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1 **LONGITUDINAL STUDY OF PSYCHOLOGICAL DISTRESS AND ITS**
2 **ASSOCIATED FACTORS AMONG YOUTH IN PENINSULAR MALAYSIA**

3
4 **Abstract**

5
6 The prevalence of mental health problems among youth worldwide is alarming and a
7 public health concern. This study aimed to determine the prevalence of psychological
8 distress among youth at two time points, ages 15 and 20, and to identify groups that are
9 particularly vulnerable to psychological distress. Utilizing data from the Malaysian
10 Health and Adolescents Longitudinal Research Team (MyHeART) study, we analyzed
11 a cohort of 416 participants who underwent mental health assessments in both 2014 and
12 2019/20. The prevalence of psychological distress increased significantly between the
13 ages of 15 (15.9%) and 20 (34.6%). Factors such as parental mental health problems,
14 Indian and other ethnicity, lower maternal education attainment, and alcohol
15 consumption were significantly associated with psychological distress in youth. This
16 study underscores the importance of increasing access to mental health care while
17 improving surveillance and prevention programs to protect youth’s psychosocial well-
18 being.

19
20 **Keywords:**

21 Psychological distress, mental health, youth, Malaysia, longitudinal study

22
23 **What We Already Know**

- 24 ● Worldwide, the prevalence of psychological distress is high among the youth
25 population, whereby 50% of the problems were established by the age of 14 years.
26 It was estimated that 70% of those with psychological distress did not receive the
27 required intervention during the early stages. Poor mental health in youth is
28 associated with suicidal behaviors and long-term adult health issues, highlighting
29 the importance of identifying at-risk groups for timely support and intervention.
- 30 ● Although low-and middle-income countries (LMICs) have the highest burden of
31 disease and health inequalities, the majority of research on the social determinants
32 of mental health has been conducted in high-income countries (HICs). The results
33 may not be applicable to the population in LMICs due to different social
34 characteristics.

35

36 **What This Article Adds**

- 37 ● The results of the study contribute to etiological research on the course of
38 psychological stress in youth and suggest that youth aged 20 are particularly
39 susceptible to psychological stress compared to youth in adolescent age.
- 40 ● Individuals with a family history of mental health problems, mothers with less
41 education, and members of minority groups were at increased risk of developing
42 mental health problems. They could, therefore, benefit from programs and
43 interventions that address predisposing factors.

44 45 **Introduction**

46 Globally, around 1.2 billion young people aged 15 to 24, make up 16% of the world's
47 population and are expected to grow to 1.3 billion by 2030. In the Asia-Pacific region,
48 they make up 19% of the population.^{1,2} Although generally healthy, they face a
49 significant burden of disability-related diseases, neuropsychiatric disorders and
50 unintentional injuries.³ It is estimated that the prevalence of psychological distress
51 among youth is between 12% and 20%.⁴ Psychological distress encompasses a range
52 of non-specific symptoms such as depression, anxiety and stress, which often assessed
53 using self-report rating scale such as the General Health Questionnaire. High levels of
54 psychological distress can be a sign of common mental health disorders such as
55 depression and anxiety disorders.^{5,6}

56 The transition from youth to adulthood involves physical, emotional, and social
57 changes, making young individuals more susceptible to mental health issue such as
58 psychological distress. Factors such as gender, family conditions, sociodemographic
59 variables, and cultural differences contribute to this distress.⁷ Studies show that being
60 female,⁸ having a family history of mental health problems,⁸ low household income,⁸
61 health-risk behaviors and family conflict are associated with psychological distress
62 among youth.^{5,8} Consequently, psychological distress among youth contribute to poor
63 physical and mental health outcomes, premature death, human rights violations, and
64 global and national economic loss.^{5,7,9}

65 Mental health is an important but often overlooked component of youth well-being,
66 especially in low- and middle-income-countries (LMICs).¹⁰ Evidence showed that
67 mental stress is a significant problem in developing regions due to factors like rapid
68 urbanisation, economic pressures, cultural factors, social changes and
69 stigmatisation.^{11,12} For example, in Haiti, a LMIC, the burden of mental health

70 problems among youth was high at 36.7%, 88.6% of whom had no access to mental
71 health services.¹³ Furthermore, it should be noted that only a proportion of them had
72 effective coping mechanisms to manage their distress effectively.¹⁴

73 Malaysia, an upper middle-income country with significant income disparities and
74 rapid urbanization, has a high prevalence of mental health problems, and when
75 compared to children, adolescents, and adults, the prevalence is much higher among the
76 youth population.¹⁵ The Adolescents Health Survey (2022) found that the rates of
77 depression were significantly higher among 16-year-olds (28.4%) and 17-year-olds
78 (30.1%) compared to adolescents aged 15 and below (ranging from 22% to 27%).¹⁶ The
79 prevalence of psychological distress in youth also showed an increasing trend across
80 the year from 12.6% in 1996 to 31.4% in 2015.¹⁷ This increase was considerably greater
81 when compared to adults, children, and adolescents.¹⁸

82 Over the years, various efforts have been made to quantify and assess mental health
83 issues among young individuals. However, there is a notable lack of longitudinal
84 nationwide studies that examine changes in the prevalence of psychological distress
85 over time and identify associated factors, specifically among Malaysian youth. To
86 bridge this gap, the primary objective of this study is to determine the extent of
87 psychological distress at two different points during the youth phase using a
88 representative sample from Peninsular Malaysia's youth population. Furthermore, as a
89 secondary aim, we aim to explore sociodemographic factors during this particular age
90 group that contribute significantly to these mental health problems.

91 92 **Methods**

93 *Procedure*

94 This closed cohort study is a sub study of the Malaysian Health and Adolescent
95 Longitudinal Research Team (MyHeART) study, initiated in 2012, with the approval
96 of the Medical Ethics Committee of University Malaya Medical Centre (MEC Ref. No:
97 896.34) and the National Medical Research Register (NMRR 14-376-20486) gathering
98 data on adolescent health in rural and urban areas across three states of Peninsular
99 Malaysia: Perak, Selangor, and Federal Territory of Kuala Lumpur (FTKL).

100 The MyHeART study used a two-stage-cluster sampling technique with
101 weightage to select schools and students from the three states. The schools were
102 stratified by geographical location into urban and rural areas, and random selection was
103 performed using computer-generated lists. Eight urban schools and seven rural schools

104 were selected. The enrolment numbers for each selected school within the defined study
105 population were determined in the second sampling stage. More details about the
106 research process can be found in the MyHeART study protocol.¹⁹

107 This project analyses data from two time periods, 2014 (participants aged 15) and
108 2019/20 (participants aged 20), to provide insights into youth well-being during
109 adolescence and early adulthood.¹⁹ Both face-to-face and telephone interviews were
110 utilized to increase the response rate. During Wave 1, face-to-face interviews were
111 conducted when the participants were in secondary school (age 15). However, by Wave
112 2, the participants were either in college or already working (age 20). Thus, they were
113 primarily contacted through telephone interviews, with home visits arranged for those
114 who could not be reached by phone. To be included in the study, participants had to
115 have participated at age 15 in 2014, be present at age 20 in 2019/20, and completed all
116 relevant questions. The mental health assessment specifically measured psychological
117 distress at both time points.

118

119 **Measurement**

120 *Independent Variables*

121 The study analysed the association of 10 sociodemographic characteristics: birth gender,
122 BMI, health-risk behaviors, mother and father's education, household income, family
123 dysfunction state (parental marital status and parental mental health problem), ethnicity,
124 residential area, and state of residence. Parental mental health problems were assessed
125 using the validated Malay version of the ACE-IQ questionnaire. Participants were
126 asked the following question: "Did you live with a household member who was
127 depressed, mentally ill, or suicidal?".²⁰ Subsequently, if the answer was "Yes,"
128 participants were then asked to identify the person.

129

130 *Dependent Variables*

131 Psychological distress (PD) was assessed using the General Health Questionnaire
132 (GHQ), a commonly used screening tool to assess psychological distress in a population
133 survey which includes items describing anxiety and depressive symptoms.⁵

134 The study used the GHQ-12 and GHQ-28 to assess psychological distress among
135 youth aged 20 and 15-year-olds, respectively. Both questionnaires, adapted from the
136 original GHQ-60 that includes depression and anxiety symptoms, have been validated
137 within the Malaysian population, demonstrating comparable validity and reliability.^{21,22}

138 Participants rate their mental experiences of each symptom over two weeks. A coding
139 system (0-0-1-1) was used for the answer options: “Not at all”, “No more than usual”,
140 “Rather more than usual”, and “Much more than usual”. Missing data in any item will
141 be counted as a low score. The answer will be added, and a higher score will indicate a
142 higher level of psychological distress. This study used threshold scores of ≥ 6 for the
143 GHQ-28 and ≥ 3 for the GHQ-12 to indicate the presence of psychological distress, as
144 used in the National Health and Morbidity Survey 2006, 2015 and other literature.^{17,22,23}
145 Both tests are suitable to be administered to youth and adults population.²⁴

146

147 **Data Analysis**

148 In this closed-cohort study, some variables were held constant and were collected at the
149 current study baseline namely gender, ethnicity, residential area, residential state,
150 parental highest education level, and household income while variables like BMI,
151 health-risk behaviour and dysfunctional family status were collected at both baseline
152 and follow-up.

153 The data was analysed using IBM SPSS Statistics Version 24.0, with categorical
154 variables presented as frequencies and percentages. Univariate and multivariate binary
155 logistic regression with add-on complex sampling module analyses were performed to
156 investigate the association between demographic characteristics and mental health
157 outcomes. The logistic regression model demonstrates a good fit, as indicated by the
158 non-significant result of the Hosmer and Lemeshow test (Chi-square=5.880, $p=0.661$).
159 Subsequently, the generalised estimating equation (GEE) was utilized to assess
160 longitudinal changes in psychological distress from age 15 to 20 years and the factors
161 associated with these changes. For the GEE analysis, the fully adjusted model
162 demonstrated strong goodness of fit as indicated by a QICC of 529 and the lowest QIC
163 value among the models evaluated. The final study weightage was accounted for during
164 both logistic regression and GEE analysis.

165

166 **Results**

167 After exclusions based on certain criteria, the total number of participants of this closed
168 cohort study was 416, of whom 65.1% were female, 77.2% of Malay ethnicity and more
169 than 50% lived in urban areas and states. The recruitment process of the current study

170 participants is shown in Supplementary Figure 1, while the descriptive statistic of this
171 study is depicted in Supplementary Table 1.

172 *Prevalence of psychological distress among youth aged 20*

173 The prevalence rate of psychological distress among participants aged 20 was 34.6%
174 (n=144, 95% CI: 27.1,42.5), with minimum score of zero (28.0%) and maximum score
175 of 11 (0.1%). The prevalence was higher among males (37.2%), Indian ethnicity
176 (51.9%), urban residents (41.9%), underweight (36.5%) and obese (39.4%), with
177 alcohol use (76.2%) and had parents with mental health problems (85.7%) (Table 1).

178 In this study, a remarkable increase of 118% was observed in the occurrence of
179 psychological distress when participants reached the age of 20 compared to when they
180 were aged 15. The study included a total of 234 individuals (56.3%) who did not exhibit
181 any signs of psychological distress at both time points during their youth, specifically
182 at ages 15 and 20 (Supplementary Table 2). Conversely, approximately 116 participants
183 (27.9%) experienced an absence of psychological distress during the initial assessment
184 at age 15 but displayed symptoms during the follow-up examination conducted at age
185 20. Out of the cohort studied here, there were initially 66 individuals (15.9%) who
186 presented with psychological distress symptoms. Remarkably, among those affected by
187 mental health issues initially, 38 participants (57.6%) recovered and achieved normal
188 mental well-being within five years after baseline measurement. In contrast, subsequent
189 manifestation of psychological distress persisted in the remaining 28 individuals
190 (42.2%).

191 *Factors associated with psychological distress among youth aged 20*

192 Table 2 presents the regression analysis conducted to examine the factors associated
193 with psychological distress among a sample of youth aged 20. From the multivariable
194 analysis, it was revealed that parental mental health problems (adjusted odds ratio
195 [AOR] = 22.60; $p < 0.001$; 95% confidence interval [CI]:2.24-227.77) and residential
196 state (AOR=2.41; $p < 0.01$; 95% CI:1.08-5.35) demonstrated significant positive
197 associations with psychological distress among individuals who were aged 20 at the
198 time of assessment.

199 *Relationship between psychological distress and sociodemographic factors among*
200 *youth aged 20*

201 Table 3 shows the result of the GEE analysis for changes in mental health status
202 over time from age 15 (Wave 1) to age 20 (Wave 2). Previously, this study showed an
203 increasing trend of psychological distress in youth from age 15 to 20 years old. Analysis
204 of GEE showed significant changes with an increase in the prevalence of psychological
205 distress in youth aged 15 to 20 years, where it progressed negatively ($p<0.001$). In the
206 longitudinal analysis, the study found an association between four sociodemographic
207 factors and psychological distress among youth aged 20 years, namely alcohol
208 consumption (B, 1.56; OR, 10.8; $p<0.01$), mothers without formal education (B, 1.71;
209 OR, 4.52; $p<0.05$), parental mental health problems (B, 1.34; OR, 1.67; $p<0.01$), and
210 ethnicity, namely Indian (B, 3.66; OR, 6.54; $p<0.01$) and other ethnicities (B, 0.76; OR,
211 9.99; $p<0.01$). In contrast, having a divorced parent had the opposite effect: it reduced
212 the risk that an individual would develop psychological distress.

213 **Discussion**

214 This study is the first longitudinal investigation into youth psychological distress in
215 Peninsular Malaysia, revealing a significant increase in mental health issues among
216 Malaysian youth. Previous findings suggest a deterioration in mental health, with
217 higher rates of psychological distress among those aged 20 to 24 (32.1%) compared to
218 10 to 15 (11.9%).¹⁷ The developmental transitions in youth, between the ages 18 and
219 19 and into the mid-20s, are often associated with considerable stress as the young
220 individual faces critical decisions like university education, financial obligations, and
221 commitment. The state of mental health is also influenced by the social, economic, and
222 physical environment, with globalization and urbanization leading to increased
223 socioeconomic inequality, migration patterns, fewer opportunities for interpersonal
224 interaction, disrupted family structures, and health-risk behaviors that increase the
225 likelihood of young individuals experiencing psychological distress.⁷

226 The secondary objective of this study was to identify sociodemographic factors
227 affecting psychological distress among youth aged 15 to 20. Results showed significant
228 associations between alcohol use, parental mental health issues, lower maternal
229 education attainment, and Indian or Other Ethnic group membership. Parental divorce

230 was found to be a protective factor against psychological distress, suggesting a complex
231 interplay between individual, family, and societal factors.

232 This study found a significant correlation between alcohol consumption and
233 psychological distress in young individuals, with a higher likelihood of experiencing
234 distress among those who consume alcohol compared to those who do not, aligning
235 with previous research in developing nations like Indonesia and Thailand.¹⁸ This is
236 worrying as the prevalence of alcohol consumption among adolescents is high both
237 globally and in Malaysia, at 19.3% in Malaysia.²⁵ Studies suggest that young people
238 may use alcohol as a coping mechanism for psychological stress, as it affects
239 neurotransmitters, reducing anxiety regulation activity and promoting relaxation.
240 Subsequently, early-onset binge drinking predicts later alcohol abuse and dependence
241 in adulthood and has a negative impact on mental health.²⁶

242 Individuals with mentally ill parents have an increased risk of developing mental
243 health problems. Our findings suggest that having parents with mental health problems
244 increases the risk of psychological distress in youth. Meadows pointed out that parental
245 mental health problems are a critical source of stress for children and have been linked
246 to worse mental health and more behavioral problems for children during their youth.²⁷
247 Interventions for alleviating children's stress and family support services for parents
248 with mental health problems may be particularly effective in reducing children's
249 psychological implications.

250 The study found that a lack of formal education in mothers is associated with a
251 higher likelihood of psychological distress in their adolescent children. This association
252 between low levels of maternal education and youth psychological distress has also
253 been observed in other studies conducted both locally and internationally.²⁷ Education
254 is crucial in determining a family's socioeconomic status and overall health. Parents'
255 education level and knowledge are reflected in their parenting style, health literacy,
256 health investments, and school engagement, which influence youth mental health. This
257 demonstrates the importance of parental education in promoting communication and
258 interaction between parents and children to support their development.

259 Ethnic minorities often bear a disproportionate burden of disability due to
260 mental health problems. This study found that young individuals of Indian and Other
261 Ethnicities have a higher prevalence of psychological distress compared to those of
262 Malay and Chinese descent. Similar findings were also found in the NHMS and other
263 local studies.^{18,25} These findings can be attributed to the fact these two ethnic groups

264 are predominantly from socially and economically disadvantaged backgrounds, which
265 could lead to increased exposure to adversity in childhood that contributes to the
266 emergence of psychological distress in later years. In addition, it should be noted that
267 there is a significant stigmatization of mental health in these specific communities. This
268 high level of stigma can lead to a reluctance to seek help for mental health problems.²⁸

269 In our investigation into the association between parental divorce and
270 psychological distress among young individuals, we encountered conflicting results
271 that challenge the existing body of literature. In contrast to prior research, which
272 consistently indicated a significant positive correlation, our analysis revealed that
273 parental divorce served as a protective factor against psychological distress in youth.
274 Similar findings were also reported by Kelly's study, where it was found that
275 approximately 75% to 80% of children who experienced their parents' divorce grew up
276 to become well-adjusted adults without enduring any substantial psychological or
277 behavioral issues.²⁹ This can be explained in two ways. First, children from high-
278 conflict families often benefit the most from their parents' divorce because it represents
279 an opportunity for a better life, and second, because of factors such as good post-divorce
280 parenting and extra-familial support, children may become more resilient in coping
281 with the stress of divorce. ²⁹ This contradictory finding highlights the intricate and
282 multifaceted nature of the relationship between divorce and psychological distress in
283 young people. Consequently, further examination is warranted to gain a nuanced
284 understanding of the underlying mechanisms and contextual factors implicated in this
285 complex dynamic.

286

287 **Policy Implications and Recommendations**

288 The research underscores the critical importance of addressing psychological distress
289 in young people at the individual, family, and societal levels, particularly those in high-
290 risk groups like alcohol users, parents with mental health issues, and ethnic minorities.
291 To effectively address the rising prevalence and significant impact of psychological
292 distress among youth, it is imperative to enhance the availability and accessibility of
293 mental health services, particularly in educational institutions and workplaces. This can
294 be achieved by increasing screening of at-risk youth by school, college, or workplace
295 health teams, ensuring timely referral for further treatment, strengthening coping skills
296 and resilience as early as adolescence through interactive health promotion activities,
297 providing mental health training programs for communities, expanding outreach in

298 underserved areas, and optimizing the use of digital mental health services such as
299 hotlines and web-based interventions to provide preventive support and treatment.
300 These measures promote a supportive environment, improve access to care, and
301 enhance overall well-being.

302

303 **Strengths and Limitations**

304 A notable strength of this study is the use of a nationally representative longitudinal
305 dataset in a middle-income country. It is the first longitudinal study conducted in
306 Malaysia and one of the first in Southeast Asia to examine the occurrence and
307 determinants of psychological distress in individuals aged 15 to 20. The study's findings
308 have limitations as the sample size is small despite having good study power, and they
309 may not accurately represent the diverse socio-demographics of youth in Peninsular
310 Malaysia due to its inclusion criteria. Future studies should include more participants
311 from various types of secondary schools and youth who are not in school or have
312 dropped out of school to represent the diverse youth population in Malaysia better.

313

314 **Conclusion**

315 The study found a rise in psychological distress among 15- to 20-year-olds in Peninsular
316 Malaysia, particularly among those with alcohol consumption, mental health issues,
317 lower maternal education, and ethnic minority backgrounds. The study highlights the
318 need for targeted mental health policies and further research to understand the complex
319 interactions between factors and psychological distress.

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332 **References**

- 333 1. United Nation. The World Youth Report: Youth Social Entrepreneurship and the
334 2030 Agenda. [https://www.un.org/development/desa/youth/wp-](https://www.un.org/development/desa/youth/wp-content/uploads/sites/21/2020/07/2020-World-Youth-Report-FULL-FINAL.pdf)
335 [content/uploads/sites/21/2020/07/2020-World-Youth-Report-FULL-FINAL.pdf](https://www.un.org/development/desa/youth/wp-content/uploads/sites/21/2020/07/2020-World-Youth-Report-FULL-FINAL.pdf).
336 Published 2020. Accessed January 18, 2023
- 337 2. Department of Economic and Social Affairs UN. 2022 Revision of World
338 Population Prospects. Published 2022. Accessed January 30, 2023.
339 <https://population.un.org/wpp/>
- 340 3. Gore FM, Bloem PJN, Patton GC, et al. Global burden of disease in young people
341 aged 10-24 years: a systematic analysis. *Lancet Lond Engl*. 2011;377(9783):2093-
342 2102. doi:10.1016/S0140-6736(11)60512-6
- 343 4. Merikangas KR, He JP, Burstein M, et al. Lifetime prevalence of mental disorders
344 in U.S. adolescents: results from the National Comorbidity Survey Replication--
345 Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*.
346 2010;49(10):980-989. doi:10.1016/j.jaac.2010.05.017
- 347 5. Drapeau A, Marchand A, Beaulieu-Prevost D. Epidemiology of Psychological
348 Distress. In: Labate L, ed. *Mental Illnesses - Understanding, Prediction and*
349 *Control*. InTech; 2012. doi:10.5772/30872
- 350 6. Viertiö S, Kiviruusu O, Piirtola M, et al. Factors contributing to psychological
351 distress in the working population, with a special reference to gender difference.
352 *BMC Public Health*. 2021;21(1):611. doi:10.1186/s12889-021-10560-y
- 353 7. World Health Organization. *World Mental Health Report: Transforming Mental*
354 *Health for all.*; 2022:272. Accessed January 20, 2023.
355 [https://iris.who.int/bitstream/handle/10665/356119/9789240049338-](https://iris.who.int/bitstream/handle/10665/356119/9789240049338-eng.pdf?sequence=1)
356 [eng.pdf?sequence=1](https://iris.who.int/bitstream/handle/10665/356119/9789240049338-eng.pdf?sequence=1)
- 357 8. Mofatteh M. Risk factors associated with stress, anxiety, and depression among
358 university undergraduate students. *AIMS Public Health*. 2021;8(1):36-65.
359 doi:10.3934/publichealth.2021004
- 360 9. Kessler RC, Rose S, Koenen KC, et al. How well can post-traumatic stress disorder
361 be predicted from pre-trauma risk factors? An exploratory study in the WHO World
362 Mental Health Surveys. *World Psychiatry*. 2014;13(3):265-274.
363 doi:10.1002/wps.20150

- 364 10. Saxena S, Thornicroft G, Knapp M, Whiteford H. Resources for mental health:
365 scarcity, inequity, and inefficiency. *Lancet Lond Engl.* 2007;370(9590):878-889.
366 doi:10.1016/S0140-6736(07)61239-2
- 367 11. Patel V, Flisher AJ, Nikapota A, Malhotra S. Promoting child and adolescent mental
368 health in low and middle-income countries. *J Child Psychol Psychiatry.*
369 2008;49(3):313-334. doi:10.1111/j.1469-7610.2007.01824.x
- 370 12. Hanlon C, Luitel NP, Kathree T, et al. Challenges and Opportunities for
371 Implementing Integrated Mental Health Care: A District Level Situation Analysis
372 from Five Low- and Middle-income Countries. Montazeri A, ed. *PLoS ONE.*
373 2014;9(2):e88437. doi:10.1371/journal.pone.0088437
- 374 13. Eustache E, Gerbasi ME, Smith Fawzi MC, et al. High burden of mental illness and
375 low utilization of care among school-going youth in Central Haiti: A window into
376 the youth mental health treatment gap in a low-income country. *Int J Soc Psychiatry.*
377 2017;63(3):261-274. doi:10.1177/0020764017700174
- 378 14. Kaligis F, Ismail RI, Wiguna T, et al. Mental Health Problems and Needs among
379 Transitional-Age Youth in Indonesia. *Int J Environ Res Public Health.*
380 2021;18(8):4046. doi:10.3390/ijerph18084046
- 381 15. Ragayah HMZ. Income Inequality in Malaysia. *Asian Econ Policy Rev.*
382 2008;3(1):114-132. doi:10.1111/j.1748-3131.2008.00096.x
- 383 16. Institute for Public Health (IPH). *Technical Report National Health and Morbidity*
384 *Survey (NHMS) 2022: Adolescent Health Survey.* Institute for Public Health;
385 2022:103. Accessed July 5, 2023. [https://iku.gov.my/images/nhms-](https://iku.gov.my/images/nhms-2022/Report_Malaysia_nhms_ahs_2022.pdf)
386 [2022/Report_Malaysia_nhms_ahs_2022.pdf](https://iku.gov.my/images/nhms-2022/Report_Malaysia_nhms_ahs_2022.pdf)
- 387 17. Institute of Public Health (IPH). National Health and Morbidity Survey 2015.
388 Institute of Public Health. 2015. Accessed December 6, 2023. [https://iku.gov.my/](https://iku.gov.my/images/IKU/Document/REPORT/nhmsreport2015vol2.pdf)
389 [images/IKU/Document/REPORT/nhmsreport2015vol2.pdf](https://iku.gov.my/images/IKU/Document/REPORT/nhmsreport2015vol2.pdf)
- 390 18. Ahmad N, MuhdYusoff F, Ratnasingam S, et al. Trends and factors associated with
391 mental health problems among children and adolescents in Malaysia. *Int J Cult*
392 *Ment Health.* 2015;8(2):125-136. doi:10.1080/17542863.2014.907326
- 393 19. Hazreen MA, Su TT, Jalaluddin MY, et al. An exploratory study on risk factors for
394 chronic non-communicable diseases among adolescents in Malaysia: overview of
395 the Malaysian Health and Adolescents Longitudinal Research Team study (The
396 MyHeART study). *BMC Public Health.* 2014;14(S3):S6. doi:10.1186/1471-2458-
397 14-S3-S6

- 398 20. Asyraf M, Dunne MP, Hairi NN, Mohd Hairi F, Radzali N, Wan Yuen C. The
399 association between elder abuse and childhood adversity: A study of older adults in
400 Malaysia. Klengel T, ed. *PLOS ONE*. 2021;16(7):e0254717.
401 doi:10.1371/journal.pone.0254717
- 402 21. Hankins M. The reliability of the twelve-item general health questionnaire (GHQ-
403 12) under realistic assumptions. *BMC Public Health*. 2008;8(1):355.
404 doi:10.1186/1471-2458-8-355
- 405 22. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ
406 in the WHO study of mental illness in general health care. *Psychol Med*.
407 1997;27(1):191-197. doi:10.1017/S0033291796004242
- 408 23. Al-Sughayr A, Ferwana M. Prevalence of mental disorders among high school
409 students in National Guard Housing, Riyadh, Saudi Arabia. *J Fam Community Med*.
410 2012;19(1):47. doi:10.4103/2230-8229.94015
- 411 24. Centofanti S, Lushington K, Wicking A, et al. Establishing norms for mental well-
412 being in young people (7–19 years) using the General Health Questionnaire-12.
413 *Aust J Psychol*. 2019;71(2):117-126. doi:10.1111/ajpy.12227
- 414 25. Institute of Public Health (IPH). National Health and Morbidity Survey 2017
415 (NHMS 2017): Adolescent Mental Health (DASS-21). Institute of Public Health.
416 2017. Accessed December 1, 2023.
417 [https://iku.gov.my/images/IKU/Document/REPORT/NHMS2017/MHSReportNH](https://iku.gov.my/images/IKU/Document/REPORT/NHMS2017/MHSReportNHMS2017.pdf)
418 [MS2017.pdf](https://iku.gov.my/images/IKU/Document/REPORT/NHMS2017/MHSReportNHMS2017.pdf)
- 419 26. Chassin L, Pitts SC, Prost J. Binge drinking trajectories from adolescence to
420 emerging adulthood in a high-risk sample: predictors and substance abuse outcomes.
421 *J Consult Clin Psychol*. 2002;70(1):67-78.
- 422 27. Meyrose AK, Klasen F, Otto C, Gniewosz G, Lampert T, Ravens-Sieberer U.
423 Benefits of maternal education for mental health trajectories across childhood and
424 adolescence. *Soc Sci Med*. 2018;202:170-178.
425 doi:10.1016/j.socscimed.2018.02.026
- 426 28. Hassan MFB, Hassan NM, Kassim ES, Hamzah MI. Issues and Challenges of
427 Mental Health in Malaysia. *Int J Acad Res Bus Soc Sci*. 2018;8(12): Pages 1685-
428 1696. doi:10.6007/IJARBSS/v8-i12/5288
- 429 29. Kelly JB, Emery RE. Children's Adjustment Following Divorce: Risk and
430 Resilience Perspectives. *Fam Relat*. 2003;52(4):352-362. doi:10.1111/j.1741-
431 3729.2003.00352.x

432 **Tables and figures**433 **Table 1** The sociodemographic characteristics of participants aged 20 with psychological distress (n=416)

Characteristics of the participants	Absence of psychological distress, n(%)	Presence of psychological distress, n(%)	Total (n)	X ²	P-value
Overall prevalence	272(65.4)	144(34.6)	416		
Gender					
Male	91(62.8)	54(37.2)	145	0.678	0.410
Female	181(66.8)	90(33.2)	271		
Ethnicity					
Malay	220(68.5)	101(31.5)	321	8.306	0.386
Chinese	22(57.9)	16(42.1)	38		
Indian	13(48.1)	14(51.9)	27		
Others	17(56.7)	13(43.3)	30		
Residential area					
Urban	126(58.1)	91(41.9)	217	0.506	0.590
Rural	146(73.4)	53(26.6)	199		
Residential state					
Selangor	67(55.4)	54(44.6)	121	12.232	0.049
FTKL	59(58.4)	42(41.6)	101		
Perak	146(75.3)	48(24.7)	194		
Mother's highest education					
No formal	9(75.0)	3(25.0)	12	11.321	0.167
Primary	23(62.2)	14(37.8)	37		
Secondary	175(66.3)	89(33.7)	264		
Tertiary	65(63.1)	38(36.9)	103		
Father's highest education					
No formal	27(62.8)	16(37.2)	43	11.501	0.149
Primary	41(63.1)	24(36.9)	65		
Secondary	151(66.2)	77(33.8)	228		
Tertiary	53(66.3)	27(33.7)	80		
Baseline household income					
< RM 1,500	126(63.3)	73(36.7)	199	2.116	0.844
RM 1,500-RM 3,000	65(71.4)	26(28.6)	91		
RM 3,001-RM 5,000	53(65.4)	28(34.6)	81		
> RM 5,000	28(62.2)	17(37.8)	45		
BMI					
Thin	40(63.5)	23(36.5)	63	0.888	0.833
Normal	156(66.1)	80(33.9)	236		
Overweight	56(66.7)	28(33.3)	84		
Obese	20(60.6)	13(39.4)	33		
Health-risk behaviour					
Cigarette use	30(63.8)	17(36.2)	47	0.057	0.896
Alcohol use	5(23.8)	16(76.2)	21	14.570	0.096
Illicit drug use	0	0	-	-	-
Dysfunctional family status					
Parental divorce	27(65.9)	14(34.1)	41	0.004	0.947
Parental death	36(66.7)	18(33.3)	54	2.673	0.371
Parental mental health problem	1 (14.3)	6(85.7)	7	8.214	0.004

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443 **Table 2** Factors associated with psychological distress among participants youth aged 20 according to the
 444 multivariable logistic regression analysis (n=416)

Variables	Unadjusted OR (95% CI)	P- value	Adjusted OR (95% CI) Adjusted for multiple variables	P- value
Residential state				
Selangor	2.24 (1.00,5.02)*	0.049	2.41 (1.08,5.35)	0.031
FTKL	0.12 (0.85,4.00)	0.121	1.59 (0.72,3.55)	0.253
Perak	Ref	Ref	Ref	Ref
Family dysfunction				
Parental divorce	0.62 (0.18,2.11)	0.440	NA	NA
Parental mental health problem	40.34 (4.43,367.52)**	0.001	22.60 (2.24,227.77)	0.008

445 ** $p < 0.01$, * < 0.05

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448 **Table 3** GEE analysis to study the longitudinal relationship between exposure and outcome of
 449 psychological distress among youth aged 20 years (n=416)

Variables	B	95% CI	OR	P-values
Time	0.915	0.234,1.933	6.251	<0.001
Alcohol use	1.564	0.632,2.497	10.810	0.001
Mother's education				
No formal education	1.706	0.133,3.279	4.521	0.033
Primary education	1.011	-0.521,2.543	1.672	0.196
Secondary education	1.395	-0.106,2.897	3.318	0.069
*Tertiary education	1	1	1	1
Parental divorce	-1.186	-2.062,-0.309	7.035	0.025
Parental mental health problem	1.341	0.428,2.254	8.285	0.004
Ethnicity				
* Malay	1	1	1	1
Chinese	0.918	-0.295,2.131	2.198	0.138
Indian	3.660	1.633,5.686	6.531	0.010
Others	0.755	0.277,1.233	9.994	0.002

The OR was adjusted for sociodemographic variables

*Reference variable

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463 **Supplementary Table 1** Numbers of observations and individuals in all categorical variables used at
 464 study baseline (Wave 1) and follow-up (Wave 2)

Exposures					
Variable	Value	Observation		%	
Gender	Male	145	34.9		
	Female	271	65.1		
Ethnicity	Malay	321	77.2		
	Chinese	38	9.1		
	Indian	27	6.5		
	Others	30	7.2		
Residential area	Urban	217	52.2		
	Rural	199	47.8		
Residential state	Selangor	121	29.1		
	FTKL	101	24.3		
	Perak	194	46.6		
Mother's highest education	No Formal	12	2.9		
	Primary	37	8.9		
	Secondary	264	63.5		
	Tertiary	103	24.8		
Father's highest education	No Formal	43	10.3		
	Primary	65	15.6		
	Secondary	228	54.8		
	Tertiary	80	19.2		
Baseline household income (RM 4.50 equal to USD 1)	< RM 1,500	199	47.8		
	RM 1,500-RM 3,000	91	21.9		
	RM 3,001-RM 5,000	81	19.5		
	> RM 5,000	45	10.8		
Baseline observation					
Follow-up observation					
Variable	Value	Baseline observation		Follow-up observation	
		observation	%	observation	%
Mean age	Years	15	-	20	-
BMI	Thin	61	14.7	63	15.1
	Normal	251	60.3	236	56.7
	Overweight	67	16.1	84	20.2
	Obese	37	8.9	33	7.9
Health-risk behaviour	Cigarette use	57	13.7	59	14.2
	Alcohol use	22	5.3	21	5.0
	Illicit drug use	0	0.0	0	0
Dysfunctional family	Parental divorce	38	9.1	41	9.9
	Parental death	33	7.9	54	13.0
	Parental mental health problem	7	1.7	7	1.7
Outcome					
Baseline observation					
Follow-up observation					
Variable	Value	Baseline observation		Follow-up observation	
		observation	%	observation	%
Mental health status	Psychological distress	66	15.9	144	34.6

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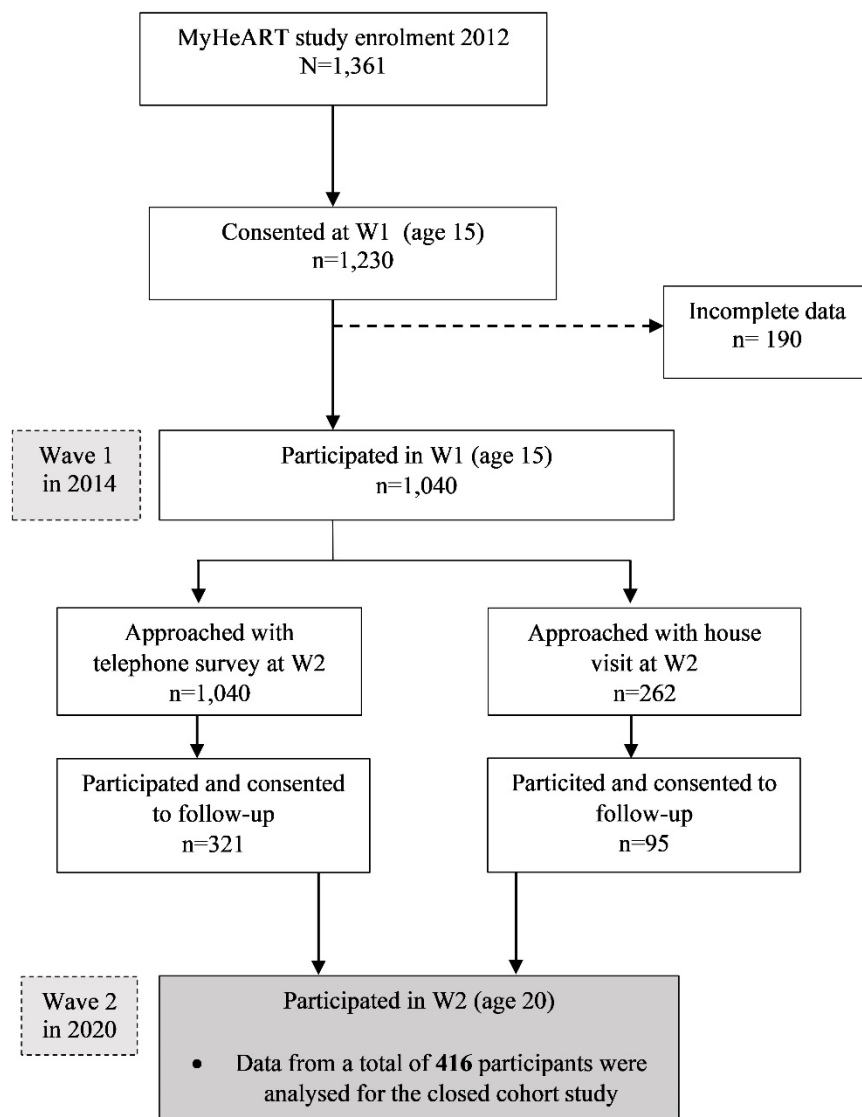
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473 **Supplementary Table 2** Proportion of participants with psychological distress at baseline (Wave 1) and
 474 follow-up (Wave 2)

Mental health status n (%)			Wave 2, 20 years	
			Normal	Have psychological distress,
			272 (65.4)	144 (34.6)
Wave 1, 15 years	Normal	350 (84.1)	234 (56.3)	116 (27.9)
	Have psychological distress	66 (15.9)	38 (9.1)	28 (6.7)

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Supplementary figure 1 Sampling flow of the study

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Supplementary Table 3 Prevalence of psychological distress at age 15 and 20 years old

Characteristics of the participants		Prevalence of psychological distress	
		Baseline (Wave 1), aged 15 years n(%)	Follow-up (Wave 2), age 20 years n(%)
Overall prevalence		66(15.9)	144(34.6)
Gender	Male	24(16.6)	54(37.2)
	Female	42(15.5)	90(33.2)
BMI	Underweight	9(14.8)	23(36.5)
	Normal	42(16.7)	80(33.9)
	Overweight/Obese	15(14.4)	41(35.3)
Health-related behavior	Cigarette use	13(22.8)	28(47.5)
	Alcohol use	10(45.5)	16(76.2)
	Illicit drug use	0	0
Mother's highest education	No formal education	1(8.3)	3(25.0)
	Primary school	6(16.2)	14(37.8)
	Secondary school	44(16.7)	89(33.7)
	Tertiary Education	15(14.6)	38(36.9)
Father's highest education	No formal education	8(18.6)	16(37.2)
	Primary school	11(16.9)	24(36.9)
	Secondary school	35(15.4)	77(33.8)
	Tertiary Education	12(15.0)	27(33.7)
	< RM 1,500	21(10.6)	73(36.7)

Baseline	RM 1,500-RM 3,000	19(20.9)	26(28.6)
Household income	RM 3,001-RM 5,000	18(22.2)	28(34.6)
	> RM 5,000	8(17.8)	17(37.8)
	Parental separation/divorce	4(10.5)	14(34.1)
Family dysfunction	Parental death	3(9.1)	18(33.3)
	Parental mental health problem	2(28.6)	6(85.7)
Ethnicity	Malay	37(14.3)	101(31.5)
	Chinese	12(19.2)	16(42.1)
	Indian	8(43.7)	14(51.9)
	Others	9(17.9)	13(43.3)
Residential area	Urban	42(24.6)	91(41.9)
	Rural	24(12.0)	53(26.6)
	Selangor	19(15.7)	54(44.6)
Residential state	Kuala Lumpur	19(18.8)	42(41.6)
	Perak	28(14.4)	48(24.7)

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