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Original Research

Self-Rated Health and Association with ACEs

Roberta Waite, Maureen Davey, Laura Lynch

Drexel University

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Corresponding Author:
Roberta Waite,
Drexel University
rlw26@drexel.edu

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Abstract

Background: Prior studies have demonstrated an association between experiencing trauma in childhood and poorer self-rated health in adulthood. Much less is known about this association among low-income minority patients in primary care settings. Methods: We replicated the Adverse Childhood Experiences (ACE) Study, a collaborative venture between the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente, with a low-income minority sample of primary care patients (N = 801) at a community-based healthcare center. We conducted a cross-sectional retrospective quantitative survey study. Data were analyzed using binary logistic regression to evaluate the hypothesis that low-income minority patients who reported more childhood trauma (abuse, neglect, household dysfunction, cumulative adverse childhood experiences [ACEs]) would more likely have reported poorer health in adulthood. Results: The number of ACEs in our sample was considerably higher than the original CDC ACE Study, as almost 50% of patients surveyed at our clinic reported 4 or more ACEs, confirming that trauma is central among individuals served in many urban primary care settings. The results of the ACE abuse, neglect, and cumulative ACEs score were in the expected direction and statistically significant suggesting that participants who reported more childhood abuse and neglect and who reported more childhood trauma (cumulative/total ACEs) were more likely to report poorer health in adulthood. Conclusion: These findings have implications for providers, researchers, and policy makers to develop more collaborative approaches with primary care that better target the negative sequelae of ACEs.

INTRODUCTION

Self-rated health is a significant predictor of morbidity, mortality, and the utilization of health services in current and preventative care [1]. Subjective perception of health status is an important predictor of quality of life and in prior studies has been significantly associated with future health status because of its association with active participation in preventive practices and self-care. McCullough and Laurenceau [2] defined self-rated ratings of health as an individual's evaluation of relevant aspects of medical, psychological, and social conditions in their lives. Representative studies with stringent statistical control have found that the odds of dying among individuals with "poor" self-rated health are typically 50% to 100% higher compared to individuals with "very good" or "excellent" self-rated health [2-3].

Examining a patient's subjective overall health assessment is important particularly when examining critical life events (e.g., adverse childhood experiences (ACEs)) that can have long-term, chronic negative consequences. Many studies have examined self-rated health including aging populations [4] and populations with specific diseases/disorders (e.g., mood disorders; [5]) or adverse childhood experiences (e.g., sexual abuse, physical abuse, and/or emotional abuse) [6].

Building on this program of research, we examined retrospective reports of ACEs among a minority adult patient population who currently receive primary care at a nurse managed health care center (NMHCC) in a medically underserved area *and* evaluated the association of all 10 ACEs and their self-rated health in adulthood.

LITERATURE REVIEW

ACEs are a pervasive public health concern with long-term negative and significant health implications such as ischemic heart disease, autoimmune diseases, cancer, depression, chronic lung disease, sleep disturbances, and liver disease) [7-16]. ACEs include childhood sexual abuse, physical abuse, emotional abuse, physical neglect, emotional neglect, and household dysfunction defined as: living with a mother who was treated violently, living with a substance and/or alcohol abuser, living with someone who had a mental illness, living with one or no parents, and/or living in a household with a criminal. The ACE Study, a collaborative effort between the CDC and Kaiser Permanente, was initially developed because of findings from a weight loss program in California during the 1990s. Adult participants who completed the program successfully lost weight; however, after conducting life story interviews, Dr. Felitti discovered many individuals had been unconsciously using obesity as a protective mechanism against unwanted sexual attention or as a form of defense against physical attack [17]. Moreover, many of the study participants who dropped out of the study had been sexually and/or physically abused as children [17].

These significant findings led to the development of the ACE Study which was designed as a retrospective study to examine the effects of stressful and traumatic childhood experiences in adults on behaviors associated with the leading causes of health and mental health problems, disability, and death among adults in the United States (US). Felliti and his colleagues [9] evaluated adults' retrospective reports of childhood exposure to many forms of abuse, neglect, and domestic violence that occurred from early childhood to late adolescence (birth to 17 years old). Their sample included nearly 17,000 adult study participants with the majority being White, college-educated, middle-class adults with a median age of 57. Their findings revealed a significant and strong association between the breadth of exposure to abuse, neglect, or household dysfunction during childhood and multiple risk factors associated with many of the leading causes of death in adults, such as ischemic heart disease, smoking, cancer, chronic lung disease, skeletal fractures, and liver disease [9]. In addition, they reported that poor self-rated health had a graded and significant association with the breadth of childhood exposures [9].

Prior research suggests that exposure to ACEs are important and significant precursors to poorer health outcomes in adulthood [6, 18]. Patients' subjective ratings of their health offers a more holistic assessment compared to examining individual diseases, because it is not dependent on a particular health behavior (e.g., smoking) [19]. Furthermore, examining the association of ACEs and health consequences over the life span demonstrated that individuals often struggled to "get over" trauma experienced in childhood, which had negatively affected quality of life over their adult lifespan [19]. In this paper, we evaluated the hypothesis that low-income minority patients who reported more childhood trauma (abuse, neglect, household dysfunction, cumulative ACEs) would more likely report poorer health in adulthood. This is important because prior empirical data had linked subjective perceptions of health status with overall quality of life, in particular an individual's preventive health practices and self-care practices.

RESEARCH QUESTION

Given the evidence in the literature, we examined the following research question: Are low-income minority adult patients at an NMHCC who report more maltreatment as children (ACEabuse, ACEneglect, ACEshousehold dysfunction, totalACEs) more likely to report poorer self-rated health in adulthood?

METHOD

Retrospective cross-sectional survey data were collected over a 12 month period during 2009 and 2010. We recruited a convenience sample of low-income minority primary care patients (18 years and older) at a federally qualified community-based NMHCC located in the northeastern region of the US. Data from de-identified self-report questionnaires and clinical chart diagnoses were then analyzed using SPSS 19.0 for windows [20].

SAMPLE SELECTION

After the authors' institutional review board first reviewed and approved this study, a concurrent two-part process supported patient recruitment. The clinical nurse at the NMHCC first mailed letters to all patients who were 18 years of age and older. These patients were informed about the study including the aims of the study, contact information for the primary

investigator (PI, first author), notification of remuneration, and estimated time needed to complete the study. Patients were also informed about the study when they came to the NMHCC for services. Research personnel were available on-site for approximately 40 hours each week over a 12-month data collection period. Individuals who wanted to learn more about the study contacted the PI or on-site study personnel. A mutually agreed upon time was identified to review and sign the informed consent and to complete the two self-report surveys which are described below.

Patients were informed that participation was voluntary and any data collected would not become part of their medical records at the NMHCC. The inclusion criteria for this study were that the person: (a) was verified as a current patient at the NMHCC; (b) was between 18 to 88 years of age; (c) agreed to complete two self-report questionnaires; (d) voluntarily consented to participate in the study; and (d) spoke English. All respondents who were pregnant at the time of filling out the retrospective survey at the NMHCC were excluded from the analyses in this paper. Patients typically took approximately 20 to 25 minutes to complete both self-report questionnaires and each participant received a $10.00 gift card.

MEASURES

Demographic Information

Patients first completed a self-report demographic measure. Questions included specifications of their age, sex, race, marital status, education, and income level.

Outcome Measure

We evaluated information from the *Health Appraisal* questionnaire, in particular the question that asks participants to rank their "current state of health" as poor, fair, good, or excellent. Self-rated current state of overall health asks participants to: "Please circle the number that you think best describes your current state of health (1 = poor; 2 = fair; 3 = good; 4 = excellent). We recoded this outcome measure to transform it to a dichotomous outcome variable where 0 = good to excellent health and 1 = poor to fair health.

Predictor Measures

The *Family Health History* and *Health Appraisal* questionnaires were used to collect information about childhood maltreatment, household dysfunction, and other sociobehavioral factors examined in the original ACE Study. After the CDC first approved use of both questionnaires in this study replication, we retrieved both questionnaires from the CDC website [21]. The *Family Health History* questionnaire asks about health behaviors and retrospective reports of childhood abuse, neglect, and adversity. Measures used to examine the ACE categories from this questionnaire were adapted from the Conflict Tactics Scale (physical abuse, witnessing inter-parental violence, and emotional abuse), the Child Trauma Questionnaire (emotional and physical neglect), and questions from the Wyatt scale (sexual abuse) [22].

Specific questions (28a to 67e) from the *Family Health History* questionnaire were examined related to retrospective reports of abuse, neglect, and family adversity. Responses from the *Family Health History* questionnaire provided an ACE score. Table 1 describes the 3 ACE subscales and total ACE scale (abuse, neglect, household dysfunction, totalACEscore) that we examined in this paper.

According to Dube and colleagues, chronbach alphas were provided for eight of the ten ACEs in wave I of the original ACE study [23]. The two neglect questions were added in wave 2 of the original ACE study (ACEs 4 and 5, table 1) and reliability information has not yet been provided in extant literature. Kappa statistics for the eight ACEs is provided, each ACE had one or more associated questions thus, kappa findings will be provided based on the numbers of questions per category: ACE1-Emotional Abuse (.66, .65, .51); ACE2- Physical Abuse (.55, .55, .63); ACE3-Sexual Abuse (.69, .66, .55, .60, .57); ACE6-Battered Mother (.77, .78, .62, .69, .61); ACE 7-Substance Abuse (.75, .76, .60); ACE 8-Mental Illness (.51, .48, .41); ACE 9-Parental Separation/Divorce (.86); and ACE 10-Incarcerated Household Member (.46). [23]

As described in Table 1, the ACEabuse subscale is comprised of ACE questions 1, 2, and 3 (ACE 1 emotional abuse; ACE 2 physical abuse; ACE 3 sexual abuse) which were summed for a range of scores from 0 to 3; the ACEneglect subscale includes ACE questions 4 and 5 (ACE 4 emotional neglect; ACE 5 physical neglect) which were summed for a range of scores from 0 to 2; and the ACEhousehold dysfunction subscale is made up of ACE questions 6, 7, 8, 9, and 10 (ACE 6 parental separation/divorce; ACE 7 mother treated violently; ACE 8 living with a substance abuser; ACE 9 living with someone who was depressed, mentally ill, and/or attempted suicide; and ACE 10 living with a person who went to prison) which were summed for a range of scores from 0 to 5. The total number of ACEs, (0 to 10 range for total ACE scores) retrospectively reported by participants in their childhoods makes up their ACE score total (i.e., cumulative number of ACEs).

Table 1. Definition of 3 broader ACE categories (ABUSE, NEGLECT, HOUSEHOLD DYSFUNCTION) AND TOTAL ACE SUBSCALE comprised of 10 ACEs/indicators (emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, battered mother, household substance abuse, mental illness in the household, parental separation or divorce, and criminal household member) occurring during the first 18 years of life.

ACE Category	Affirmative Responses to ACE Questions for each Category
CHILD ABUSE SUBSCALE (Sum of ACE 1, ACE2, ACE 3) (Range of scores from 0-3)	
1. Emotional abuse: Responded often or very often to either of the following two questions:	
ACE 1	•"How often did a parent, stepparent, or adult living in your home swear at you, insult you, or put you down?" •"How often did a parent, stepparent, or adult living in your home act in a way that made you afraid that you might be physically hurt?"
***2.* Physical abuse:** Responded often or very often to the following two questions:	
ACE 2	•"How often did a parent, stepparent, or adult living in your home push, grab, slap, or throw something at you?" •"How often did a parent, stepparent, or adult living in your home hit you so hard that you had marks or were injured?"
3. Sexual abuse: Responded yes to any of the following four questions. Had an adult or someone who was at least five years older than themselves ever	
ACE 3	•Touch or fondle their body in a sexual way? •Touch his or her body in a sexual way? •Attempt to have any type of sexual intercourse with them (oral, anal, or vaginal)? •Have any type of sexual intercourse with them (oral, anal, or vaginal)?
CHILDHOOD NEGLECT SUBSCALE (Sum of ACE 4 AND ACE 5) (Range of scores from 0-2)	
1. Physical neglect: Responded never or rarely true to questions 2 or 5; responded often or very often to questions 1, 3, or	
ACE 4	"I didn't have enough to eat" "I knew there was someone there to take care of me and protect me" "My parents were too drunk or too high to take care of me" "I had to wear dirty clothes" "There was someone to take me to the doctor if I needed it."
2. Emotional neglect: Responded never or rarely true when answering any of the following	
ACE 5	"There was someone in my family who helped me feel important or special." "I felt loved" "People in my family looked out for each other." "People in my family felt close to each other." "My family was a source of strength and support."
HOUSEHOLD DYSFUNCTION ACE SUBSCALE (Sum of ACE 6, ACE7, ACE 8, ACE 9, ACE 10) (Range of scores from 0-5)	
1. Battered mother: Responded often, or very often to at least one of the first two indicators or any response other than never to either of the last two:	
ACE 6	• How often did your father (or stepfather) or mother's boyfriend do any of these things to your mother (or stepmother): (j) push, grab, slap, or throw something at her; (ii) kick, bite, hit her with a fist or hit her with something hard; (iii) repeatedly hit her for at least a few minutes; or (iv) threaten her with a knife or gun or use a knife or gun to hurt her?
2. Household substance abuse: Affirmative response to anyone of the following:	
ACE 7	Living with a problem drinker or alcoholic, or anyone who used street drugs.
3. Mental illness in household: Affirmative response to anyone of the following:	
ACE 8	Someone in the household was depressed or mentally ill or had attempted suicide was defined as being exposed to mental illness.
4. Parental separation/divorce: Affirmative response to the question:	
ACE 9	"Were your parents ever separated or divorced?"
5. Criminal household member: Affirmative response to this question:	
ACE 10	"Did anyone in the household go to prison during the respondent's childhood?"

DATA ANALYSIS PLAN

Data were analyzed using Statistical Package for Social Sciences (SPSS®) Statistics software version 19.0 [20] with the significance level set at $p < .05$. All analyses were 2-sided. We first examined the number of ACEs reported in our sample and compared it to the original CDC ACE study findings. Then using self-rated health in adulthood as a categorical outcome variable, we conducted logistic regression analysis. In order to assess the impact of these factors on the likelihood that certain patients would report poorer self-rated health in adulthood, we examined two models: the first model used 6 predictor variables (ACEabuse, ACEneglect, ACEhoushold, age, sex, and race); and the second model used 4 predictor variables (ACEtotal, age, sex, and race).

RESULTS

Study Sample

The final convenience sample included 801 primary care patients. There were 647 women (top 3 categories: 86.7% Black, 6.3% other, and 4% white) and 154 men (top 3 categories; 74.7% Black, 14.3 % white, and 6.5% other); the age range was from 19 to 82 years of age. Most participants were high school graduates or had some college/technical school education. Most were never married, and more than half were not employed outside of the home. Table 2 provides more detailed demographic information describing the sample.

We first examined the number of ACEs reported in our sample of low-income minority patients and compared it to the original CDC study findings. Our sample's prevalence estimates were considerably higher than the original CDC ACE Study results; almost 50% of the patients surveyed at our clinic reported 4 or more ACEs (see Table 3). This is a significantly higher number of adverse child events compared to findings from the original ACE Study (12.5%). Since we do not have raw data from the original ACE study, statistical analysis cannot be run to statistically examine the difference. Nonetheless, according to the frequencies reported in table 3 we can confidently say that on average our sample has more ACEs compared to the CDC study conducted in California with a primarily White, middle class sample. Also, reliability data for subscales for our study include: ACE Abuse (.65), ACE Neglect (.55), ACE Household Dysfunction (.67), and Total ACE (.75).

Likelihood of Poorer Self-rated Health in Adulthood

The results of the first model with the 6 predictors (ACEabuse, ACEneglect, ACEhoushold, age, sex, and race) indicated that the ACEabuse, ACEneglect and age factors were related to the likelihood of reporting poorer self-rated health in adulthood, chi-square ($6, N = 801$) $= 56.293$, $p < .001$). This first model suggests that with each increase in age by 1 year, the odds of reporting poorer self-rated health in adulthood increased by 2%; with every 1 point increase on the ACEabuse scale, there is a 25% increased odds of reporting poorer self-rated health; and for every 1 point increase on the ACEneglect scale, there is a 34% increased odds of reporting poorer self-rated health in adulthood. See Table 4 for additional details.

Table 2. Demographic profile of sample (N = 801)

N = 801	Females 80.8 % (N= 647)			Males 19.2 % (N = 154)		
Race	Black	White	Other	Black	White	Other
	86.6 % (n= 560)	4.0% (n=26)	8.7% (n=56)	75.3% (n=116)	14.3% (n=22)	11.7% (n=18)
Education	< HS	HS Graduate	Beyond HS Graduate	< HS	HS Graduate	Beyond HS Graduate
	22.7% (n= 147)	27.4% (n= 177)	49.3% (n= 319)	25.3% (n= 39)	31.8% (n= 49)	44.2% (n= 68)
Employment	Part Time	Full Time	Not-employed	Part Time	Full Time	Not-employed
	20.2% (n= 131)	23.6% (n= 153)	53.5% (n= 346)	16.2% (n= 25)	20.8% (n= 32)	62.3% (n= 96)
Age	<25	26-45	45+	<25	26-45	45+
	23.2% (n= 149)	48.7% (n= 315)	28.0% (n= 181)	7.8% (n= 12)	42.9% (n= 66)	50.6% (n= 78)
Marital Status	Single	Married	Divorced	Single	Married	Divorced
	80.5% (n= 521)	11.7% (n= 76)	7.3% (n= 47)	68.2 (n= 105)	22.1% (n= 34)	11.0% (n= 17)

Table 3. Comparison of Results of Our ACEs Study to the Original ACE Study

Number of Adverse Childhood Experiences (ACE Score)	Women		Men		Total	
	Our Patients	Original Study	Our Patients	Original Study	Our Patients	Original Study
0	6.8%	34.5%	3.9%	38.0%	6.3%	36.1%
1	12.5%	24.5%	9.9%	27.9%	12.0%	26.0%
2	18.5%	15.5%	14.5%	16.4%	17.8%	15.9%
3	14.6%	10.3%	16.4%	8.6%	14.9%	9.5%
4 or more	47.5%	15.2%	55.3%	9.2%	49.0%	12.5%

The second model with the 4 predictors (ACEtotal, age, sex, and race) was also statistically significant, chi-square (4, N = 801) = 53.546, $p < .001$. As shown in Table 5, only 2 predictor variables made a unique, statistically significant contribution to this model – total ACEs score and age of patient.

This second model suggests that for each increase in 1 point on the cumulative ACE score, patients have a 19% greater likelihood of reporting poorer self-rated health in adulthood. This suggests that patients who cumulatively reported experiencing more childhood trauma (e.g., emotional, physical, and sexual abuse; emotional neglect; mother treated violently; and living with someone who was a substance abuser, mentally ill, and/or attempted suicide) were over 1.19 times more likely to report poorer self-rated health in adulthood.

Table 4. Logistic Regression Predicting Likelihood of Reporting Poorer Self-rated Health in Adulthood for ACE subscales

	B	*S.E.*	*Wald*	*df*	*p*	*Odds Ratio*	*95% C.I. for Odds Ratio*	
							Lower	Upper
Sex	-.194	.200	.939	1	.333	.823	.556	1.220
Age	.023	.006	15.835	1	.000	1.023	1.012	1.035
Race	.077	.254	.091	1	.762	1.080	.657	1.775
ACEabuse	.223	.089	6.233	1	.013	1.249	1.049	1.488
ACEneglect	.294	.101	8.453	1	.004	1.342	1.100	1.635
ACEdysfun	.105	.058	3.269	1	.071	1.111	.991	1.246
Constant	-1.700	.273	38.891	1	.000	.183		

Table 5. Logistic Regression Predicting Likelihood of Reporting Poorer Self-rated Health in Adulthood for total ACE score

	B	*S.E.*	*Wald*	*df*	*p*	*Odds Ratio*	*95% C.I. for Odds Ratio*	
							Lower	Upper
Sex	-.223	.199	1.248	1	.246	.800	.542	1.183
Age	.023	.006	16.584	1	.000	1.024	1.012	1.035
Race	.087	.253	.118	1	.731	1.091	.665	1.790
ACEtotal	.177	.031	32.117	1	.000	1.193	1.123	1.269
Constant	-1.712	.266	41.565	1	.000	.180		

DISCUSSION

Although few studies have examined the association of all ACE subscales and cumulative ACE score and self-rated health, particularly those with significant minority, underserved patient populations, Felliti et al. [9] reported that adults in their study who reported four or more ACEs (e.g., living with: a family member in prison, violence against the mother, a substance abuser, or a chronically mentally ill or depressed family member) more often reported chronic illnesses, as well as negative health behaviors and depression. Rogosch, Dackis, and Cicchetti [24] found that additional contributors to health effects among individuals exposed to early childhood maltreatment were objective markers of immune functioning and allostatic load; these were triggered as a result of additive stress. Thus, stress and exposure to traumatic incidents likely shape one's self-perceived health and quality of life. Sledjeski, Speisman, and Dierker [25] reported that trauma has a direct role on physical health. Moreover, the occurrence of one ACE increases odds of other ACEs occurring further influencing long-term health. Specifically, the cumulative effect of multiple lifetime traumas was found to be strongly associated with chronic medical conditions through chronic over-activation of the physiological stress pathways (e.g., hypothalamic-pituitary-adrenal axis, sympathetic nervous system) resulting in wear and tear on bodily systems (e.g., allostatic load).

What is perceived as chronically stressful can vary among populations living in different contexts contributing to the perspectives of the population in the original study (e.g., most were White, college-educated, middle-class adults) compared to our urban population (e.g., most were African American, low-income, unemployed adults with some college education). Unlike the original ACE Study, findings from our study indicated that living with someone who was in prison before the age of 18 and living with only one or no parents was not strongly associated with poorer self-rated health.

While significant effects were shown with ACE neglect and ACE abuse, ACE Total revealed even stronger statistical significance which is aligned with research conducted by Chartier, Walker, and Naimark [26]. Their findings showed a strong link between adverse childhood experiences, unfavorable indices on adult health, and high health care utilization. Moreover, an increased risk of adult health concerns were noted with each adverse childhood experience reported. Importantly and significant to our study is that the total or cumulative ACE score, induces the most harmful to long-term adult health. This presents further evidence about the importance of capturing individuals self-rated health to support earlier intervention [26].

Bisgaier and Rhodes note that self-rated health is a valuable and unique indicator that each individual has when assessing their living body, experiences it's been through, and gauging their health status; specifically, since self-rated health serves as such a robust predictor of mortality [27]. Seeking subjective perceptions can therefore be critical to better understanding and revealing prospective stress associated with psychological and physiological processes, both implicated in ACEs among our cohort of subjects, which often leads to many common diseases/disorders [27].

Our findings have highlighted the importance of research on the prevalence and risks for multiple types of childhood maltreatment, particularly in the somewhat neglected area of self-rated health status. These findings could be used to focus on preventive interventions that target negative sequelae of ACEs and to tailor preventive interventions to the needs and expectations of those at high risk. The implications from these findings suggest that primary care providers should be aware of and routinely ask about ACEs.

LIMITATIONS

While findings from this study have provided important insights, there were several limitations that should be noted so that future research can address these gaps. First, licensed health care providers did not confirm participant's self-rated overall health with clinical evaluations. Second, since each of the questions about ACEs addressed sensitive topics, and the questions about ACEs and self-rated health were retrospective, both the exposure (ACEs) and the outcome (self-rated health) were possibly not accurate. Dube and colleagues [24] report that individuals who experience early adversities likely under-report rather than over-report retrospective self-assessment. Third, because the sample included a large proportion of participants from lower socioeconomic status, our findings may not generalize to cases of ACEs among adults with midlevel or higher socioeconomic status.

CONCLUSIONS

Future research on ACEs should continue to disentangle the pathways, correlates, and differential impacts of the varied types of childhood traumas. In addition, studies should also examine the role of protective factors (e.g., social support, parental attachment) related to risk and resilience for self-rated health status among those who have experienced adverse childhood experiences. It might also be useful for researchers to determine if different ACE indicators should be used based on salient contextual and cultural factors (e.g., within urban areas including gun

violence/shooting versus living with someone before the age of 18 who was in prison). In clinical practice, increasing use and evaluation of trauma-informed approaches to counseling may help to avert and better manage self-rated health status that is significantly affected by ACEs, which can lead to further reduction in the occurrence of negative health outcomes.

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