social domains and Wave III contraceptive ever-use and consistency of use. Because of this, we cannot ascertain if the longitudinal associations were due to Wave I social domains cross-sectionally associated with Wave I contraceptive use, which further predicted Wave III contraceptive use. Further testing of this longitudinal association is needed with different datasets.

Finally, using data from the late 1990s and early 2000s, this study should be interpreted cautiously when generalizing to today’s young adults. Add Health data represents a generation of adolescents that may have different views and circumstances of the generation of adolescents today. There have been significant changes in healthcare policy and the contraceptive landscape. For example, the Obama administration increased publicly funded family planning services under the Affordable Care Act, such as the expansion of Planned Parenthood and coverage of birth control methods under an insurance plan. This was followed by a concerted effort to exclude Title X national family planning programs from state and federal funding streams during the Trump administration (Smith et al., 2022). These changes in healthcare policy expanded contraceptive deserts, leading to the non-availability of contraceptive methods even when there is access to healthcare centers in the community, which differs from the findings of this study (Smith et al., 2022).

Additionally, the Food and Drug Administration approval and subsequent availability of numerous long-acting reversible contraceptives after the early 2000s might affect the findings of our study (Shoupe, 2016). Although the Add Health data set is older, it is among the strongest and largest, longitudinal, nationally representative data sets available in the United States. The study provides foundational insights into the long-term patterns and structural influence of SDH measures (e. g., economic and neighborhood factors) on contraceptive use. However, we suggest using caution in generalizing these findings in the current scenario, and we warrant a need to investigate the associations of time-varying measures of SDH in assessing their dynamic effects on contraceptive use.

In conclusion, this study adds its findings to mounting evidence that indicates how socioeconomic, neighborhood, and community-related contextual factors during the early years of life are associated with later health behaviors. These significant associations may exist because the socioeconomic circumstances where the children grow up establish psychosocial trajectories that may persist over the rest of their lives, thus

warranting a need for appropriate early interventions, particularly in the areas of economic reform, education opportunities, and access to health care.

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**Shristi Bhochhibhoya:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Sarah B. Maness:** Writing – original draft, Resources. **Julie Ober Allen:** Writing – review & editing, Supervision. **Marshall K. Cheney:** Supervision. **B. Mitchell Peck:** Conceptualization, Supervision, Writing – review & editing. **Yu Lu:** Writing – review & editing, Writing – original draft, Validation, Supervision, Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2025.103021>.

Data availability

The data that has been used is confidential.

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