

PISA Performance and Adolescent Suicide Mortality Across Countries: A Multidimensional Indicator Analysis

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Research Article

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Abstract

National debates often treat educational achievement and adolescent well-being as parallel policy goals, yet different indicators of how young people are doing need not move together. PISA captures educational competencies, whereas suicide mortality represents a severe population-health outcome and life satisfaction captures adolescents' subjective appraisal of life. This exploratory ecological study linked PISA 2025 scores in science, reading and mathematics with previously recorded suicide mortality among 15–19-year-olds in 43 countries. Higher PISA scores were generally associated with higher mortality, with the most consistent evidence for reading, qualified evidence for science and weak evidence for mathematics. In 41 countries, adjustment for national income and relative child poverty strengthened rather than attenuated the associations. At the same time, five countries combined above-OECD-average performance with below-median mortality, and their life-satisfaction profiles differed. The findings therefore do not indicate an inevitable trade-off between achievement and well-being. Instead, they suggest that the conditions under which high achievement is produced may matter, and that educational, severe-health and subjective well-being indicators should be considered together when evaluating national outcomes.

1 Introduction

How well young people are doing cannot be captured by a single national indicator. The child-indicators tradition therefore distinguishes between resources and conditions, objective outcomes, and young people's own evaluations of their lives (Ben-Arieh, 2008; Casas, 2011). This multidimensional perspective is particularly relevant when education and mental health are considered together. PISA scores describe what students can demonstrate academically; suicide mortality captures a rare but severe population-health outcome; and life satisfaction reflects how adolescents evaluate their lives. These indicators are not interchangeable measures of a single construct. Their value lies in showing whether different dimensions of adolescent development move together—or tell different stories—across countries.

Educational performance is one of the most visible of these indicators. PISA provides internationally comparable measures of 15-year-olds' competencies in science, reading and mathematics and has become influential in national education policy (Breakspear, 2012; OECD, 2026). When scores decline, pressure to demonstrate improvement can increase. Yet higher achievement can be pursued in different ways: through stronger instruction, early support and broader opportunities to learn, or through intensified testing, competition, selection and consequences attached to relative performance. PISA therefore measures an educational outcome, not the psychological process through which that outcome is produced. This distinction is central to the present study.

Academic pressure is one plausible process that may connect the organisation of achievement with adolescent mental health. It refers to the perceived demands, expectations and consequences attached to academic performance, rather than to performance itself. A systematic review found repeated associations between academic pressure or school-year timing and depression, anxiety, self-harm and

suicidality (Stearns et al., 2023). Longitudinal evidence from England linked pressure at age 15 with later depressive symptoms and self-harm (Guo et al., 2026), while studies in Singapore, Korea and China similarly identified associations with suicidal ideation or suicide risk and highlighted depression, attachment and school cohesion as relevant pathways (Ang & Huan, 2006; Li et al., 2026; Shin & Bae, 2025). Together, these studies suggest that the mental-health implications of demanding educational environments may depend on how expectations are experienced, how failure is interpreted and what support or alternative pathways remain available.

Self-determination theory and the integrated motivational–volitional (IMV) model help clarify why the same level of academic demand may have very different psychological consequences. Self-determination theory proposes that autonomy, competence and relatedness support adaptive motivation and well-being, whereas controlling environments can make achievement more psychologically costly even when performance remains high (Roth et al., 2009; Ryan & Deci, 2000). The IMV model, developed to explain suicidal behaviour, emphasises defeat and entrapment as processes involved in the emergence of suicidal ideation in vulnerable individuals (O'Connor & Kirtley, 2018). Applied cautiously to education, these perspectives suggest a possible multilevel pathway: when achievement becomes highly consequential and comparison is difficult to escape, academic setbacks may threaten self-worth, belonging or future prospects. Academic pressure is therefore treated here as a candidate mechanism linking educational context to mental health, not as a variable measured by PISA.

Suicide mortality was selected because it adds a qualitatively different outcome to the existing achievement–well-being literature. Most research on academic pressure has examined self-reported stress, symptoms, self-harm or suicidal thoughts. Mortality captures the most severe endpoint and is derived from population records rather than student self-report. At the same time, suicide is multifactorial and reflects influences far beyond education, including psychiatric morbidity, family adversity, social connectedness, access to care and prevention (Turecki et al., 2019). Individual educational competence may also be protective: lower school grades have been associated with later suicide mortality (Björkenstam et al., 2011). This apparent tension is informative rather than contradictory. Individual achievement describes a student's position and resources within an education system; national PISA performance describes an aggregate outcome of the system itself.

Two socioeconomic indicators were added to locate the PISA–mortality relationship within a broader structural context. Gross national income (GNI) captures national material resources, which can support both educational performance and health systems. Relative child poverty captures the distribution of resources experienced by children and families. These indicators were not treated as alternative measures of well-being, but as contextual variables that could contribute to both educational and health outcomes. If the PISA–mortality association weakened substantially after accounting for them, broad resource differences would provide a plausible explanation. If it persisted or strengthened, educational performance and structural resources would appear to capture different aspects of national context.

Life satisfaction serves a different purpose. Low suicide mortality indicates protection from an extreme adverse outcome, but it does not show whether adolescents experience their lives positively. Life satisfaction provides a direct subjective indicator of positive well-being and therefore complements, rather than replaces, mortality (Casas, 2011). Including it makes it possible to ask a third question beyond achievement and severe health: do countries that combine strong educational performance with lower mortality also show comparatively favourable subjective well-being? In this way, the three outcome indicators distinguish competence, protection from severe harm and positive appraisal of life.

Existing cross-national evidence already suggests that these dimensions do not align automatically. Högberg (2023), using repeated PISA and Health Behaviour in School-aged Children data, found weak and inconsistent evidence of a national achievement–well-being trade-off, while Marquez and Main (2021) showed that school and policy contexts contribute to cross-country differences in life satisfaction. What is largely missing is the integration of a severe, age-specific population-health outcome into this comparative indicator framework. Examining adolescent suicide mortality alongside PISA, socioeconomic context and life satisfaction therefore extends the question from whether achievement and subjective well-being trade off to whether national educational success is accompanied by a broader pattern of adolescent health and well-being.

Accordingly, the current study addressed three linked questions. First, how strongly are national PISA scores in science, reading and mathematics associated with adolescent suicide mortality? Second, does this relationship change after accounting for national income and relative child poverty? Third, which countries combine comparatively strong educational performance with lower mortality, and what does life satisfaction add to the interpretation of those profiles? The indicators were deliberately kept separate rather than collapsed into a single index. The central aim was to use their convergence and divergence to understand what national averages reveal—and what they may conceal—about the relationship between educational achievement and adolescent well-being.

2 Methods

2.1 Design, indicators and country sample

This exploratory ecological study used countries as the unit of analysis. The design followed the conceptual sequence developed in the Introduction. PISA represented an educational-system outcome; adolescent suicide mortality represented the primary severe health outcome; GNI and relative child poverty located the association within structural resource conditions; and life satisfaction provided a complementary subjective well-being perspective for the country-profile analysis. Academic pressure was not measured and PISA was not treated as its proxy. Rather, academic pressure provided a theoretically motivated interpretation to be examined in future multilevel research. Countries received equal statistical weight, so the estimates describe differences between national profiles rather than population-weighted relationships.

Educational performance was represented by the published national mean scores from OECD PISA 2025 in science, reading and mathematics (OECD, 2026). PISA assesses enrolled students aged approximately 15 years using internationally standardised tests. Published country means, rounded to whole points, were retained and the three domains were analysed separately.

Adolescent suicide mortality was defined as the annual number of suicide deaths per 100,000 people aged 15–19 years, both sexes combined. Rates were obtained from UNICEF Innocenti Report Card 20 (UNICEF Innocenti, 2026), which reports three-year averages compiled primarily from the World Health Organization Mortality Database, with national data used for New Zealand. The mortality periods preceded PISA 2025 and ended no later than 2023. Published rates were analysed without reconstructing annual deaths and population denominators.

Two indicators described socioeconomic context because national resources can plausibly influence both educational performance and adolescent health. Gross national income (GNI) per capita for 2023, expressed in 2021 purchasing-power-parity international dollars, was obtained from the United Nations Development Programme (UNDP) Human Development Report (United Nations Development Programme, 2025). Relative child poverty was taken from UNICEF Innocenti (2026) and defined as the percentage of children aged 0–17 years living in households with equivalised disposable income below 60% of the national median. GNI was log-transformed because its distribution was strongly right-skewed. These variables were used to test whether the PISA–mortality relationship primarily reflected broad resource differences between countries.

Subjective well-being was represented by the percentage of 15-year-olds rating their overall life satisfaction above 5 on a 0–10 scale. These published estimates were obtained from UNICEF Innocenti (2026), drawing on PISA 2022 for most countries and Health Behaviour in School-aged Children 2021/22 data for Canada. Data were available for 37 of the 43 reference countries. Life satisfaction was not included as a covariate in the mortality regressions because it represents a different developmental outcome rather than a structural confounder. It was instead used to ask whether countries with a favourable combination of educational performance and mortality also showed favourable subjective well-being.

All 44 countries in the mortality compilation had complete PISA scores. Norway was excluded because its available mortality period (2014–2016) was substantially earlier than the other reported periods, leaving a 43-country reference sample. Four countries carried PISA sampling warnings: Canada, the Netherlands, New Zealand and the United States. They were retained in the primary analyses and excluded in a sensitivity analysis. Exact component years of the three-year mortality averages were not available for most countries in the published compilation, and missing values or metadata were not imputed.

2.2 Analytical strategy

The analyses followed the three study questions. First, the overall correspondence between each PISA domain and adolescent suicide mortality was examined. Pearson correlations quantified linear associations, while Spearman correlations assessed whether the rank ordering of countries showed the same pattern with less dependence on the exact distances between values. Holm correction was applied across the six correlation tests. Bias-corrected and accelerated bootstrap confidence intervals based on 99,999 country resamples provided an additional assessment of uncertainty. Separate ordinary least-squares regressions translated the same associations onto the mortality scale as the estimated difference in annual deaths per 100,000 adolescents associated with a ten-point difference in PISA performance; HC3 confidence intervals reduced sensitivity to heteroskedasticity (Efron, 1987; Holm, 1979; MacKinnon & White, 1985; Phipson & Smyth, 2010).

Second, the analyses tested whether broad socioeconomic resources accounted for the PISA–mortality relationship. For each PISA domain, three models were estimated on the same 41 countries with complete PISA, mortality, GNI and child-poverty data: PISA alone (A0), PISA plus log(GNI) (A1), and PISA plus log(GNI) and child poverty (A2). Keeping the country sample fixed across these steps meant that changes in the PISA coefficient reflected statistical adjustment for the contextual variables rather than changes in sample composition. The three PISA coefficients in the fully adjusted models formed a separate Holm-adjusted test family, and partial correlations provided standardised summaries of the A2 associations.

Sensitivity analyses then assessed whether the main findings depended strongly on individual countries, PISA sampling concerns or selected modelling decisions. These included leave-one-country-out estimates, exclusion of countries with PISA sampling warnings, log-transformation of mortality, inclusion of Norway, restriction to OECD or European countries, and selected country exclusions motivated by performance or mortality profiles. Their purpose was to evaluate the stability of the main pattern, not to create additional independent tests of the hypothesis.

2.3 Descriptive country profiles

The country-profile analysis addressed the third question by moving from an average association to configurations of indicators within countries. A descriptive profile identified countries that scored above the OECD mean in all three PISA domains and below the mortality median of the 43-country sample. More stringent thresholds were examined to show how dependent this classification was on the chosen cut-points. Life satisfaction was then added as a separate subjective indicator to ask whether favourable educational and mortality profiles also coincided with more positive well-being. The measures were deliberately not combined into a composite index. Figure 1 plots mortality against the equally weighted mean of the three PISA domains for visualisation only; all inferential analyses remained domain-specific.

2.4 Software and generative AI use

All statistical analyses were conducted in Python 3.13.5. Data management used pandas 2.2.3, numerical operations used NumPy 2.3.5, statistical procedures used SciPy 1.17.0 and statsmodels

0.14.6, and figures were produced with Matplotlib 3.10.8. Fixed random seeds were used for Monte Carlo permutation and bootstrap procedures to support computational reproducibility.

OpenAI GPT-5.6 Sol, accessed through ChatGPT (OpenAI, San Francisco, CA, USA), was used as an assistive tool during study preparation. Its use included exploratory literature scoping, support with transcription and checking of publicly available country-level data, support with Python code development and review, and refinement of manuscript structure and language. All statistical estimates were generated by executing the Python analyses on the source-derived data; no numerical result was taken directly from a language-model response. References and factual claims suggested during AI-assisted work were checked against primary or authoritative sources before inclusion. The author determined the study design, data inclusion, analytical strategy, interpretation and final wording, reviewed all AI-assisted output, and assumes full responsibility for the work. No confidential or identifiable participant-level data were entered into the model.

All tests were two-sided, and effect sizes and confidence intervals were considered alongside P values. Confidence intervals were nominal rather than multiplicity-adjusted. Analyses treated countries as independent observations and did not incorporate sampling uncertainty in the published national estimates.

3 Results

3.1 PISA performance and adolescent suicide mortality

The first analysis asked whether national educational performance and adolescent suicide mortality tended to move together across countries. Across the 43-country sample, higher PISA scores generally occurred alongside higher mortality. This association links two different national outcomes—educational performance and a severe health indicator—and does not imply that higher achievement itself produces mortality. Suicide mortality ranged from 1.1 to 17.9 deaths per 100,000 adolescents annually (mean 6.42, standard deviation 3.78; median 6.20, interquartile range 3.50–8.40). The three PISA domains were strongly intercorrelated ($r = 0.861$ – 0.951), indicating a broad cross-country performance pattern even though the strength of evidence differed by domain.

Reading showed the clearest and most consistent positive association (Table 1). Its Pearson correlation was 0.390, and both Pearson and Spearman tests remained below 0.05 after Holm correction. Science was also positively associated with mortality (Pearson $r = 0.346$), although only the Spearman test remained below 0.05 after correction. Mathematics showed a smaller Pearson coefficient ($r = 0.196$), and neither adjusted correlation test was below 0.05. Fisher-z intervals excluded zero for science and reading, whereas the corresponding Pearson BCa bootstrap intervals included zero; mathematics included zero under both approaches. The evidence was therefore strongest for reading, more qualified for science and weak for mathematics. No formal test compared the three domain coefficients directly.

Figure 1 illustrates both the average pattern and the heterogeneity around it. Japan, the Republic of Korea, Estonia and New Zealand combined relatively high performance with higher mortality, whereas Cyprus, Greece and Malta combined lower scores with low mortality. Uruguay departed markedly from the average pattern, with the highest mortality despite lower performance. Conversely, the United Kingdom and Italy combined comparatively stronger performance with lower mortality. These profiles show why the country-level association should be read as an average tendency rather than a universal configuration.

The association weakened when the four countries with PISA sampling warnings were excluded: Pearson correlations fell to 0.288 for science, 0.306 for reading and 0.164 for mathematics. Removing Japan and the Republic of Korea also reduced the coefficients, particularly for mathematics. Including Norway changed each coefficient by less than 0.001, and no leave-one-country-out estimate reversed the direction of an association. The overall pattern was therefore not produced by a single country, although its magnitude depended partly on country composition.

Table 1
Country-level associations with adolescent suicide mortality a Pearson correlations

Domain	r	95% Fisher-z CI	95% BCa CI	p	p, Holm-adjusted
Science	0.346	0.051 to 0.585	−0.037 to 0.619	0.023	0.061
Reading	0.390	0.102 to 0.618	−0.023 to 0.648	0.010	0.039
Mathematics	0.196	−0.110 to 0.469	−0.229 to 0.505	0.207	0.207
b Spearman correlations					

Domain	ρ	95% BCa CI	p, permutation	p, Holm-adjusted
Science	0.498	0.152 to 0.747	< 0.001	0.004
Reading	0.462	0.111 to 0.718	0.002	0.010
Mathematics	0.351	0.010 to 0.627	0.020	0.061

Both panels include 43 countries. Holm adjustment applies to one family of six tests: three parametric Pearson tests and three Spearman permutation tests. BCa, bias-corrected and accelerated bootstrap; each resampling procedure used 99,999 iterations. All confidence intervals are nominal and do not incorporate uncertainty in the national estimates. Sources: OECD (2026) and UNICEF Innocenti (2026).

3.2 Socioeconomic context

The second analysis asked whether broad socioeconomic resources could explain the positive PISA–mortality relationship. Comparable child-poverty data were unavailable for Australia and Israel, leaving 41 countries. On this common sample, the unadjusted mortality-rate differences per ten PISA points were 0.366 for science, 0.434 for reading and 0.190 for mathematics (A0). Adding national income

increased these estimates to 0.637, 0.668 and 0.473, respectively (A1). Adding child poverty produced smaller additional changes for science and reading, yielding fully adjusted estimates of 0.669, 0.675 and 0.575 (A2; Table 2). Thus, the positive association was not accounted for by these two broad resource indicators.

The increase after income adjustment helps explain how the indicators relate. GNI correlated positively with PISA scores ($r = 0.500\text{--}0.654$) but weakly negatively with mortality ($r = -0.114$). In other words, national affluence tended to accompany stronger educational performance while, if anything, accompanying lower mortality. Statistically holding income constant therefore revealed rather than reduced the positive PISA–mortality relationship. For reading, the estimated mortality difference increased from 0.434 to 0.675 deaths per 100,000 per ten PISA points (A2 HC3 95% confidence interval 0.242–1.108). Partial correlations showed the same ordering across domains: 0.499 for reading, 0.472 for science and 0.363 for mathematics. Child-poverty coefficients were imprecisely estimated.

In the fully adjusted models, all three PISA coefficients had Holm-adjusted P values below 0.05, while BCa intervals excluded zero for reading and science but not mathematics. After excluding the four countries with PISA sampling warnings, all coefficients remained positive but smaller (science 0.525, reading 0.532, mathematics 0.443), and only the reading HC3 interval still excluded zero. Reading therefore remained the most stable association across the reported specifications, science received qualified support, and mathematics remained sensitive to analytical choices.

Table 2

Associations with adolescent suicide mortality after accounting for national income and child poverty					
Domain	b per 10 points	95% HC3 CI	95% BCa CI	p, HC3	p, Holm-adjusted
Science	0.669	0.147 to 1.191	0.063 to 1.062	0.013	0.027
Reading	0.675	0.242 to 1.108	0.189 to 1.040	0.003	0.009
Mathematics	0.575	0.090 to 1.059	–0.005 to 0.971	0.021	0.027

Separate A2 models, each including PISA, natural-log GNI and child poverty; $n = 41$. The coefficient b is the estimated difference in annual deaths per 100,000 adolescents per ten-point difference in PISA scores. HC3 intervals use a t distribution with 37 residual degrees of freedom. Holm adjustment applies only to the three A2 PISA tests. All confidence intervals are nominal. Sources: OECD (2026), UNICEF Innocenti (2026) and UNDP (2025).

3.3 Country profiles and life satisfaction

The third analysis shifted from the average cross-country association to configurations within individual countries. Five countries scored above the OECD mean in all three PISA domains while also having mortality below the 43-country median: the United Kingdom, Lithuania, Germany, Sweden and Italy (Table 3). None carried a PISA sampling warning. Only the United Kingdom exceeded every OECD domain mean by at least ten points, and only Italy also had mortality below the lower quartile; no country

met both stricter rules. These profiles are important because they demonstrate that the average positive PISA–mortality association is not an inevitable trade-off. High educational performance and comparatively low mortality can coexist.

Life satisfaction then added a third dimension to these profiles. Across the 37 countries with available data, the median proportion of adolescents reporting life satisfaction above 5 was 73%. Lithuania (77%) and Sweden (75%) were above this benchmark, Italy (73%) matched it, and Germany (68%) and the United Kingdom (62%) were below it. Only Lithuania and Sweden therefore met all three descriptive criteria. The profiles show that educational performance, protection from severe harm and positive subjective well-being are related but distinct outcomes: favourable results on two indicators do not guarantee a favourable result on the third.

Table 3
Life satisfaction in countries combining above-OECD-average PISA scores with below-median suicide mortality

Country	Science	Reading	Mathematics	Suicide rate	Life satisfaction > 5/10 (%)
United Kingdom	511	494	488	5.0	62
Lithuania	488	464	470	5.8	77
Germany	486	465	464	4.1	68
Sweden	485	466	464	5.8	75
Italy	483	474	468	2.8	73

The reference profile required science > 482, reading > 461 and mathematics > 463, with mortality < 6.2 per 100,000 adolescents. These are descriptive point-estimate comparisons, not tests of superiority. Mortality refers to earlier, country-specific three-year periods. Life satisfaction is the percentage scoring > 5 on a 0–10 scale, from PISA 2022 for these five countries; its 37-country comparison median was 73%. The three measures were not combined into an index. Sources: OECD (2026) and UNICEF Innocenti (2026).

4 Discussion

The current study asked whether three different types of national indicators—educational performance, adolescent suicide mortality and subjective well-being—tell the same story about how young people are doing across countries. They did not. Higher PISA scores were associated with higher previously recorded suicide mortality on average, with the most consistent evidence for reading, qualified evidence for science and weak evidence for mathematics. Adjustment for national income and relative child poverty strengthened rather than attenuated these associations, indicating that broad resource differences did not explain the pattern. Yet the average relationship coexisted with countries that

combined stronger performance and lower mortality, and life satisfaction further differentiated those profiles. Taken together, the findings point less to a simple achievement–well-being trade-off than to a multidimensional pattern in which educational, severe-health and subjective indicators can align in some countries and diverge in others.

4.1 Different indicators tell different stories

This multidimensional pattern helps reconcile the findings with earlier achievement–well-being research. Högberg (2023) found weak and inconsistent evidence of a national trade-off when well-being was measured through subjective and symptom-based indicators. The current findings do not contradict that conclusion; they show that the picture changes with the outcome being examined. Life satisfaction, psychological symptoms and suicide mortality capture different parts of adolescent experience and are shaped by partly different processes. For child-indicator research, disagreement between measures is therefore substantively informative. It can reveal that a favourable national average in one domain coexists with vulnerability in another.

Life satisfaction illustrates this point particularly clearly. It captures adolescents' global appraisal of their lives rather than the absence of illness or mortality. Among the favourable performance–mortality profiles, higher life satisfaction was not universal. This prevents two common shortcuts: interpreting low mortality as evidence that young people are flourishing, and interpreting strong educational performance as evidence of a broadly favourable developmental environment. The indicators become most useful when they are read together but not collapsed into one another.

4.2 From achievement to pressure: a possible multilevel mechanism

The positive PISA–mortality association also requires a clear distinction between achievement itself and the social organisation of achievement. PISA is an outcome indicator: it measures competencies, not pressure. Individual competence can provide mastery, opportunity and future options, and lower school performance has been associated with later suicide risk (Björkenstam et al., 2011). At the system level, however, the same high average score can be produced under very different educational conditions. Some systems may combine demanding standards with strong instructional support, autonomy and multiple routes after setbacks. Others may attach greater consequences to ranking, selection and comparative performance. The country-level association therefore points to the context in which achievement is produced, not to learning or competence as inherently harmful.

Academic pressure is one plausible mechanism through which system-level organisation could become psychologically consequential for individual students. Where access to valued educational pathways, family approval or social status is experienced as contingent on performance, rising average attainment need not reduce pressure; standards and reference groups may rise at the same time. Students who struggle may experience failure more sharply, while successful students may experience pressure to maintain their position. This interpretation connects the country-level pattern with individual-level

evidence linking academic pressure to depression, self-harm and suicidal experiences (Ang & Huan, 2006; Guo et al., 2026; Li et al., 2026; Shin & Bae, 2025; Steare et al., 2023). Self-determination theory clarifies why demanding environments can differ in impact: high expectations may be adaptive when competence is supported within autonomy-supportive, relationally secure settings, and more costly when motivation becomes controlling or approval is contingent on performance (Roth et al., 2009; Ryan & Deci, 2000). The IMV model adds a severe-outcome perspective by identifying defeat and entrapment as processes relevant to suicidal ideation in vulnerable individuals (O'Connor & Kirtley, 2018). Together, these frameworks suggest a testable multilevel pathway from the organisation of achievement to perceived pressure, distress and, for a small vulnerable subgroup, suicidal risk. The current ecological data do not test these intermediate processes directly, but they identify a pattern for which this mechanism is theoretically relevant.

4.3 Structural context and informative country profiles

The socioeconomic analyses place this possible mechanism within a broader social ecology. National income was positively related to PISA performance but weakly negatively related to suicide mortality. Affluence therefore tended to accompany both stronger performance and, if anything, lower mortality; controlling for it revealed a stronger positive PISA–mortality association. This makes a simple resource explanation less compelling, but it does not isolate an educational mechanism. GNI and child poverty are broad structural indicators. They do not capture the stakes attached to examinations, family expectations, school climate, access to alternative pathways after failure or the quality of mental-health support. Such institutional and relational features may vary substantially among countries with similar levels of income and educational performance.

The country profiles make this heterogeneity concrete. The United Kingdom, Lithuania, Germany, Sweden and Italy combined above-OECD-average performance across all three domains with below-median mortality. These descriptive ‘positive deviations’ show that high achievement and lower suicide mortality are compatible and shift the comparative question from whether achievement is harmful to how high-performing systems differ. Future work could compare high-performing countries with higher and lower mortality on features such as autonomy-supportive teaching, the stakes attached to examinations, flexibility after educational setbacks, school belonging, availability of psychological support and broader social safety nets.

4.4 A multidimensional monitoring and policy perspective

Life satisfaction provides a final qualification to the country profiles. Only Lithuania and Sweden among the five favourable performance–mortality profiles also exceeded the available-country median for life satisfaction. Germany and the United Kingdom combined comparatively strong achievement and lower mortality with below-median life satisfaction. This illustrates the core logic of multidimensional child indicators: PISA describes what students can do, suicide mortality reflects protection from the most severe outcome, and life satisfaction reflects how adolescents experience their lives. No single measure can stand in for the others.

This distinction is especially relevant for policy when declining PISA results create pressure for rapid educational improvement. The findings do not imply that expectations should be lowered. They suggest that the route to higher achievement should itself be evaluated. A narrow response centred on intensified testing, ranking or greater consequences for failure could plausibly amplify the pressure mechanisms identified in the literature. By contrast, reforms based on instructional quality, early support, meaningful feedback, autonomy and credible second chances may pursue high performance while protecting well-being. Australian population-based evidence is compatible with this non-zero-sum perspective: students with more favourable mental-health profiles also showed better same-year academic achievement (Gregory et al., 2024). Educational performance and well-being are therefore better treated as joint policy goals than as competing outcomes.

From a child-indicators perspective, the broader lesson is methodological as well as substantive. Highly visible international rankings can compress a multidimensional developmental reality into a single ordering. PISA identifies educational strengths and weaknesses; socioeconomic indicators locate those outcomes within structural resources; mortality identifies severe population-health burden; and life satisfaction gives adolescents a direct voice in evaluating their lives. The purpose of considering these indicators together is not to manufacture a broader score of national success, but to identify where they converge and where they diverge. Those patterns can generate more precise questions about mechanisms and policy than any one ranking alone.

4.5 Strengths and limitations

A strength of the study is the deliberate comparison of conceptually different national indicators rather than treating one measure as a proxy for overall child well-being. The sequential analysis also moved from an average association to structural context and then to country configurations, allowing different explanations of the same pattern to be examined. Several limitations are substantial. Most importantly, the observation periods were not aligned: mortality preceded PISA 2025, exact mortality years were unavailable for most countries, and the socioeconomic and life-satisfaction indicators referred to different periods. The analysis therefore compares national profiles measured at different times rather than following one cohort or one common historical period. The ecological design prevents individual-level interpretation; PISA represents enrolled students aged approximately 15 years, whereas mortality covers all 15–19-year-olds. Academic pressure and the proposed psychological pathways were not measured. Mortality came from published aggregates rather than a reconstruction of annual WHO records, and registration differences, regional dependence and unmeasured country characteristics may contribute to the associations. Statistical precision varied across procedures, particularly for mathematics, and life satisfaction represented only one component of subjective well-being. Finally, the profile thresholds were descriptive and sample-dependent rather than validated classifications of education systems.

5 Conclusion

In conclusion, higher national PISA scores were associated with higher adolescent suicide mortality on average, most consistently for reading, but the relationship was neither uniform across domains nor inevitable across countries. Broad socioeconomic adjustment did not explain the pattern, while country profiles and life satisfaction showed that educational performance, protection from severe harm and positive subjective well-being can combine in different ways. The most informative interpretation is therefore not that high achievement is harmful, but that achievement is embedded in educational and social systems whose psychological consequences may differ. The next step is to identify which institutional conditions allow high expectations and strong learning to coexist with low suicide mortality and positive adolescent well-being—and to evaluate education systems against these outcomes together rather than one at a time.

Declarations

Author Contribution

J.S. conceptualized the study, developed the study design and analytical strategy, curated and verified the source data, supervised and verified the statistical analyses, interpreted the results, prepared the figures and tables, and drafted and critically revised the manuscript. J.S. approved the final version and takes full responsibility for the integrity and content of the work.

Data Availability

No new primary data were generated for this study. All analyses were based on publicly available country-level data. PISA 2025 country mean scores in science, reading and mathematics were obtained from the OECD PISA 2025 Results (Volume I): Future-Ready Students (<https://doi.org/10.1787/73451bc5-en>). Adolescent suicide mortality rates and life-satisfaction indicators were obtained from UNICEF Innocenti Report Card 20, Unequal Chances: Children and Economic Inequality (<https://www.unicef.org/innocenti/reports/unequal-chances>). Gross national income data were obtained from the UNDP Human Development Report 2025 statistical annex (<https://hdr.undp.org/content/human-development-report-2025>). The harmonised country-level dataset used for the analyses was constructed from these public sources and can be made available by the author on reasonable request. No restricted or individual-level data were used.

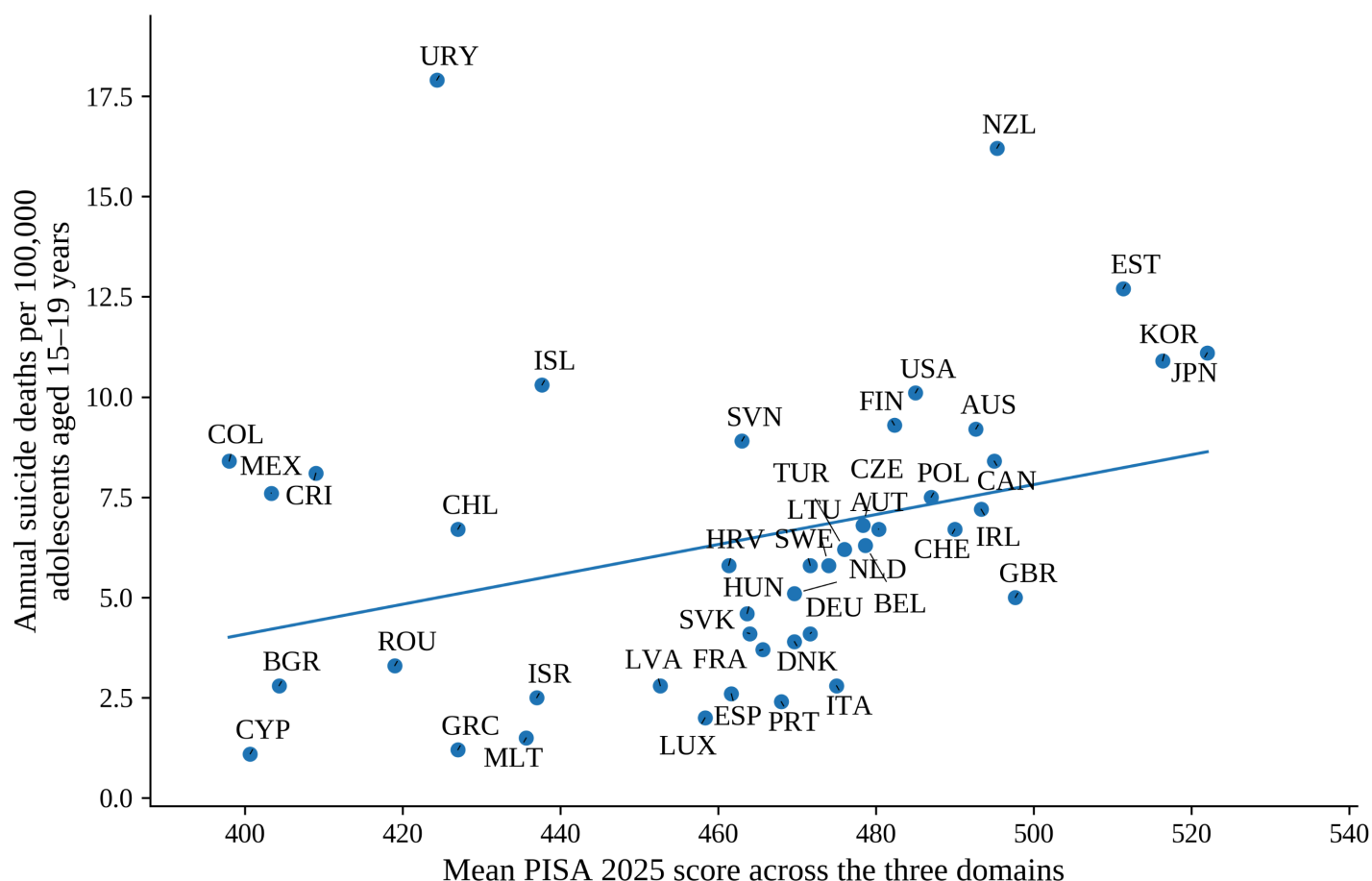
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Figures



Country codes

AUS	Australia	FIN	Finland	MEX	Mexico
AUT	Austria	FRA	France	MLT	Malta
BEL	Belgium	GBR	United Kingdom	NLD	Netherlands
BGR	Bulgaria	GRC	Greece	NZL	New Zealand
CAN	Canada	HRV	Croatia	POL	Poland
CHE	Switzerland	HUN	Hungary	PRT	Portugal
CHL	Chile	IRL	Ireland	ROU	Romania
COL	Colombia	ISL	Iceland	SVK	Slovakia
CRI	Costa Rica	ISR	Israel	SVN	Slovenia
CYP	Cyprus	ITA	Italy	SWE	Sweden
CZE	Czechia	JPN	Japan	TUR	Türkiye
DEU	Germany	KOR	Republic of Korea	URY	Uruguay
DNK	Denmark	LTU	Lithuania	USA	United States
ESP	Spain	LUX	Luxembourg		
EST	Estonia	LVA	Latvia		

Figure 1

National educational performance and adolescent suicide mortality. All 43 countries are labelled with ISO three-letter codes (key included). PISA scores are averaged across domains for visualisation only; inference remains domain-specific. The line is an unadjusted least-squares fit. Mortality rates are earlier three-year averages with country-specific periods. Sources: OECD (2026) and UNICEF Innocenti (2026)