Relationship Between Adverse Childhood Experience Survey Items and Psychiatric Disorders

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ABSTRACT

Context: Developmental psychopathology theory suggests a relationship between early childhood adversity and mental disorder.

Objective: To examine the relationship between the specific items on the Adverse Childhood Experiences (ACE) survey and the International Classification of Diseases, Tenth Revision (ICD-10) categories of psychiatric diagnoses in a pediatric sample.

Design: The sample included patients enrolled in the Child and Adolescent Addiction Mental Health and Psychiatry Program with both a completed ACE survey and at least 1 diagnosis of record (per admission). These criteria yielded 2 samples for each sex (ACE survey item frequencies and values in collapsed and multiple-admission groups). Data were analyzed employing tetrachoric correlation, hierarchical regression, and polychoric factor analysis.

Results: Hierarchical regression analysis identified that ICD-10 diagnostic categories, except for substance disorders, were not consistently related to ACE total score and tended to reduce the magnitude of the ACE total score in the multiple-admission group. Tetrachoric correlation revealed very low (< 0.4) positive and negative correlations between ICD-10 categories and ACE items in both multiple-admission and collapsed sample groups. Polychoric factor analysis indicated that the ACE survey items and the ICD-10 categories for both sexes were independent, with only the diagnostic ICD-10 category substance disorders being marginally associated with the ACE items factor for females.

Conclusion: The nominal relationship between ACE items and ICD-10 diagnostic categories indicates the need to include ACE assessment in advance of differential diagnosis and implementation of conventional mental health interventions for children and adolescents.

INTRODUCTION

The Adverse Childhood Experiences (ACE) survey has been a standard component of assessment in the Child and Adolescent Addiction Mental Health and Psychiatry Program (CAAMHPP) in Alberta, Canada, since September 1, 2016.[1] Implementation of the ACE survey advances CAAMHPP's strategic direction of developing a trauma-informed and trauma-focused standard of care. To date, research has identified a relationship between ACE survey total score and clinical urgency and severity.[1] In keeping with results from the original population-based ACE study,[2] regional findings have shown a relationship between physical disorders and mental disorder as a potential endpoint for early adverse experience in children, adolescents, and adults,[1,3,4] in addition to the relationship of mental disorder with chronic and preventable disease.[5,6]

As formulating psychiatric diagnoses is a cornerstone of practice, it stands to reason that an examination of its relationship to individual ACE items is warranted. This is particularly the case, given a conclusion of the article examining the relationship between ACE scores and clinical urgency and severity,[1] being that those with an ACE score of 0 and a particular diagnosis might require fundamentally different treatments than those with the same diagnosis and a high ACE score.

Psychiatric diagnosis, misdiagnosis, and comorbidity are interrelated constructs with a longstanding body of supporting literature.[7-13] The need for trauma-informed and trauma-focused models of care adds a layer of complexity.[14,15] Identification of ACEs is required to optimize treatment and outcomes.[16,17] However, general medical education related to developmental psychopathology remains an area in considerable need of applied clinical pedagogical innovation.[18] The ACE survey criteria brings this to the foreground of diagnostic considerations. In the present article, we examined the relationship between the specific ACE items and the International Classification of Diseases, Tenth Revision (ICD-10) categories of psychiatric diagnoses. The results are discussed in terms of the role of the ACE survey in assessment, diagnosis, and care planning.

METHODS

This research was conducted under The University of Calgary Research Ethics Board approval (REB15-1057). Staff training on the collection of the ACE survey, the details of data collection, storage, and retrieval, as well as the relationship of ACE scores to clinical and demographic variables have been described.[1] This article focuses on the relationship of individual ACE survey items to psychiatric diagnoses of record. For each separation from service, where applicable, at least 1 and often several psychiatric diagnoses assigned by the attending resident or psychiatrist were recorded in each patient's file and entered into the electronic Regional Access and Intake System (RAIS).

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Sample

Diagnosis formed the basis of the sample construction, and the proportions in specific ICD-10 diagnostic categories were different for each sex. The sample was selected from CAAMHPP enrollments who had a completed ACE survey collected between November 2015 and February 2018 linked to an admission with 1 or more diagnoses of record (n = 72,714) between July 2012 (when discharge diagnosis was implemented in the information system) and February 2018. Only ACE surveys noted as completed (ie, items assigned the value of 0 or 1, as per ACE survey completion instructions) were included in the analysis, and missing items were not included. There were 33,886 diagnoses (37% in males) linked to ACE survey scores, representing 3116 unique females and 2124 unique males. Each ACE score and index diagnosis was counted only once in the relevant ICD-10 categories for each patient. CAAMHPP serves primarily children and youth aged 0-18 years, with specialized areas (eg, Eating Disorders and Transitional Youth) also serving young adults up to about age 24 years. Males had a mean age of 11 years (standard deviation = 7 years) and a mean ACE total score of 2.4. Females had a mean age of 14 years (standard deviation = 8 years) and a mean ACE total score of 2.9. A total of 3221 ACE surveys (35% in males) were not linked to diagnoses. There were, respectively, 4.5 and 4.8 diagnoses on average for males and females (eg, discharge diagnoses are recorded for each patient admission); hence, the data were reduced to represent a single count for each ACE item or total score associated with each unique index patient diagnosis in each ICD-10 category. Thus, an individual patient was counted only once for each ACE item for each distinct diagnosis in each ICD-10 category and could be counted in more than one ICD-10 category (eg, for comorbid or diagnoses). Two groups were constructed for each sex, representing an ACE survey-linked group collapsed by unique diagnosis by each patient and an ACE survey-linked group linked by unique diagnoses by patient to the multiple admissions for each patient.

Table 1. Distribution of Adverse Childhood Experiences (ACE) survey total score value by integer frequency and mean by groups[a]

ACE survey item	Collapsed dataset, no. (% of total responses)		Multiple-admissions dataset, no. (% of total responses)	
	Females (n = 3116)	Males (n = 2124)	Females (n = 23,265)	Males (n = 13,842)
Value 0	593 (19.0)	551 (26.0)	2690 (11.6)	2342 (16.9)
Value 1	580 (18.6)	430 (20.3)	3324 (14.3)	2312 (16.7)
Value 2	442 (14.2)	322 (15.2)	3092 (13.3)	2177 (15.7)
Value 3	384 (12.3)	237 (11.2)	2906 (12.5)	1649 (11.9)
Value 4	321 (10.3)	172 (8.1)	2403 (10.3)	1309 (9.5)
Value 5	243 (7.8)	140 (6.6)	2429 (10.4)	1217 (8.8)
Value 6	200 (6.4)	124 (5.9)	2020 (8.7)	1167 (8.4)
Value 7	124 (3.9)	87 (4.1)	1474 (6.3)	957 (6.9)
Value 8	120 (3.9)	37 (1.8)	1335 (5.7)	390 (2.8)
Value 9	74 (2.4)	14 (0.7)	1071 (4.6)	129 (0.9)
Value 10	35 (1.1)	10 (0.5)	521 (2.2)	193 (1.4)
Mean ACE total score (standard deviation)	2.4 (2.3)	2.9 (2.6)	3.8 (2.8)	3.5 (2.1)

[a] Percentages may not total 100 because of rounding.

Variables

The analysis examined the relationship between ICD-10 categories and the 10 individual ACE items and the total score on the original ACE survey. The following ICD-10 diagnostic categories were included: Organic, including symptomatic, mental disorders (F00-F09); mental and behavioral disorders caused by psychoactive substance use (F10-F19); schizophrenia, schizotypal, and delusional disorders (F20-F29); mood (affective) disorders (F30-F39); neurotic, stress-related, and somatoform disorders (F40-F48); behavioral syndromes associated with physiologic disturbances and physical factors (F50-F59); disorders of adult personality and behavior (F60-F69); mental retardation (F70-F79); disorders of psychological development (F80-F89); behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98); and unspecified mental disorder (F99). An additional variable was constructed that represented the frequency of unique diagnoses for each unique patient across all admissions.

In addition to total ACE score (sum of ACE items), ACE survey items included the following: 1) emotional abuse; 2) physical abuse; 3) sexual abuse; 4) lack of love/support; 5) neglect; 6) parental divorce/separation; 7) spousal abuse; 8) parental substance abuse; 9) parental mental illness;

and 10) parental prison. Additionally, because of the effect of sex, males and females were analyzed separately.

Data Analysis

Tetrachoric correlation compared ACE items and ICD-10 categories by admission and collapsed samples by sex. Hierarchical regression and polychoric factor analysis for binary data were employed to describe and explicitly test the relationship between ACE total score and ICD-10 categories.[19]

RESULTS

Table 1 shows the distribution of ACE scores ranging from 0 to 10 for the 2 main groups stratified by sex. Of note is that the first group representing the collapsed data maximizes the number of diagnoses for each individual in the ACE score distribution, whereas the multiple-admissions dataset maximizes the number of diagnoses over admissions for each individual in the ACE score distribution. The collapsed and multiple-admissions datasets are presented in tandem throughout Tables 1-6 and are also identified in relation to the sample sizes in each. Note in Table 1 that the 2 distributions for each group (males and females) are representative of one another for values greater than 0, with the greatest difference being under 5% in Value 1 items for males and females. Also,

the ratio comparing the 2 groups in each sex increases with the total score value, representing additional admissions for individuals with higher ACE score totals.

Table 2 shows the frequency distributions for the individual ACE items in the 2 groups (collapsed vs multiple admissions) for males and females. The highest frequencies are in Item 9 (parental mental illness) in both groups. Note between groups, the difference in the percentage total sample recorded by sex

for each group. For example, for females, Item 1 (emotional abuse), there is a 14% difference, indicating that this group had additional admissions.

Table 3 shows the frequency of ICD-10 category counts in the 2 groups. Note that the group with multiple admissions included the total number of diagnoses in the sample, not just those linked to ACE scores. This is because diagnoses have been recorded for a longer period than ACE surveys have been collected.

Tables 4A and 4B provide for each sex a crosstabulation of the count for each ACE item by each ICD-10 category. The most important percentage total is that of the whole sample because each individual in the sample is equipotent for positive membership in any given cell, with the denominator including 0 value counts. The highest percentage totals (Table 4A) in the crosstabulation for females are mood disorders (F30-F39) and neurotic, stress-related, and somatoform disorders (F40-F48). The highest percentage totals in the crosstabulation for males (Table 4B) are neurotic, stress-related, and somatoform disorders (F40-F48); mood (affective) disorders (F30-F39); behavioral syndromes associated with psychological disturbances and physical factors (F50-F59); and childhood adolescent behavioral emotional disorders (F90-F98). Although the foregoing descriptive tables are necessary, the associations between ACE items and ICD-10 categories are better revealed in the 2 groups on the basis of tetrachoric correlation analyses and polychoric factor analyses.

Tables 5A and 5B present for each sex the tetrachoric correlations for the collapsed and multiple-admission samples. Overall, the correlations were low. Thirty-two product correlations were greater than 0.2. Only 4 of these correlations were greater than 0.3 for females, and only 3 were greater than 0.3 for males. All correlations were weak, with none greater than 0.34, which was for female mood (affective) disorders (F30-F39).

Tables 6A and 6B present for females and males, respectively, the hierarchical regression models describing the relationship in both collapsed and multiple-admission groups: ICD-10 categories and the ACE total score. For females in the multiple-admission group, membership in the following diagnostic categories significantly, but marginally, reduced the ACE total score in the model: Substance disorder (F10-F19); mood (affective) disorders (F30-F39); neurotic, stress-related, and somatoform disorders (F40-F48); mental retardation (F70-F79); developmental disorders (F80-F89); child/adolescent behavioral emotional disorders (F90-F98); and unspecified mental disorder (F99).

Table 2. Frequency of Adverse Childhood Experiences (ACE) survey items with Value 1 in the sample

ACE survey item	Sample collapsed by diagnosis by patient, no. (% of total sample)		Sample with multiple admissions repeated by diagnosis, no. (% of total sample)	
	Females (n = 3116)	Males (n = 2124)	Females (n = 23,265)	Males (n = 13,842)
1. Emotional abuse	1140 (36.6)	578 (27.2)	11,797 (50.7)	5791 (41.8)
2. Physical abuse	593 (19.0)	325 (15.3)	6962 (29.9)	3422 (24.7)
3. Sexual abuse	503 (16.1)	79 (3.7)	6277 (27.0)	961 (6.9)
4. Lack of love/support	1353 (43.4)	628 (29.6)	13,463 (57.9)	5782 (41.8)
5. Neglect	460 (14.8)	274 (12.9)	4737 (20.4)	2445 (17.7)
6. Parental divorce/separation	1498 (48.1)	1043 (49.1)	13,378 (57.5)	7923 (57.2)
7. Spousal abuse	751 (24.1)	447 (21.0)	7551 (32.5)	3672 (26.5)
8. Parental substance abuse	985 (31.6)	532 (25.0)	8912 (38.3)	4414 (31.9)
9. Parental mental illness	1781 (57.2)	1051 (49.5)	15,755 (67.7)	8162 (59.0)
10. Parental prison	309 (9.9)	189 (8.9)	3257 (14.0)	1655 (12.0)

Table 3. Frequency of International Classification of Diseases, Tenth Revision (ICD-10) category counts in the sample

ICD-10 category	Sample collapsed by diagnosis by patient, no. (% of sample total)		Sample with multiple admissions repeated by diagnosis, no. (% of sample total)	
	Females (n = 3116)	Males (n = 2124)	Females (n = 42,658)	Males (n = 30,056)
Organic mental disorders (F00-F09)	92 (3.0)	86 (4.0)	322 (0.8)	249 (0.8)
Substance disorder (F10-F19)	241 (7.7)	179 (8.4)	1231 (2.9)	1312 (4.4)
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	50 (1.6)	77 (3.6)	164 (0.4)	296 (1.0)
Mood (affective) disorders (F30-F39)	1253 (40.2)	529 (24.9)	5181 (12.1)	2070 (6.9)
Neurotic, stress-related, and somatoform disorders (F40-F48)	2159 (69.3)	1182 (55.6)	14,306 (33.5)	6253 (20.8)
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	535 (17.2)	38 (1.8)	1202 (2.8)	106 (0.4)
Personality/behavior disorders (F60-F69)	282 (9.1)	97 (4.6)	1006 (2.4)	511 (1.7)
Mental retardation (F70-F79)	45 (1.4)	60 (2.8)	172 (0.4)	197 (0.7)
Developmental disorders (F80-F89)	184 (5.9)	334 (15.7)	795 (1.9)	1833 (6.1)
Child/adolescent behavioral emotional disorders (F90-F98)	883 (28.3)	959 (45.2)	4147 (9.7)	6351 (21.1)
Unspecified mental disorder (F99)	764 (24.5)	486 (22.9)	2882 (6.8)	2188 (7.3)

For females in the multiple-admission group, membership in the following diagnostic categories significantly, but marginally, increased the ACE total score: Schizophrenia, schizotypal, and delusional disorders (F20-F29). For females in the collapsed-admission group, membership in the following diagnostic categories significantly, but marginally, reduced the ACE total score in the model: Developmental disorders (F80-F89) and unspecified mental disorder (F99).

For females in the collapsed-admission group, membership in the following diagnostic categories significantly, but marginally, increased the ACE total score: Mood (affective) disorders (F30-F39), child/adolescent behavioral emotional disorders (F90-F98), behavioral syndromes associated with physiological disturbances and physical factors (F50-F59), and substance disorder (F10-F19).

For females there was sign reversal between the significant-collapsed group and multiple-admission group in the following diagnostic categories: Mood (affective) disorders (F30-F39) and child/adolescent behavioral emotional disorders (F90-F98). The remaining categories for females were nonsignificant. For females the frequency of comorbid diagnoses significantly, but marginally increased the ACE total score.

For males in the multiple-admission group membership in the following diagnostic categories significantly, but marginally, reduced the ACE total score in the model: Organic mental disorders (F00-F09); schizophrenia, schizotypal, and delusional disorders (F20-F29); mood (affective) disorders (F30-F39); neurotic, stress-related, and somatoform

Table 4A. Frequency totals by Adverse Childhood Experiences (ACE) survey item by International Classification of Diseases, Tenth Revision (ICD-10) category for females[a]

ICD-10 category	ACE item (n = 3116), no. (% row total) [% sample total]										
	1. Emotional abuse	2. Physical abuse	3. Sexual abuse	4. Lack of love/ support	5. Neglect	6. Parental divorce/ separation	7. Spousal abuse	8. Parental substance abuse	9. Parental mental illness	10. Parental prison	Total [% total sample]
Organic mental disorders (F00-F09)	41 (44.6) [1.3]	30 (32.6) [1.0]	24 (26.1) [0.8]	51 (55.4) [1.6]	18 (19.6) [0.6]	49 (53.3) [1.6]	25 (27.2) [0.8]	29 (31.5) [0.9]	56 (60.9) [1.8]	15 (16.3) [0.5]	92 [3.0]
Substance disorder (F10-F19)	135 (56.0) [4.3]	75 (31.1) [2.4]	84 (34.9) [2.7]	143 (59.3) [4.6]	65 (27.0) [2.1]	151 (62.7) [4.8]	82 (34.0) [2.6]	130 (53.9) [4.2]	162 (67.2) [5.2]	49 (20.3) [1.6]	241 [7.7]
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	20 (40.0) [0.6]	15 (30.0) [0.5]	14 (28.0) [0.4]	27 (54.0) [0.9]	9 (18.0) [0.3]	27 (54.0) [0.9]	14 (28.0) [0.4]	18 (36.0) [0.6]	28 (56.0) [0.9]	10 (20.0) [0.3]	50 [1.6]
Mood (affective) disorders (F30-F39)	604 (48.2) [19.4]	333 (26.6) [10.7]	295 (23.5) [9.5]	708 (56.5) [22.7]	228 (18.2) [7.3]	674 (53.8) [21.6]	352 (28.1) [11.3]	481 (38.4) [15.4]	820 (65.4) [26.3]	162 (12.9) [5.2]	1253 [40.2]
Neurotic, stress-related, and somatoform disorders (F40-F48)	883 (40.9) [28.3]	448 (20.8) [14.4]	397 (18.4) [12.7]	1007 (46.6) [32.3]	326 (15.1) [10.5]	1083 (50.2) [34.8]	524 (24.3) [16.8]	710 (32.9) [22.8]	1285 (59.5) [41.2]	224 (10.4) [7.2]	2159 [69.3]
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	221 (41.3) [7.1]	124 (23.2) [4.0]	120 (22.4) [3.9]	268 (50.1) [8.6]	98 (18.3) [3.1]	230 (43) [7.4]	127 (23.7) [4.1]	194 (36.3) [6.2]	321 (60.0) [10.3]	50 (9.3) [1.6]	535 [17.2]
Personality/behavior disorders (F60-F69)	154 (54.6) [4.9]	99 (35.1) [3.2]	80 (28.4) [2.6]	182 (64.5) [5.8]	51 (18.1) [1.6]	150 (53.2) [4.8]	87 (30.9) [2.8]	95 (33.7) [3.0]	179 (63.5) [5.7]	30 (10.6) [1.0]	282 [9.1]
Mental retardation (F70-F79)	18 (40.0) [0.6]	12 (26.7) [0.4]	12 (26.7) [0.4]	24 (53.3) [0.8]	12 (26.7) [0.4]	19 (42.2) [0.6]	12 (26.7) [0.4]	13 (28.9) [0.4]	25 (55.6) [0.8]	7 (15.6) [0.2]	45 [1.4]
Developmental disorders (F80-F89)	64 (34.8) [2.1]	34 (18.5) [1.1]	27 (14.7) [0.9]	79 (42.9) [2.5]	19 (10.3) [0.6]	84 (45.7) [2.7]	39 (21.2) [1.3]	46 (25.0) [1.5]	107 (58.2) [3.4]	17 (9.2) [0.5]	184 [5.9]
Child/adolescent behavioral emotional disorders (F90-F98)	396 (44.8) [12.7]	204 (23.1) [6.5]	186 (21.1) [6.0]	450 (51.0) [14.4]	164 (18.6) [5.3]	486 (55.0) [15.6]	264 (29.9) [8.5]	322 (36.5) [10.3]	588 (66.6) [18.9]	115 (13.0) [3.7]	883 [28.3]
Unspecified mental disorder (F99)	306 (40.1) [9.8]	165 (21.6) [5.3]	142 (18.6) [4.6]	371 (48.6) [11.9]	121 (15.8) [3.9]	390 (51.0) [12.5]	183 (24.0) [5.9]	229 (30.0) [7.3]	460 (60.2) [14.8]	83 (10.9) [2.7]	764 [24.5]

[a] In each row, values in parentheses represent the percentage total of the cell for the row total, and values in brackets represent the percentage total of the cell in respect to the whole sample.

disorders (F40-F48); behavioral syndromes associated with physiological disturbances and physical factors (F50-F59); personality/behavior disorders (F60-F69); developmental disorders (F80-F89); and unspecified mental disorder (F99).

For males in the multiple-admission group, membership in none of the diagnostic categories significantly increased the ACE total score. For males in the collapsed-admission group, membership in the following diagnostic categories significantly reduced the ACE total score

in the model: Neurotic, stress-related, and somatoform disorders (F40-F48); personality/behavior disorders (F60-F69); and developmental disorders (F80-F89).

For males in the collapsed-admission group, membership in the following diagnostic categories significantly, but marginally, increased the ACE total score: Substance disorder (F10-F19) and child/adolescent behavioral emotional disorders (F90-F98).

For males there was no sign reversal between the significant-collapsed group and the multiple-admission group. The

remaining categories for males were nonsignificant. For males in both the collapsed group and multiple-admission group, the frequency of comorbid diagnoses marginally increased the ACE total score.

Tables 7A and 7B, and 8A and 8B present, respectively, for females and males the polychoric factor analysis results in the collapsed group only because the tetrachoric results were nearly identical for both groups. For both sexes, with the exception of substance disorders for females, the ICD-10 categories and the individual ACE items were independent,

Table 4B. Frequency totals by Adverse Childhood Experiences (ACE) survey item by International Classification of Diseases, Tenth Revision (ICD-10) category for males[a]

ICD-10 category	ACE item (n = 2124), no. (% row total) [% sample total]										
	1. Emotional abuse	2. Physical abuse	3. Sexual abuse	4. Lack of love/ support	5. Neglect	6. Parental divorce/ separation	7. Spousal abuse	8. Parental substance abuse	9. Parental mental illness	10. Parental prison	Total [% total sample]
Organic mental disorders (F00-F09)	30 (34.9) [1.4]	18 (20.9) [0.8]	6 (7.0) [0.3]	25 (29.1) [1.2]	9 (10.5) [0.4]	41 (47.7) [1.9]	17 (19.8) [0.8]	19 (22.1) [0.9]	43 (50.0) [2.0]	5 (5.8) [0.2]	86 [4.0]
Substance disorder (F10-F19)	81 (45.3) [3.8]	57 (31.8) [2.7]	16 (8.9) [0.8]	79 (44.1) [3.7]	34 (19.0) [1.6]	116 (64.8) [5.5]	48 (26.8) [2.3]	76 (42.5) [3.6]	95 (53.1) [4.5]	25 (14.0) [1.2]	179 [8.4]
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	25 (32.5) [1.2]	14 (18.2) [0.7]	5 (6.5) [0.2]	27 (35.1) [1.3]	9 (11.7) [0.4]	42 (54.5) [2.0]	14 (18.2) [0.7]	21 (27.3) [1]	34 (44.2) [1.6]	7 (9.1) [0.3]	77 [3.6]
Mood (affective) disorders (F30-F39)	200 (37.8) [9.4]	115 (21.7) [5.4]	26 (4.9) [1.2]	224 (42.3) [10.5]	75 (14.2) [3.5]	264 (49.9) [12.4]	104 (19.7) [4.9]	153 (28.9) [7.2]	272 (51.4) [12.8]	32 (6.0) [1.5]	529 [24.9]
Neurotic, stress-related, and somatoform disorders (F40-F48)	386 (32.7) [18.2]	215 (18.2) [10.1]	53 (4.5) [2.5]	380 (32.1) [17.9]	150 (12.7) [7.1]	586 (49.6) [27.6]	225 (19.0) [10.6]	315 (26.6) [14.8]	606 (51.3) [28.5]	107 (9.1) [5.0]	1182 [55.6]
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	11 (28.9) [0.5]	4 (10.5) [0.2]	4 (10.5) [0.2]	16 (42.1) [0.8]	1 (2.6) [0.0005]	12 (31.6) [0.6]	5 (13.2) [0.2]	5 (13.2) [0.2]	17 (44.7) [0.8]	1 (2.6) [0.0005]	38 [1.8]
Personality/behavior disorders (F60-F69)	28 (28.9) [1.3]	20 (20.6) [0.9]	12 (12.4) [0.6]	37 (38.1) [1.7]	13 (13.4) [0.6]	48 (49.5) [2.3]	14 (14.4) [0.7]	22 (22.7) [1.0]	45 (46.4) [2.1]	5 (5.2) [0.2]	97 [4.6]
Mental retardation (F70-F79)	16 (26.7) [0.8]	11 (18.3) [0.5]	8 (13.3) [0.4]	22 (36.7) [1.0]	12 (20) [0.6]	28 (46.7) [1.3]	16 (26.7) [0.8]	14 (23.3) [0.7]	34 (56.7) [1.6]	6 (10.0) [0.3]	60 [2.8]
Developmental disorders (F80-F89)	108 (32.3) [5.1]	54 (16.2) [2.5]	8 (2.4) [0.4]	96 (28.7) [4.5]	28 (8.4) [1.3]	151 (45.2) [7.1]	62 (18.6) [2.9]	75 (22.5) [3.5]	176 (52.7) [8.3]	31 (9.3) [1.5]	334 [15.7]
Child/adolescent behavioral emotional disorders (F90-F98)	343 (35.8) [16.1]	190 (19.8) [8.9]	48 (5.0) [2.3]	323 (33.7) [15.2]	130 (13.6) [6.1]	529 (55.2) [24.9]	226 (23.6) [10.6]	274 (28.6) [12.9]	529 (55.2) [24.9]	107 (11.2) [5.0]	959 [45.2]
Unspecified mental disorder (F99)	156 (32.1) [7.3]	88 (18.1) [4.1]	25 (5.1) [1.2]	169 (34.8) [8.0]	75 (15.4) [3.5]	258 (53.1) [12.1]	107 (22) [5.0]	132 (27.2) [6.2]	265 (54.5) [12.5]	48 (9.9) [2.3]	486 [22.9]

[a] In each row, values in parentheses represent the percentage total of the cell for the row total, and values in brackets represent the percentage total of the cell in respect to the whole sample.

having no significant shared variance (ie, loadings < 0.35). Furthermore, each group of variables loaded on different factors, with the ACE items accounting for 50% of the variance for females and 37% of the variance for males.

Results Summary

Simple descriptive bivariate analysis of the ACE item and ICD-10 category frequencies identified potentially distinct relationships among these groups of variables for both sexes. Hierarchical regression indicated only marginal (weak) significant relationships between the ACE total score and the categories of psychiatric disorder, which for the most part reduced the magnitude of the ACE total score and in the case of frequency of diagnosis only marginally increased the ACE total score for both sexes. Tetrachoric correlation indicated low (weak) correlations between ICD-10 categories and ACE items, with no value greater than 0.34. The highest value was for male and female substance disorders in the collapsed group across about 6 of the ACE items: Emotional abuse, physical abuse, sexual abuse, neglect, parental substance abuse, and parental prison. Female substance disorders was the only ICD-10 category with a significant relationship in the polychoric factor analyses. Hierarchical regression produced results that were similar to, although less precise than, the polychoric factor analyses, likely because of the weak positive and negative correlations between the ACE items and the ICD-10 categories.

Table 5A. Tetrachoric correlation comparing Adverse Childhood Experiences (ACE) survey items and International Classification of Diseases, Tenth Revision (ICD-10) categories by multiple admissions and collapsed samples for females

ICD-10 diagnosis	ACE item									
	1. Emotional abuse	2. Physical abuse	3. Sexual abuse	4. Lack of love/ support	5. Neglect	6. Parental divorce/ separation	7. Spousal abuse	8. Parental substance abuse	9. Parental mental illness	10. Parental prison
From multiple-admissions data (n = 23,265)										
Organic mental disorders (F00-F09)	-0.04	0.03	0.01	-0.02	0.01	-0.02	-0.04	-0.05	-0.04	0.05
Substance disorder (F10-F19)	0.12	0.08	0.14	0.09	0.11	0.08	0.06	0.18	-0.01	0.15
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	-0.11	-0.03	-0.07	-0.09	-0.08	-0.09	-0.09	-0.09	-0.21	0.04
Mood (affective) disorders (F30-F39)	0.02	0.01	0.02	0.07	0.00	-0.04	-0.02	0.00	0.04	-0.03
Neurotic, stress-related, and somatoform disorders (F40-F48)	-0.04	-0.04	-0.01	-0.07	-0.04	-0.05	-0.06	-0.03	-0.01	-0.06
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	-0.07	-0.04	-0.02	-0.06	0.00	-0.16	-0.11	-0.03	-0.08	-0.05
Personality/behavior disorders (F60-F69)	0.07	0.06	0.07	0.12	0.06	0.00	0.04	-0.01	-0.04	0.00
Mental retardation (F70-F79)	-0.15	-0.04	-0.02	-0.02	0.09	-0.15	-0.06	-0.08	-0.08	0.03
Developmental disorders (F80-F89)	-0.1	-0.05	-0.09	-0.14	-0.2	-0.1	-0.12	-0.16	-0.03	-0.19
Child/adolescent behavioral emotional disorders (F90-F98)	0.04	0.01	-0.04	0.00	0.01	0.06	0.05	0.04	0.07	0.08
Unspecified mental disorder (F99)	-0.09	-0.1	-0.1	-0.08	-0.06	-0.06	-0.11	-0.11	-0.07	-0.07
From collapsed data (n = 3116)										
Organic mental disorders (F00-F09)	0.09	0.19	0.16	0.13	0.08	0.06	0.04	0.00	0.04	0.14
Substance disorder (F10-F19)	0.26	0.21	0.33	0.21	0.24	0.2	0.16	0.31	0.14	0.26
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	0.04	0.14	0.17	0.11	0.05	0.06	0.05	0.05	-0.01	0.18
Mood (affective) disorders (F30-F39)	0.31	0.28	0.30	0.34	0.15	0.15	0.13	0.19	0.22	0.18
Neurotic, stress-related, and somatoform disorders (F40-F48)	0.23	0.13	0.19	0.16	0.03	0.10	0.01	0.07	0.12	0.05
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	0.08	0.1	0.16	0.11	0.10	-0.09	-0.01	0.09	0.05	-0.02
Personality/behavior disorders (F60-F69)	0.25	0.28	0.24	0.29	0.08	0.07	0.11	0.03	0.09	0.02
Mental retardation (F70-F79)	0.04	0.1	0.15	0.1	0.17	-0.06	0.03	-0.03	-0.02	0.11
Developmental disorders (F80-F89)	-0.02	-0.01	-0.03	-0.01	-0.11	-0.03	-0.05	-0.1	0.01	-0.02
Child/adolescent behavioral emotional disorders (F90-F98)	0.18	0.12	0.16	0.16	0.13	0.15	0.15	0.11	0.20	0.14
Unspecified mental disorder (F99)	0.07	0.07	0.08	0.1	0.04	0.06	0.00	-0.04	0.06	0.04

DISCUSSION

The results identified female substance disorder as the only significant diagnostic category related to both ACE items and the ACE total score. This finding related to substance disorders is most closely aligned with that of a recent article examining ACEs and substance use among young adults,[20] which found that ACEs accumulated over development and were associated with young-adult outcomes, particularly substance disorders. Most importantly, the tetrachoric correlations and polychoric factor analysis in the current study provided evidence that the ICD-10 diagnostic categories and ACE items are independent.

Consistent with transactional epigenetic models of developmental psychopathology,[21-24] the main ACE items for males and females were parental divorce/separation, parental mental illness, and emotional abuse, which combine variance under the rubrics of heredity and transgenerational transmission of coping styles, notwithstanding the influence of these vicissitudes on the zone of proximal development.[25-27] Females appeared to more frequently endorse the ACE items lack of love/support and parental substance abuse.

Psychiatry is not an exact science or medicine.[28] Nevertheless, it is heavily prescriptive, pharmacotherapy-focused, and controlled in terms of treatment on the basis of diagnosis.[29,30] Given the level

Table 5B. Tetrachoric correlation comparing Adverse Childhood Experiences (ACE) survey items and International Classification of Diseases, Tenth Revision (ICD-10) categories by multiple admissions and collapsed samples for males

ICD-10 diagnosis	ACE item									
	1. Emotional abuse	2. Physical abuse	3. Sexual abuse	4. Lack of love/ support	5. Neglect	6. Parental divorce/ separation	7. Spousal abuse	8. Parental substance abuse	9. Parental mental illness	10. Parental prison
From multiple-admissions data (n = 13,842)										
Organic mental disorders (F00-F09)	-0.08	-0.07	-0.02	-0.13	-0.14	-0.11	-0.12	-0.14	-0.11	-0.16
Substance disorder (F10-F19)	0.06	0.13	0.17	0.08	0.07	0.11	-0.01	0.14	-0.06	0.02
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	-0.05	-0.03	-0.02	-0.02	-0.08	-0.03	0.00	-0.01	-0.12	-0.04
Mood (affective) disorders (F30-F39)	0.00	-0.02	-0.04	0.07	-0.01	-0.07	-0.1	0.00	-0.06	-0.18
Neurotic, stress-related, and somatoform disorders (F40-F48)	-0.08	-0.07	-0.01	-0.1	-0.09	-0.09	-0.13	-0.05	-0.02	-0.10
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	-0.11	-0.12	0.02	-0.02	-0.16	-0.16	-0.07	-0.27	0.00	-0.28
Personality/behavior disorders (F60-F69)	-0.18	-0.08	0.18	0.01	-0.16	-0.12	-0.25	-0.17	-0.18	-0.18
Mental retardation (F70-F79)	-0.07	0.03	0.23	0.05	0.11	-0.07	0.07	0.01	0.01	0.07
Developmental disorders (F80-F89)	-0.09	-0.11	-0.25	-0.13	-0.17	-0.13	-0.07	-0.10	-0.05	-0.08
Child/adolescent behavioral emotional disorders (F90-F98)	0.09	0.09	0.03	0.05	0.04	0.11	0.12	0.05	0.09	0.14
Unspecified mental disorder (F99)	-0.09	-0.09	-0.06	-0.05	0.01	-0.01	-0.04	-0.04	-0.01	-0.03
From collapsed data (n = 2124)										
Organic mental disorders (F00-F09)	0.10	0.10	0.15	-0.01	-0.06	-0.02	-0.02	-0.04	0.01	-0.10
Substance disorder (F10-F19)	0.27	0.31	0.26	0.21	0.14	0.22	0.10	0.27	0.05	0.15
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	0.07	0.05	0.13	0.07	-0.03	0.06	-0.05	0.03	-0.06	0.01
Mood (affective) disorders (F30-F39)	0.24	0.20	0.11	0.27	0.05	0.02	-0.04	0.09	0.04	-0.15
Neurotic, stress-related, and somatoform disorders (F40-F48)	0.23	0.17	0.14	0.11	-0.01	0.02	-0.1	0.07	0.06	0.01
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	0.02	-0.09	0.23	0.14	-0.30	-0.18	-0.12	-0.17	-0.05	-0.22
Personality/behavior disorders (F60-F69)	0.02	0.1	0.32	0.11	0.01	0.00	-0.12	-0.04	-0.04	-0.13
Mental retardation (F70-F79)	-0.01	0.05	0.32	0.09	0.13	-0.03	0.08	-0.02	0.08	0.03
Developmental disorders (F80-F89)	0.10	0.02	-0.12	-0.02	-0.15	-0.06	-0.06	-0.05	0.05	0.02
Child/adolescent behavioral emotional disorders (F90-F98)	0.29	0.21	0.18	0.13	0.04	0.17	0.10	0.13	0.16	0.16
Unspecified mental disorder (F99)	0.11	0.09	0.12	0.11	0.09	0.08	0.03	0.05	0.10	0.04

of error inherent in psychiatric diagnostic formulation, overdiagnosis of some disorders,[31-33] and the issues attending misdiagnosis,[13,34] particularly in children,[35] any opportunity to add precision is imperative.

The diagnoses made were not associated with high endorsement of or correlation with the ACE items. However, both males and females substantially endorsed ACE items (Table 1), such as parental divorce/separation and parental mental disorder, factors often associated with enduring family adversity and mental disorders.[36-40] By necessity, these family adversities are embedded in the micro-interactions within familial relationships that originally establish neuronal architecture and subsequently constitute the basis of an individual's memory and propensity.[41]

Furthermore, there was a low base rate of ACE item endorsement across all ICD-10 diagnostic categories. Possibly, ACEs account for more dimensional core aspects of mental disorder that permeate all categorical constructs of diagnosis, possibly illustrating the limits of psychiatric diagnosis and may be related to poorly understood phenomena, such as treatment resistance.[42,43] Hence, first including ACE assessment as an axis in differential diagnosis before labeling a child with a diagnosis is warranted in advance of implementing conventional interventions.[44-46] Prior ACE assessment may at least help to rule out misdiagnosis, and identify comorbidity and significant underlying diatheses to better inform care planning before treatment. The present results hold the potential to inform direct use of ACE survey information to focus treatment planning and to create the clinical "space" required to develop, implement, and test trauma-focused care.

This study has a number of limitations. There was a preponderance of diagnoses for each individual. Psychiatrists in Alberta, Canada, are remunerated in part on the basis of making diagnoses; hence, some diagnoses may be overrepresented in this sample and in the population and could bias the relationship with ACE survey items and total score. Additionally, some diagnoses might go unidentified, and hence be under-represented. Similarly, some ACE items might also have gone unreported, possibly because of stigma. Additionally, the ACE survey may not

Table 6A. Hierarchical regression model of Adverse Childhood Experiences total score (dependent variable) and International Classification of Diseases, Tenth Revision (ICD-10) categories in females

Variable	Collapsed group, n = 3116		Multiple-admission group, n = 21,181	
R^2 differential models	R^2 Model 2 - Model 1 = 0.023; $F_{(13,103)} = 77.94$; p = 0.0001		R^2 Model 2 - Model 1 = 0.109; $F_{(121,168)} = 2610.67$; p = 0.0001	
ICD-10 category	Coefficient (SE)	p > |t|	Coefficient (SE)	p > |t|
Organic mental disorders (F00-F09)	0.13 (0.29)	0.645	-0.16 (0.27)	0.562
Substance disorder (F10-F19)	0.69 (0.19)	0.001	0.43 (0.13)	0.001
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	-0.01 (0.36)	0.98	-1.04 (0.27)	0.0001
Mood (affective) disorders (F30-F39)	0.55 (0.1)	0.001	-0.19 (0.06)	0.001
Neurotic, stress-related, and somatoform disorders (F40-F48)	-0.04 (0.1)	0.671	-0.33 (0.05)	0.0001
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	0.4 (0.13)	0.002	-0.19 (0.1)	0.061
Personality/behavior disorders (F60-F69)	-0.03 (0.17)	0.874	-0.15 (0.12)	0.214
Mental retardation (F70-F79)	-0.26 (0.42)	0.53	-1.08 (0.32)	0.001
Developmental disorders (F80-F89)	-0.88 (0.18)	0.001	-1.28 (0.1)	0.0001
Child/adolescent behavioral emotional disorders (F90-F98)	0.41 (0.11)	0.001	-0.15 (0.07)	0.019
Unspecified mental disorder (F99)	-0.31 (0.11)	0.004	-0.61 (0.08)	0.0001
Frequency of comorbid diagnoses	0.06 (0.01)	0.001	0.05 (0.01)	0.0001

SE = standard error.

Table 6B. Hierarchical regression model of Adverse Childhood Experiences total score (dependent variable) and International Classification of Diseases, Tenth Revision (ICD-10) categories in males

Variable	Collapsed group, n = 2124		Multiple-admission group, n = 12,705	
R^2 differential models	R^2 Model 2 - Model 1 = 0.049; $F_{(12,111)} = 114.89$; p = 0.0001		R^2 Model 2 - Model 1 = 0.134; $F_{(112,692)} = 2003.91$; p = 0.0001	
ICD-10 category	Coefficient (SE)	p > |t|	Coefficient (SE)	p > |t|
Organic mental disorders (F00-F09)	-0.4 (0.22)	0.069	-0.98 (0.21)	0.0001
Substance disorder (F10-F19)	0.6 (0.20)	0.003	0.03 (0.12)	0.815
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	-0.38 (0.26)	0.153	-0.44 (0.22)	0.044
Mood (affective) disorders (F30-F39)	-0.03 (0.12)	0.781	-0.45 (0.08)	0.0001
Neurotic, stress-related, and somatoform disorders (F40-F48)	-0.21 (0.10)	0.047	-0.52 (0.06)	0.0001
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	-0.56 (0.30)	0.062	-0.92 (0.25)	0.0001
Personality/behavior disorders (F60-F69)	-0.57 (0.25)	0.021	-1.22 (0.16)	0.0001
Mental retardation (F70-F79)	0.17 (0.33)	0.61	-0.04 (0.30)	0.903
Developmental disorders (F80-F89)	-0.76 (0.14)	0.0001	-1 (0.08)	0.0001
Child/adolescent behavioral emotional disorders (F90-F98)	0.27 (0.11)	0.011	-0.08 (0.06)	0.173
Unspecified mental disorder (F99)	-0.09 (0.12)	0.446	-0.42 (0.10)	0.0001
Frequency of comorbid diagnoses	0.09 (0.01)	0.0001	0.07 (0.01)	0.0001

SE = standard error.

include all categories underpinning the development of subsequent trauma.

There is also the requirement for one or more exit diagnoses for each admission. These diagnoses can change over time for each individual. Individuals could have both the same or different diagnoses for each distinct admission and/or multiple concurrent comorbid diagnoses in any particular admission. Hence, it was necessary to link multiple diagnoses and/or admissions for each patient to a smaller number of ACE surveys. This effect was minimized by counting each diagnosis only once for each individual with an ACE survey in the collapsed group. Even so, individuals could be counted more than once for each distinct diagnosis in 1 ICD-10 category and more than once between the 11 ICD-10 categories.

Comparison of the collapsed group with the multiple-admission group provided a basis to understand the differences that arise when the same analyses were applied to datasets constructed somewhat differently, yet consisting of the same variables. To some extent, this approach provided a means that validated the findings, especially with respect to the hierarchical, tetrachoric, and polychoric analyses. Although one might expect relatively consistent results across these analyses in and between each of the 2 data groups, the multiple-admission group could be biased in at least 2 ways. First, for more serious disorders such as schizophrenia, increased frequency of admission could inflate the membership in the multiple-admission group. This also holds true for a greater number of individuals having fewer admissions with common disorders, such as neurotic, stress-related, and somatoform disorders. This bias is possibly evident where the results are significant in the multiple-admission linked data but not the collapsed data, or as with child/adolescent behavioral emotional disorders where the results are significant in both groups but have a reversed sign in the coefficient (eg, Tables 6A and 6B).

Secondly, the larger sample size in the multiple-admission data group tended to dampen the correlations of ICD-10 categories and ACE items, which were also low in the collapsed data group. Tallying the frequency of all diagnoses for each patient provided a variable that could be employed as a covariate of analysis in the hierarchical regression analyses. Of note, the frequency of diagnosis variable for each patient was significantly positively related to the ACE total score in the collapsed and multiple-admission datasets, but it accounted for less than 0.07 increase in total ACE score for both sexes. Polychoric factor analysis resolved this issue in the collapsed group (the group with the least bias in respect to the relationship between ACE score and diagnosis), demonstrating overall a nonsignificant level of shared variance between ICD-10 categories and ACE items, with only a marginal shared variance for female substance disorders.

Finally, mandatory completion of ACE surveys has been implemented only since September 2016, after commencement

Table 7A. Polychoric factor analysis model describing factors derived from Adverse Childhood Experiences items and International Classification of Diseases, Tenth Revision categories for females (no. of observations = 3116; retained factors = 4)[a]

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	5.89	3.56	0.5	0.5
Factor 2	2.33	1.08	0.2	0.7
Factor 3	1.24	0.23	0.11	0.81
Factor 4	1.02	0.38	0.09	0.9

[a] Logistic regression test: Independent vs saturated: $\chi^2(210) = 504.60$ Pr[> χ^2] < 0.00001.

Table 7B. Polychoric factor analysis model describing factor loadings of Adverse Childhood Experiences items and International Classification of Diseases, Tenth Revision categories for females (no. of observations = 3116; retained factors = 4)[a]

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness
1. Emotional abuse	0.84[a]	-0.1	0.12	0.004	0.19
2. Physical abuse	0.81	-0.08	0.01	0.14	0.2
3. Sexual abuse	0.63	0.02	0.06	0.17	0.57
4. Lack of love/support	0.80	-0.06	0.05	0.08	0.31
5. Neglect	0.79	-0.19	-0.21	-0.01	0.3
6. Parental divorce/separation	0.64	-0.13	-0.08	-0.22	0.49
7. Spousal abuse	0.77	-0.21	-0.18	-0.12	0.32
8. Parental substance abuse	0.73	-0.24	-0.08	-0.12	0.33
9. Parental mental illness	0.54	-0.08	-0.02	-0.18	0.65
10. Parental prison	0.64	-0.07	-0.18	-0.06	0.47
Organic mental disorders (F00-F09)	0.17	0.28	-0.08	0.17	0.85
Substance disorder (F10-F19)	0.39	0.24	0.24	0.2	0.6
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	0.19	0.42	-0.16	0.49	0.46
Mood (affective) disorders (F30-F39)	0.4	0.32	0.48	0.04	0.5
Neurotic, stress-related, and somatoform disorders (F40-F48)	0.24	0.45	0.5	-0.28	0.41
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	0.02	-0.5	0.06	0.47	0.52
Personality/behavior disorders (F60-F69)	0.29	0.26	0.39	0.3	0.6
Mental retardation (F70-F79)	0.16	0.64	-0.54	0.21	0.22
Developmental disorders (F80-F89)	0.02	0.54	-0.22	-0.06	0.65
Child/adolescent behavioral emotional disorders (F90-F98)	0.29	0.6	-0.15	-0.3	0.45
Unspecified mental disorder (F99)	0.13	0.4	0.08	-0.11	0.81

[a] Bold/shaded cells represent variables loading on factors.

of training in November 2015, with voluntary completion during the training period. Although the best efforts have been made to ensure completeness, some staff may still not complete ACE surveys for all patients. Staff may also complete surveys on the basis of incomplete information or, depending on their practice model, variations may also arise in the staff's approach to collecting the information required to complete the ACE survey.

Table 8A. Polychoric factor analysis model describing factors derived from Adverse Childhood Experiences items and International Classification of Diseases, Tenth Revision categories for males (no. of observations = 2124; retained factors = 5)[a]

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	5.51	3.42	0.37	0.37
Factor 2	2.1	0.49	0.14	0.52
Factor 3	1.6	0.26	0.11	0.63
Factor 4	1.34	0.04	0.09	0.72
Factor 5	1.3	0.54	0.09	0.81

[a] Logistic regression test: Independent vs saturated: $\chi^2(210) = 415.56$ Pr[> χ^2] < 0.00001.

Table 8B. Polychoric factor analysis model describing factor loadings of Adverse Childhood Experiences items and International Classification of Diseases, Tenth Revision categories for males (no. of observations = 2124; retained factors = 5)[a]

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Uniqueness
1. Emotional abuse	**0.81**[a]	0.15	0.0001	-0.11	0.27	0.24
2. Physical abuse	**0.77**	0.14	-0.05	-0.08	0.15	0.35
3. Sexual abuse	**0.54**	0.34	-0.2	0.33	0.01	0.44
4. Lack of love/support	**0.78**	0.05	-0.11	0.03	0.26	0.32
5. Neglect	**0.77**	-0.23	-0.05	0.05	-0.1	0.33
6. Parental divorce/separation	**0.7**	-0.18	0.002	0.01	-0.12	0.47
7. Spousal abuse	**0.75**	-0.27	0.06	0.14	0.02	0.34
8. Parental substance abuse	**0.76**	-0.19	-0.03	-0.02	-0.08	0.38
9. Parental mental illness	**0.58**	-0.14	0.13	0.01	0.09	0.62
10. Parental prison	**0.71**	-0.3	0.13	0.1	-0.17	0.35
Organic mental disorders (F00-F09)	0.04	**0.46**	0.07	0.18	0.08	0.75
Substance disorder (F10-F19)	0.34	**0.42**	-0.34	-0.16	-0.41	0.40
Schizophrenia, schizotypal, and delusional disorders (F20-F29)	0.08	**0.42**	-0.21	0.27	**-0.47**	0.47
Mood (affective) disorders (F30-F39)	0.17	**0.45**	-0.18	**-0.35**	0.26	0.55
Neurotic, stress-related, and somatoform disorders (F40-F48)	0.14	**0.36**	0.02	**-0.43**	0.24	0.61
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	-0.15	0.22	-0.24	**0.51**	**0.67**	0.15
Personality/behavior disorders (F60-F69)	0.08	**0.48**	**-0.44**	-0.14	-0.21	0.5
Mental retardation (F70-F79)	0.12	**0.43**	**0.44**	0.59	-0.18	0.22
Developmental disorders (F80-F89)	0.01	**0.38**	**0.72**	-0.06	0.02	0.33
Child/adolescent behavioral emotional disorders (F90-F98)	0.27	0.32	**0.55**	-0.22	-0.01	0.47
Unspecified mental disorder (F99)	0.14	0.16	0.21	-0.23	-0.09	0.85

[a] Bold/shaded cells represent variables loading on factors.

CONCLUSION

The previously published article, drawn from the same dataset at an earlier date, identified a strong relationship of the ACE total score with standardized, reliable, and valid measures of clinical severity and urgency.[1] In the present study, ICD-10 categories were largely independent of the ACE survey items and total score. There were mostly only marginal and often negative ICD-10 category relationships with either ACE items or the ACE total score. The findings illustrate the imperative requirement to reorganize the structural approach to diagnosis and pedagogy associated with psychiatric assessment and care planning. On the basis of the present findings, it is recommended that clinical assessment practice include ACE total scores and items as a formal dimension of differential diagnosis, in advance of intervention planning, rather than focusing treatment based solely on traditional categorical psychiatric diagnostic formulation.

For an institution to become trauma informed, it must make use of trauma-related information. Making the ACE survey (trauma information) available for assessment before diagnosis and in advance of care planning are necessary process steps on the path to developing trauma-focused care.

Next steps may include implementation of trauma-informed practice guidelines, which are available in many regions across North America.[47,48] Transforming treatment from trauma-informed into trauma-focused practice is in the early stages. Fortunately, there are the targeted, globally accessible, and extensive resources of the Alberta Family Wellness Initiative, the primary focus of which is on brain growth and the effects of toxic stress on developmental trajectory. Many individuals and professionals have been exposed to their exceptional education programs.

The implementation of the ACE survey in our regional CAAMHPP services is relatively recent and was motivated by the international Alberta Family Wellness Initiative Accelerating Innovation Symposia. This step oriented our regional child and adolescent mental health services to the importance of early adverse experiences and their place in assessment and treatment, permitting us to become

more trauma informed. Although not all-encompassing with respect to trauma, the ACE survey items provide a guide to formally identifying information that may be used to establish a care plan that is trauma focused. During the implementation phase, it was acknowledged that staff has been dealing with trauma in the served population for many years as a standard of care. The ACE survey provided a mechanism to organize and make use of its trauma-specific information. Furthermore, community physician education has taken place with respect to the contextual importance of past trauma and the use of the ACE survey.[49,50]

Nevertheless, much work remains to be done. For example, defining and linking interventions to clinical outcomes on the basis of identifying specific interventions that are more effective than others in respect to the number and type of ACE survey items endorsed. Becoming trauma focused at a system level will take years and necessarily involves integrating the best information from multiple sources as evidence-based research emerges.

Becoming trauma informed at the system level is a complex innovation, requiring change management that takes place against the background of attempting to improve the capacity to serve the long-term unmet need in the community.[51] Employing the adverse childhood experience survey fits well into a strategy under development termed "shaping demand." Emergencies aside, one component of this strategy involves empowering and educating families that are actively seeking access to publicly funded, ambulatory, and elective mental health services. In short, rather than waiting weeks to months for an appointment to gain access to specialized knowledge from professionals, by employing online resources, families would engage in orientation to treatment and problem definition[52] (including ACE surveys) with linkages to vetted resources, such as those provided nationally by organizations such as Teen Mental Health.[53] On the basis of past research,[54] one might expect some portion of the families who would otherwise be waiting for services to be able to gather and implement targeted information that would help them to some extent resolve their difficulties. This approach might prove useful to many organizations, such as insurance companies as well as privately and publicly funded mental health services. ❖

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The Story

The doctor may … learn more about the illness from the way the patient tells the story than from the story itself.

— James B Herrick, 1861-1954, American physician credited with the description of sickle-cell disease and as one of the first physicians to describe the symptoms of myocardial infarction