A B S T R A C T

Self-rated health is a commonly used measure of physical health status. While the development of one's perception of self-rated health likely occurs during childhood and adolescence, its development has been largely unexplored. This study addresses this issue by examining the relationship between adolescent self-rated health and personal (sex, age) and situation (family structure, family income) factors at five different time intervals to identify inter- and intra-cohort effects as well as concomitant changes in adolescent health compromising behaviour, specifically substance use. Five waves between 1989 and 1997 of the biennial Ontario Student Drug Use Survey (OSDUS) by the Addiction Research Foundation (ARF) consisting of 19,512 cases were examined. The results indicate the presence of both inter- and intra-cohort effects on self-rated health. In addition, health-compromising behaviours had a varied effect on self-rated health across grade. This analysis confirms some previous findings but also presents contradictory evidence by identifying the complexity of relationships among these factors and self-rated health.

A B R É G É

L'évaluation personnelle de sa santé est une mesure de l'état de santé physique couramment utilisée. Le développement de la perception personnelle que l'on a de sa santé se fait au cours de l'enfance et de l'adolescence mais ce développement a été peu étudié. C'est le but de cette étude qui examine les rapports qui existent entre l'évaluation personnelle de sa santé pendant l'adolescence et les facteurs personnels (sexe, âge) et du milieu (structure familiale, revenu familial) à cinq intervalles de temps différents pour identifier les effets inter- et intra-cohortes ainsi que les changements concomitants à la santé pendant l'adolescence qui nuisent au comportement, notamment pour ce qui est de la toxicomanie. On a examiné cinq vagues portant de 1989 à 1997 et comprenant 19 512 cas de l'enquête ontarienne sur la toxicomanie chez les étudiants réalisée tous les deux ans par la Fondation de la recherche sur la toxicomanie. Les résultats indiquent la présence d'effets inter- et intra-cohortes sur l'évaluation personnelle de sa santé. En outre, pour toutes les catégories, les comportements nuisibles à la santé avaient un effet varié sur l'évaluation personnelle de sa santé. Cette analyse confirme certains résultats précédents mais fait également apparaître des éléments contradictoires en identifiant la complexité des rapports entre ces facteurs et l'évaluation personnelle de sa santé.

The Development of Self-rated Health During Adolescence: An Exploration of Inter- and Intra-cohort Effects

Terrance J. Wade, PhD,¹ Evelyn Vingilis, PhD²

One of the most commonly used measures of physical health status consists of a single Likert-type scale item, querying about respondents' overall health. This item has been used extensively as a method to capture diverse components of health status. Validation research has identified that this item principally reflects physical health problems, notably limitations on physical functioning and chronic and acute conditions and to a lesser extent, mental health problems.^{1,2} Furthermore, evidence suggests that self-rated health is a good predictor of health care utilization.^{1,3-5}

The development of this perception of self-rated health likely occurs throughout childhood and adolescence, but its development has been largely unexplored. Most health literature on youth has focussed primarily on various beliefs and knowledge about health, illness and health behaviour.⁶⁻⁹ Specifically, studies have investigated a wide range of health-related issues, such as self-esteem,¹⁰⁻¹³ health concerns,^{6,14} social/familial supports/pressures, life stresses,^{8,10,11,15,16} socioeconomic factors,¹⁷ and health risk behaviours/lifestyles.^{6,8,18,19} A few studies have investigated the relationships among self-rated health and person factors, such as gender, school achieve-

ment/competence, drug use, health behaviours, self-esteem^{2,20,21} and proximal situation factors of the adolescent's immediate environment, such as family income, and parent-child relationships.^{20,21} While surveys have been tracking age and cohort trends among adolescents on various behavioural indices, such as substance use and delinquency,²²⁻²⁴ it is unknown whether self-rated health among adolescents is relatively invariant over time or whether it manifests similar trends to these health-compromising and risk-taking behaviours.

This study addresses this issue by examining the relationship between self-rated health and age among adolescents at five different time intervals to identify potential age and cohort effects. In addition, it investigates associated changes in adolescent health-compromising behaviour across both age and cohort to identify potential correlates that may guide one's development of this overall perception of physical health.

METHODS

Sample

The analyses were conducted using the Ontario Student Drug Use Survey (OSDUS) by the Addiction Research Foundation (ARF). This survey is a biennial survey of students in grades 7, 9, 11 and 13 across Ontario from 1977 to 1997. This analysis uses the last five surveys from 1989 to 1997. For these years, the sample was based on a stratified single-stage cluster probability design.^{23,24} The target population was all students enrolled in the regular school system in Ontario. Adolescents who were institutionalized, on Indian reserves and Canadian forces bases and those in the

1. The Departments of Psychiatry and Community Health Sciences, The University of Calgary; The Regional Clinical Department of Psychiatry, Calgary Regional Health Authority; and The Calgary World Health Organization Collaboration Centre for Research and Training in Mental Health
2. The Population and Community Health Unit, Departments of Family Medicine and Epidemiology and Biostatistics, The University of Western Ontario

Correspondence and reprint requests: Terrance J. Wade, Department of Psychiatry, Peter Lougheed Centre, 3645 - 3500 26th Avenue NE, Calgary, AB, T1Y 6J4; Tel: 403-219-1539, Fax: 403-219-3095, E-mail: terrance.wade@CRHA-Health.ab.ca

far northern regions of Ontario were excluded. The total sample for the five surveys was 19,512 composed of approximately 4,000 students in each year evenly distributed across the four grades. Participation in the survey was voluntary and anonymous and required the written consent of school boards, parents and students.

Measures

Self-rated Health

This construct was included in the OSDUS surveys between 1989 and 1997 and measured using a single item that asked students "How would you rate your physical health?" Responses were based on a five-point Likert scale containing the choices excellent (1), very good (2), good (3), fair (4) and poor (5). For this analysis, the scale was reverse-coded so that higher scores indicate better health. The mean varied across gender, grade and year.

Socio-demographic Indicators

Sex was dummy coded so that males = 0 and females = 1. Grade, reported as school grade, included those in grades 7, 9, 11 and 13. Family structure was dichotomized into two natural parents versus other. The other category included single-parents, step-parents, and families with neither natural parents. Family financial situation was based on a five-point scale ranging from well below average to well above average. Family financial situation was only asked in OSDUS surveys between 1993 and 1997.

Health-compromising Behaviours

Four variables assessing use of various substances based on 12-month prevalence rates were examined. Tobacco use, alcohol use and cannabis use were coded so that no use = 0. Greater frequency/quantity of use

TABLE I
Distribution of Sociodemographic Variables, Self-rated Health, and Substance Use for Total Sample, Male and Females between 1989 and 1997 (N=19,153)†

	Total	Male	Female
Sex	—	51.1%	48.9%
Grade			
7	24.4%	24.4%	24.5%
9	26.7%	26.7%	26.7%
11	24.8%	25.5%	24.1%
13	24.1%	23.5%	24.7%
Year			
1989	20.1%	20.0%	20.2%
1991	21.1%	22.2%	20.0%
1993	18.3%	18.2%	18.4%
1995	20.0%	20.0%	19.9%
1997	20.5%	19.6%	21.5%
Percentage with Two Natural Parents	76.6%	77.3%	76.0%
Family Financial Situation‡	3.46	3.53*	3.41
Self-rated Health	3.86	3.99*	3.75
Tobacco Consumption	0.76	0.78	0.75
Alcohol Consumption	1.04	1.13*	0.95
Cannabis Consumption	0.53	0.63*	0.43
Hard Drug Use	0.47	0.51*	0.43

† N = 11,142 for family financial situation because it was collected for years 1993, 1995 and 1997 only

‡ Family financial situation was rated on a five-point scale from "well below average" to "well above average". The mean of 3.5 for the total sample indicates that the average rating of family income was between "about average" and "somewhat above average"

* p ≤ 0.001

Figure 1. Student self-rated health among males and females in grades 7, 9, 11 and 13 from 1989 to 1997

TABLE II
Pearson Correlation Coefficients of Student Self-rated Health by Health Determinants

	Sex	Grade	Year	Family Structure	Family Income	Tobacco Use	Alcohol Use	Cannabis Use	Hard Drug Use
Self-rated Health	-0.128*	-0.129*	-0.121*	-0.064*	0.167*	-0.246*	-0.112*	-0.174*	-0.132*
N	19,168	19,184	19,198	19,114	10,973	19,040	19,096	19,092	17,852

* p ≤ 0.001

TABLE III
Multivariate Analysis of Variance Results for Self-rated Health by Sex, Grade and Year

Source of Variation	SS	df	MS	F	Sig of F
Within + Residual	15,191.17	19,114	0.80		
Explained	891.72	39	22.86	28.77	0.000*
Sex	258.41	1	258.20	324.88	0.000*
Grade	205.57	4	51.39	64.66	0.000*
Year	334.22	3	111.41	140.18	0.000*
Sex x Year	11.42	4	2.86	3.59	0.006
Sex x Grade	12.74	3	4.25	5.34	0.001*
Grade x Year	25.68	12	2.14	2.69	0.001*
Sex x Grade x Year	9.51	12	0.79	1.00	0.448

* $p \leq 0.001$

TABLE IV
Examination of Main Effects and Interaction Effects of Sex, Grade and Year on Substance Use†

	Tobacco	Alcohol	Cannabis	Hard Drug Use
Sex	1.753	143.932*	112.918*	19.442*
Grade	308.625*	1111.078*	392.172*	75.553*
Year	11.872*	32.662*	102.462*	22.814*
Sex x Year	1.221	1.033	2.676	1.013
Sex x Grade	3.600	39.736*	17.712*	4.466
Grade x Year	3.669*	4.497*	15.320*	2.252
Sex x Grade x Year	1.526	1.173	1.180	1.189
N	19,290	19,344	19,338	18,022

† F-tests are reported.

* $p \leq 0.001$

TABLE V
OLS Regression of Self-rated Health on Sex, Year, Family Structure and Substance Use Stratified by Grade†‡

	Grade 7	Grade 9	Grade 11	Grade 13
Sex	-0.110*	-0.091*	-0.176*	-0.169*
Year	-0.013	-0.035	-0.036	-0.094*
Family Structure	-0.028	0.001	0.011	0.014
Family Financial Situation	0.174*	0.168*	0.136*	0.133*
Tobacco Use	-0.054	-0.133*	-0.254*	-0.218*
Alcohol Use	0.003	0.032	0.040	0.041
Cannabis Use	-0.031	-0.108*	-0.046	-0.006
Hard Drug Use	-0.085	0.005	-0.011	-0.023
R ²	0.067	0.079	0.129	0.098
N	2112	2757	2480	2587

† Analysis includes 1993, 1995 and 1997 only because family financial situation was not asked in years 1989 and 1991.

‡ All effects shown are standardized regression coefficients.

* $p \leq 0.001$

ranged from 1 to 6 for alcohol and cannabis use and from 1 to 7 for tobacco use. For alcohol, use specified as 'for special events only' and 'less than once per month' were recoded to equal 1. Hard drug use included use of glue, solvents, barbiturates (with or without a prescription), tranquilizers (with or without a prescription), LSD, PCP, other hallucinogens (e.g., mescaline and psilocybin), cocaine,

crack and ecstasy. Since prevalence for individual drugs was small, coding indicated usage versus non-usage for each drug which were then summed to create a 12-month prevalence of overall hard drug use.

RESULTS

Table I presents the distribution among all variables for the total sample and across

gender. Gender was evenly distributed across samples and there were no differences across gender for grade, year and family structure but males rated their family finances more positively. Males also rated their health significantly better than females. Prevalence of tobacco consumption was similar across genders but males reported significantly higher 12-month prevalence of alcohol, cannabis and hard drugs.

In Table II, all indicators were significantly associated with self-rated health. To examine inter- and intra-cohort effects, the data were analyzed in a 2 (sex) x 4 (grade) x 5 (year) analysis of variance (Table III). Significant main effects ($p \leq 0.001$) were observed for sex, grade and year. Using Scheffe's comparison of means test ($p \leq 0.001$), females' self-rated health was consistently lower than males' for all grades. Self-rated health declined significantly from grade 7 to grade 9 to grade 11 but not between grades 11 and 13. Mean self-rated health decreased significantly across years from 1989 to 1995 but not between 1995 and 1997.

Significant two-way interactions ($p \leq 0.001$) were found for both sex x grade and grade x year suggesting that both intra- and inter-cohort effects were present in the development of self-rated health. That is, the differences between males and females as well as the changes over time were not consistent across grade. Figure 1 reveals that the sex x grade interaction was due to the fact that females' ratings decline more steeply from grade 7 to grade 11 compared to males'. Furthermore, it appears that the decline across grades became more pronounced across successive years as was evidenced by the significant year x grade interaction.

Similar patterns were also evident for tobacco, alcohol and cannabis consumption (Table IV); however, the shape of the distribution for these substances across grade were reversed compared to self-rated health, increasing in usage from grade 7 to grade 11 with a leveling out or decrease in grade 13 (not shown).²⁵ Only alcohol use had a significant increasing trend up to grade 13. The temporal trends across substances were varied. For tobacco and cannabis use, use was significantly higher

in 1995 and 1997 compared to earlier years, while alcohol use showed a significant dip in 1993 compared to 1989, 1991 and 1997.

Since grade appears to moderate the effects of both gender and year on self-rated health as well as tobacco, alcohol and cannabis use, we decomposed the subsequent regression analyses by grade to examine the relationship between substance use and self-rated health (Table V). As well, we included personal and proximal situational factors such as gender, family structure and family financial situation as controls. The inclusion of family financial situation reduced our effective sample size for this analysis because it was only included in years 1993, 1995 and 1997. Gender was a significant predictor across all grades but strongest in grades 11 and 13. Year was only significant among students in grade 13. Family financial situation was an important positive predictor of perceived health in all grades while the adjusted effect of family structure was non-significant. Substance use had a varied effect on perceived health status conditional upon grade. Among those in grade 7, no substance had a significant effect and students in this grade consistently reported higher health status compared to higher grades for all years. Among students in grade 9, the use of tobacco and cannabis were both significantly associated with poorer self-rated health but only tobacco use remained significant among those in grades 11 and 13. Finally, controlling for all other variables, alcohol and hard drug use were not associated with self-rated health for any grade.

DISCUSSION

This study confirms the findings of previous research on factors associated with student self-rated health but also identifies the complexity of relationships among these factors. First, this study confirms that various person factors such as gender, and proximal situation factors such as socioeconomic status, are associated with self-rated health. Specifically, females' self-rated health was significantly lower than males, a finding consistent with many other studies.^{2,21,26} In addition, family

income was associated with self-rated health, whereby lower income was related to lower health ratings, again a finding corroborated by other studies.^{5,21,26} However, contrary to some studies,^{20,21} this analysis found a grade effect; self-rated health decreased significantly through to grade 11, and plateaued between grades 11 and 13. The meaning of this plateau is difficult to interpret. As this study is not longitudinal, we do not know whether this trend reflects a stabilization of perceptions of self-rated health or the fact that grade 13 students are an unrepresentative subset of grade 11 students.

The findings also support the results of Krause and Jay² that younger people may use health-compromising behaviours as part of their 'frame of reference' for self-rated health. Alcohol, tobacco, cannabis and hard drug use were all significantly, although modestly, associated with lower self-rated health, with the highest correlation existing between tobacco use and self-rated health ($r = -0.25$). Furthermore, interactions between both tobacco and cannabis use by grade showed an inverse trend to self-rated health; namely significant increases in use to grade 11 which decreased or leveled off in grade 13. Only alcohol use exhibited a significantly increasing trend beyond grade 11 to grade 13 which may be due to an 'age of majority' effect.

The analyses also revealed complex patterns of relationships among the variables and self-rated health. In particular, there are both intra- and inter-cohort effects present in the development of self-rated health. First, the decomposition of the regression analysis by grade examining the relationship between predictors and self-rated health revealed that gender and financial situation are significant across all grades; however, among higher grades, the effect of gender increased while financial situation decreased. Substance use also had varied effects across grades. While substance use was not predictive of self-rated health for grade 7 students, cannabis use was associated with poor perceived health among grade 9 students and tobacco use was predictive of poor self-rated health for those in grades 9, 11 and 13. This suggests that changes in substance use through high school may have a compromising effect on

personal health perceptions. Alternatively, substance use and poor health perceptions may be concomitant outcomes of a similar underlying process.²⁷

Second, the regression equations indicate that year of survey was a significant predictor of self-rated health only among grade 13 students confirming the significant grade x year interaction identified in the ANOVA analysis. Although Davies and Ware¹ suggest that self-rated health is more 'state' than 'trait', they and others argue that person factors such as physical and mental health problems are the main determinants of the somewhat varying state of self-rated health. Yet this inter-cohort finding of differences in self-rated health among grade 13 students may be suggesting external environmental (distal situational) factors which may or may not be mediated by health behaviours. This unique finding of temporal effects, whereby self-rated health showed a significant decline from 1989 through to 1995 and remained unchanged in 1997, seems to be coincident with the recessionary period, in particular Ontario's and Canada's high poverty and youth unemployment rates.^{28,29} Clearly these speculations move beyond the scope of this paper. However, the issue of proximal and distal determinants and the variance in self-rated health among adolescents needs to be examined in greater depth not only with cross-sectional studies but also within a repeated-measures longitudinal research design.

ACKNOWLEDGEMENTS

We thank Edward Adlaf and the Addiction Research Foundation of Ontario (now a division of the Centre for Addiction and Mental Health) for making the Ontario Student Drug Use Survey available for analysis.

REFERENCES

1. Davies AR, Ware Jr JE. Measuring Health Perceptions in the Health Insurance Experiment. The Rand Corporation, Santa Monica, CA, October 1981.
2. Krause NM, Jay GM. What do global self-rated health items measure. *Medical Care* 1994;32(9):930-42.
3. Birch S, Eyles J, Newbold KB. Equitable access to health care: Methodological extensions to the analysis of physician utilization in Canada. *Health Economics* 1993;2:87-101.

4. Fylkesnes K. Determinants of health care utilization—visits and referrals. *Scand J Soc Med* 1993;21(1):40-50.
5. Warren R. Wealth and Health, Health and Wealth. Centre for Health Promotion, University of Toronto, May 1994.
6. Eiser C, Patterson D, Eiser RJ. Children's knowledge of health and illness. *Child Care, Health and Development* 1983;9:285-92.
7. Kalnino I, Love R. Children's concepts of health and illness. *Health Educ Q* 1982;9:104-15.
8. Mayall B. Keeping healthy at home and school. *Sociol Health Illness* 1993;15(4):464-87.
9. Pridmore P, Bendelow G. Images of health: Exploring the beliefs of children. *Health Educ J* 1995;54:473-88.
10. Dielman TE, Campanelli PC, Shope JT, Butchart AT. Susceptibility to peer pressure, self-esteem, and health locus of control as correlates of adolescent substance abuse. *Health Educ Q* 1987;14(2):207-21.
11. Long BH. Parental discord vs family structure: Effects of divorce on the self-esteem of daughters. *J Youth Adolesc* 1986;15:19-27.
12. Rivas Torres RM, Fernández Fernández P. Self-esteem and value of health as determinants of adolescent health behavior. *J Adolesc Health* 1995;16:60-63.
13. Rivas Torres RM, Fernández Fernández P, Maceira D. Self-esteem and value of health as correlates of adolescent health behavior. *Adolescence* 1995;30(118):403-12.
14. Sobal J. Health concerns of young adolescents. *Adolescence* 1987;XXII(87):739-50.
15. Burke RJ, Weir T. Sex differences in adolescent life stress, social support, and well-being. *J Psychol* 1978;98:277-88.
16. Yarcheski A, Mahon NE. Perceived stress and symptom patterns in early adolescents: The role of mediating variables. *Res Nurs Health* 1986;9:289-97.
17. Hammer T. Unemployment and mental health among young people: A longitudinal study. *J Adolesc* 1993;16:407-20.
18. Meredith CN, Dwyer JT. Nutrition and exercise: Effects on adolescent health. *Annu Rev Public Health* 1991;12:309-33.
19. Department of Health and Human Services. Youth risk behaviour surveillance. *MMWR* 1993;44:1-56.
20. Mechanic D, Hansell S. Divorce, family conflict, and adolescents well-being. *J Health Soc Behav* 1989;30:105-16.
21. Vingilis E, Wade TJ, Adlaf EM. What factors predict student self-rated physical health? *J Adolesc* 1998;21:83-97.
22. Adlaf EM, Smart RG, Walsh GW. Ontario student drug use survey, 1977-1993. Toronto: Addiction Research Foundation of Ontario, 1993.
23. Adlaf EM, Ivis FJ, Smart RG, Walsh GW. Ontario student drug use survey, 1977-1995. Toronto: Addiction Research Foundation, 1995.
24. Adlaf EM, Ivis FJ, Smart RG. Ontario student drug use survey, 1977-1997. Toronto: Addiction Research Foundation of Ontario, 1997.
25. Wade TJ, Brannigan A. The changing patterns of adolescent female delinquency in Ontario: Opportunity or self control? American Society of Criminology, San Diego, November, 1997.
26. Canadian Institute of Child Health. *The Health of Canada's Children* 2nd Edition. Ottawa: Canadian Institute of Child Health, 1994.
27. Wade TJ. Delinquency and health among adolescents: Multiple outcomes of a similar social and structural process. *Int J Law Psychiatry* (In press).
28. Poverty Profile 1996. A report by the National Council of Welfare. Minister of Public Works and Government Services Canada, Spring, 1998.
29. Sarkella J. Demographic profile. In: Alder R, Vingilis E, Mai V (Eds.), *Community Health and Well-Being in Southwestern Ontario - A Resource for Planning*. London, Ontario: Middlesex-London Public Health Unit-The Faculty of Medicine, The University of Western Ontario, 1996;13-40.

Received: June 15, 1998

Accepted: October 16, 1998

Style Requirements for Authors

The *Canadian Journal of Public Health* publishes peer-reviewed original articles on all aspects of public health, preventive medicine and health promotion. All manuscripts submitted to the Journal must conform to our Style guidelines. Would-be contributors should read the Style Requirements for Contributors on pages 6-7 of the January/February 1999 issue (Vol. 90, No. 1) of the *Canadian Journal of Public Health* before preparing any manuscript for submission. Copies are also available from the editorial office.

All material intended for publication should be submitted to the Scientific Editor, Canadian Journal of Public Health, 1565 Carling Avenue, Suite 400, Ottawa, ON, Canada K1Z 8R1.

The original manuscript and two copies (for review purposes) should be submitted along with a diskette, preferably 3½" Macintosh. It must be typed, **double-spaced**, preferably on paper of 8½ x 11 inches, on one side only, and with margins of at least 1¼ inches all around.

Manuscripts of original articles should not exceed **2,000 words** in length. Short Reports, which will get priority for publication, should not exceed **800 words**; it is not necessary to provide an abstract for a short report. Please provide a word count for your article.

To ensure anonymity in the peer review process, authors should supply identifying information on the title page of the **original only**; the title page for the two reviewers' copies should list only the title.

The title page of the original should include: 1) the title and a running title (40 characters maximum); 2) the names (given name and surname) of the authors; 3) their academic degrees; 4) the name(s) of department(s) and/or institution(s) where the work was done; 5) the current affiliations of the authors, if different from 4); 6) the name, address, telephone number and e-mail address of the author responsible for correspondence; 7) disclaimers, if any; 8) the name and address of the author to whom requests for reprints should be sent; and 9) sources of support in the form of grants, equipment or drugs.

Material will be accepted in English or French. The second page should be a summary of the material, no longer than **150 words**, in the language of the article. A **professional quality** translation of the summary into the other official language is also required (i.e., French if the manuscript is in English, English if the manuscript is in French).

Letters to the Editor are welcomed. Please keep them as short as possible.

The Editor reserves the right to make editorial changes.