

The Hong Kong University of Science and Technology
UG Course Syllabus

SOSC3610: Adversity and Biological Social Science

No. of Credits: 3

Name: Maleah Fekete, PhD; Assistant Professor in the Division of Social Sciences

Email: mfekete@ust.hk

Office Hours: Office 3351, Division of Social Science; Tuesday 3:30-5:30 pm

Course Description

This course provides an overview of research on social adversity and its biological consequences for health, with a particular focus on how stress, trauma, and social disadvantage become biologically embedded across the life course. Drawing on sociological research that uses DNA-based health biomarkers—especially epigenetics and genetics—the course examines how social conditions become biologically embedded, and how biological mechanisms contribute to the social stratification of health outcomes. Central questions guiding the course include: How do social circumstances shape biological processes related to health? Through what physiological pathways does adversity influence morbidity and mortality? How do genetics and environments interact to produce health inequalities? How do the timing, duration, and magnitude of social exposures—such as poverty, social isolation, or potentially traumatic events—shape health trajectories across the life course?

We begin by examining the challenges and benefits of integrating social science and biology, including ethical concerns and methodological tradeoffs. We then develop a foundational understanding of the biology of adversity, including multiple conceptualizations of stress and its physiological and psychological consequences. Building on this foundation, the course explores empirical patterns in exposure to adversity and health outcomes, the use of epigenetics and genetics in sociological health research, and what these tools reveal about mechanisms linking social position to health. In the final portion of the course, we consider key areas in which biologically informed sociological research is especially well positioned to contribute, including the biological bases of stress-related dysfunction, the interpersonal and meaning-making dimensions of distress, and population-level patterns in the distribution of stress-related dysfunctions.

In approaching these topics, we will consider contemporary research and, in some cases, the history of thought on a given topic. By examining variation in how scientists have conceptualized phenomena such as the physiological consequences of stress, we highlight the contested and provisional nature of knowledge in this area. This perspective is important for developing a critical approach to both the social world and the social and biological sciences. As such, this approach allows us to ask the type of incisive questions that are essential for advancing scientific understanding. The broad goals of the course are thus twofold: (1) to provide substantive knowledge of biological social science and (2) to develop skills for critically evaluating biosocial research across academic and public contexts.

This course may be particularly relevant for students interested in stress-related mental health conditions (including depression, anxiety, and posttraumatic stress disorder), social inequalities in health, resilience, epigenetics and epigenetic age acceleration, and gene–environment interactions.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Explain the benefits and challenges of biological social science research, including ethical considerations and key scientific contributions
2. Describe how epigenetic and genetic measures are used in sociological health research to study mechanisms linking socioeconomic position and health across the life course
3. Compare different conceptualizations and measurements of stress
4. Analyze patterns and explanations of health consequences associated with exposure to adversity, including morbidity, mortality, and stress-related mental health outcomes
5. Evaluate the research tools and methodologies used in biosocial health research
6. Interpret experimental and observational findings on exposure and vulnerability to adversity
7. Communicate scientific ideas effectively through oral presentations and a structured term paper

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date *
Participation	10%	24/11/2026
5 in-class quizzes	30%	15/09/2026 29/09/2026 13/10/2026 27/10/2026 10/11/2026
Group presentation	30%	Rolling deadline
Final examination	60%	08/12/2026

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Participation	ILO1, ILO2, ILO3, ILO4	This task asks students to engage in the courses' critical concepts – including the benefits and challenges of biological social science research, epigenetic and genetic measurement in

		sociological health research, conceptualization and measurement of stress, and social patterns in health (ILOs1-4) – by asking questions to clarify and deepen their understanding.
Quizzes	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	The quizzes assess students command over course concepts (ILOs1-4), as well as their ability to evaluate relevant methodologies (ILO5) and interpret empirical study findings (ILO6).
Group presentation	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6, ILO7	The presentation assesses students' command over course concepts (ILOs1-4), their ability to evaluate relevant methodologies (ILO5), interpret empirical study findings (ILO6), and to synthesize scientific ideas into a cohesive oral presentation (ILO7).
Final examination	ILO4, ILO5, ILO6, ILO7	The final examination assess students' understanding of all course concepts (ILOs1-4), their ability to evaluate relevant methodologies (ILO5), interpret empirical study findings (ILO6), and to synthesize scientific ideas into a well-structured short essay (ILO7).

Grading Rubrics

Detailed rubrics for the group presentation and final examination will be provided. These rubrics clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high

		motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

The use of AI tools is permitted in this course. Students may use AI for brainstorming, literature discovery, feedback, critique, and language style and refinement. However, while AI tools may serve as an editor and sounding board, they may not serve as the author. Generating raw text to fulfill writing assignments remains prohibited, and students are responsible for the accuracy and originality of all submitted work. Whenever AI is used, students must cite the tool and provide a description of how AI was used.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include a description of assessment based on the provided rubric. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Assignment submissions are final; resubmissions will not be accepted. Late work will incur a penalty of one letter grade per calendar day (including weekends). Exceptions to this policy are made only in the case of documented emergencies.

Required Texts and Materials

Students are not required to purchase any materials.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic

integrity. The University has zero tolerance of academic misconduct. Please refer to [Academic Integrity | HKUST – Academic Registry](#) for the University’s definition of plagiarism and ways to avoid cheating and plagiarism.

Assignment Descriptions

Group presentation. In groups of three or four, students will deliver a 15-minute presentation (followed by 5 minutes of Q&A) on an instructor-approved aspect of a course topic. Presentations must be grounded in peer-reviewed literature.

- During the third-class period (Sept. 15), students will have 10 minutes in class to form groups based on topic interest. Any unassigned students will be placed into groups by the instructor. Groups will then have 5 minutes to discuss their preferred presentation dates. Student groups who choose to go in the first three weeks (October 13, 20, or 27) will be receive up to 3 extra points (+3 for the first week, +2 for the second week, and +1 for the third week). During the fourth-class period (Sept. 22), presentation slots will be chosen at the end of class via a random draw order.
- At least 1 week prior to your presentation date, your group must submit one comprehensive review article and one primary research paper on your topic to Canvas for topic verification.
- Presentations should provide a brief contextual overview of the topic followed by an in-depth analysis of key research findings (including the submitted papers). I suggest 3 minutes for high-level overview of the topic, 10 minutes of deep-dive into 1 or 2 key studies, and 2 minutes for conclusions/key takeaways. When deep-diving into studies, be sure to include a description of methodology and potential limitations of the study.
- Presentations will be evaluated on content quality, relevance of cited literature, scientific rigor, and delivery. Once scheduled, presentation dates are final; no extensions will be granted without formal institutional accommodation.

Final Examination. Students will (1) write a brief in-class essay of two pages or less responding to one of several prompts, (2) critically analyze it using feedback from ChatGPT or another generative AI tool, and (3) submit a revised short essay and a (4) short reflection on the revision process (including the strengths and limitations of AI feedback). In addition, students will (5) complete a cumulative in-class test.

Course Units

Class 1: Sept. 1 – Why does social science need biology?

- Introduction – course expectations and assessments, overview of course content (what you will do, what you will learn)
- Why do adversity and biology matter for social science?
 - Why does adversity matter for understanding social patterns in health?
 - How does the body matter for social science?
 - Nature vs nurture – which matter more?
 - Challenges of using biological explanations of social patterns

Assigned Readings: Course syllabus.

Class 2: Sept. 8 – The biology of adversity

- The puzzle of the socioeconomic gradient in health
- Further benefits to thinking about how adversity is embodied
- What is “stress”?
 - The history
 - How does stress shape health outcomes?
- The stress process model
- Meaning in the stress process

Assigned Readings:

1. Ganzel, B. L., Morris, P. A., & Wethington, E. (2010). Allostasis and the human brain: Integrating models of stress from the social and life sciences. *Psychological review*, 117(1), 134. **Pp. 1-13.**
2. McLeod, Jane D. "The meanings of stress: Expanding the stress process model." *Society and Mental Health* 2, no. 3 (2012): 172-186.
3. Kalisch, R., Müller, M. B., & Tüscher, O. (2015). A conceptual framework for the neurobiological study of resilience. *Behavioral and brain sciences*, 38, e92.

Optional Readings: Sterling, P., & Eyer, J. (1988). Allostasis: A new paradigm to explain arousal pathology. In S. Fisher & J. Reason (Eds.), *Handbook of Life Stress, Cognition and Health* (pp. 629–649). Wiley.

Homework: Brainstorm potential presentation topics, complete next week’s readings.

Class 3: Sept. 15 – The epidemiology of stress-related mental disorders

- Quiz
- Recap
- What are (stress-related) mental disorders?
 - Explanatory reductionism
 - The network approach
 - Meaning in mental disorders
 - The case of PTSD
- Challenges of measuring mental disorders
 - The atheoretical approach
 - The case of depression
- Challenges of measuring the effects of stress
- 15 minutes for presentation planning

Assigned Readings:

1. Borsboom, Denny, Angélique O. J. Cramer, and Annemarie Kalis. 2019. "Brain Disorders? Not Really: Why Network Structures Block Reductionism in Psychopathology Research." *Behavioral and Brain Sciences* 42:e2.
2. Fried, Eiko I., Jessica K. Flake, and Donald J. Robinaugh. "Revisiting the theoretical and methodological foundations of depression measurement." *Nature Reviews Psychology* 1, no. 6 (2022): 358-368.
3. Turner, R. J. (2013). Understanding health disparities: The relevance of the stress process model. *Society and Mental Health*, 3(3), 170-186.
4. Thoits, P. A. (2010). Stress and health: Major findings and policy implications. *Journal of health and social behavior*, 51(1_suppl), S41-S53.

Optional Readings: [1] Kessler, R. C., Abelson, J., Demler, O., Escobar, J. I., Gibbon, M., Guyer, M. E., ... & Zheng, H. (2004). Clinical calibration of DSM-IV diagnoses in the World Mental Health (WMH) version of the World Health Organization (WHO) Composite International Diagnostic Interview (WMH-CIDI). *International journal of methods in psychiatric research*, 13(2), 122-139. [2] Fried, Eiko I., Claudia D. van Borkulo, Sacha Epskamp, Robert A. Schoevers, Francis Tuerlinckx, and Denny Borsboom. 2016. "Measuring Depression over Time... Or Not? Lack of Unidimensionality and Longitudinal Measurement Invariance in Four Common Rating Scales of Depression." *Psychological Assessment* 28(11):1354-67

Homework: Start solidifying presentation topic, complete next week's readings.

Class 4: Sept. 22 – The sociology of stress-related disorders. Patterns and Explanations

- WHO MH Survey findings
- Fundamental causes of disease (FCT)
 - Context of the theory's development
 - Understanding the power of the theory
 - Heterogeneity in disease patterns
- Social support and stress
- Time-dependent explanations

Assigned Readings:

1. Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of health and social behavior*, 52(2), 145-161.
2. Link, Bruce G., and Jo Phelan. "Social conditions as fundamental causes of disease." *Journal of health and social behavior* (1995): 80-94.
3. Kessler, Ronald C., Nancy A. Sampson, Patricia Berglund, Michael J. Gruber, Ali Al-Hamzawi, L. Andrade, B. Bunting et al. "Anxious and non-anxious major depressive disorder in the World Health Organization World Mental Health Surveys." *Epidemiology and psychiatric sciences* 24, no. 3 (2015): 210-226.

Homework: Submit presentation topic, complete next week's readings.

Class 5: Sept. 29 – A new wave of adversity research? Epigenetics – Part 1.

- Quiz
- What is epigenetics?
 - Intro
 - DNA methylation
- Applications
 - Epigenetic clocks
 - Reliability and validity
 - Other measures

Assigned Readings:

1. Harris, Kathleen Mullan, and Kristen M. Schorpp. "Integrating biomarkers in social stratification and health research." *Annual review of Sociology* 44, no. 1 (2018): 361-386.
2. Ryan, C. P. (2021). "Epigenetic clocks": Theory and applications in human biology. *American Journal of Human Biology*, 33(3), e23488.
3. Lu, A. T., Quach, A., Wilson, J. G., Reiner, A. P., Aviv, A., Raj, K., ... & Horvath, S. (2019). DNA methylation GrimAge strongly predicts lifespan and healthspan. *Aging (alban NY)*, 11(2), 303.

Optional Readings: [1] Boardman, J. D., & Fletcher, J. M. (2021). Evaluating the continued integration of genetics into medical sociology. *Journal of Health and Social Behavior*, 62(3), 404-418. [2] Levine, Morgan E. "Assessment of epigenetic clocks as biomarkers of aging in basic and population research." *The Journals of Gerontology: Series A* 75, no. 3 (2020): 463-465.

Homework: Complete next week's readings.

Class 6: Oct. 6 – A new wave of adversity research? Epigenetics – Part 2.

- Midpoint course feedback
- Biological embedding the social science
- Overview of social epigenetic clock research
- Selected findings from social epigenetics

Assigned Readings:

1. Oblak, L., van der Zaag, J., Higgins-Chen, A. T., Levine, M. E., & Boks, M. P. (2021). A systematic review of biological, social and environmental factors associated with epigenetic clock acceleration. *Ageing research reviews*, 69, 101348.
2. Martin, C. L., Ghastine, L., Lodge, E. K., Dhingra, R., & Ward-Caviness, C. K. (2022). Understanding health inequalities through the lens of social epigenetics. *Annual review of public health*, 43(1), 235-254.
3. McEwen, C. A. (2022). Connecting the biology of stress, allostatic load and epigenetics to social structures and processes. *Neurobiology of Stress*, 17, 100426.

Optional Readings: [1] Crimmins, E. M., Klopach, E. T., & Kim, J. K. (2024). Generations of epigenetic clocks and their links to socioeconomic status in the Health and Retirement Study. *Epigenomics*, 16(14), 1031-1042. [2] McCrory, C., Fiorito, G., Cheallaigh, C. N., Polidoro, S., Karisola, P., Alenius, H., ... & Kenny, R. A. (2019). How does socio-economic position (SEP) get biologically embedded? A comparison of allostatic load and the epigenetic clock (s). *Psychoneuroendocrinology*, 104, 64-73. [3] Warner, B., Ratner, E., Datta, A., & Lendasse, A. (2024). A systematic review of phenotypic and epigenetic clocks used for aging and mortality quantification in humans. *Aging (Albany NY)*, 16(17), 12414.

Homework: Complete next week's readings. First-week presenters' literature selection is due.

Class 7: Oct. 13 – Genetics in social science research. Part 1.

- Quiz
- Why should social scientists care about genetics?
- The “meat and potatoes” of genetics
- Population genetics and its challenges
- Challenges of computation in genetics
- Class presentations.

Assigned Readings:

1. Harden, K. P., & Koellinger, P. D. (2020). Using genetics for social science. *Nature human behaviour*, 4(6), 567-576.
2. Freese, J. (2018). The arrival of social science genomics. *Contemporary sociology*, 47(5), 524-536.
3. [What is a gene?](#)
4. [What is noncoding DNA?](#)
5. [What are single nucleotide polymorphisms \(SNPS\)?](#)

Homework: Complete next week's readings. Second-week presenters' literature selection is due.

Class 8: Oct. 20 – Genetics in social science research. Part 2.

- The benefits of genetic approaches for causal inference and reducing problems of confounding, review an example of applied polygenetic risk score research, review examples of GxE research.
- Class presentations.

Assigned Readings:

1. Freese, J. (2008). Genetics and the social science explanation of individual outcomes. *American Journal of Sociology*, 114(S1), S1-S35.

2. Herd, P., Freese, J., Sicinski, K., Domingue, B. W., Mullan Harris, K., Wei, C., & Hauser, R. M. (2019). Genes, gender inequality, and educational attainment. *American sociological review*, 84(6), 1069-1098.

[1] [2] [3] Rauf, T., & Freese, J. (2024). Genetic influences on depression and selection into adverse life experiences. *Social science & medicine*, 344, 116633. [4] Liu, H., & Guo, G. (2015). Lifetime socioeconomic status, historical context, and genetic inheritance in shaping body mass in middle and late adulthood. *American sociological review*, 80(4), 705-737.

Homework: Complete next week's readings. Third-week presenters' literature selection is due.

Class 9: Oct. 27 – Special topics: Mental dysfunction and potentially traumatic events. Part 1.

- Quiz
- Who develops mental dysfunction after a PTE and who does not? Traumatic versus chronic stress; the puzzle of PTSD and variation in prevalence across groups and trauma-types; theoretical explanation of variation in the development of PTSD, biological and cognitive, socio-cognitive, meaning-making and resilience.
- Class presentations.

Assigned Readings: [1] Kessler, R. C., Aguilar-Gaxiola, S., Alonso, J., Benjet, C., Bromet, E. J., Cardoso, G., ... & Koenen, K. C. (2017). Trauma and PTSD in the WHO world mental health surveys. *European journal of psychotraumatology*, 8(sup5), 1353383. [2] McLaughlin, K. A., Koenen, K. C., Bromet, E. J., Karam, E. G., Liu, H., Petukhova, M., ... & Kessler, R. C. (2017). Childhood adversities and post-traumatic stress disorder: evidence for stress sensitisation in the World Mental Health Surveys. *The British journal of psychiatry*, 211(5), 280-288. [3] Feriante, J., & Sharma, N. P. (2023). Acute and chronic mental health trauma. In *StatPearls [Internet]*. StatPearls Publishing.

Optional Readings: Maeng, L. Y., & Milad, M. R. (2017). Post-traumatic stress disorder: the relationship between the fear response and chronic stress. *Chronic Stress*, 1, 2470547017713297. Girotti, M., Bulin, S. E., & Carreno, F. R. (2024). Effects of chronic stress on cognitive function—From neurobiology to intervention. *Neurobiology of stress*, 33, 100670. Khan, Z., El Messiri, N., Iqbal, E., Hassan, H., Tanweer, M. S., Sadia, S. R., ... & Zaidi, M. (2025). On the role of epigenetic modifications of HPA axis in posttraumatic stress disorder and resilience. *Journal of neurophysiology*.

Homework: Complete next week's readings. Fourth-week presenters' literature selection is due.

Class 10: Nov. 3 – Special topics: Mental dysfunction and potentially traumatic events. Part 2.

- Resilience in the face of adversity: Overview of current resilience research, case study – extreme isolation, case study – working-class rural White men's broken expectations, case study – sexual assault, case study – Afghani children in the midst of war.
- Class presentations.

Assigned Readings: [1] Masten, A. S., Lucke, C. M., Nelson, K. M., & Stallworthy, I. C. (2021). Resilience in development and psychopathology: Multisystem perspectives. *Annual review of clinical psychology*, 17(1), 521-549. [2] Southwick, S. M., & Charney, D. S. (2018). *Resilience:*

The science of mastering life's greatest challenges (2nd ed.). Cambridge University Press. Chapter 10. [3] Eggerman, M., & Panter-Brick, C. (2010). Suffering, hope, and entrapment: Resilience and cultural values in Afghanistan. *Social science & medicine*, 71(1), 71-83.

Homework: Complete next week's readings. Fifth-week presenters' literature selection is due.

Class 11: Nov. 10 – Special topics: How do social relations distribute health and adversity?

- Quiz
- Part 1: Puzzling gap in the explanation for health at the top of the health distribution; current (insufficient) theoretical explanations of health disparities – brief overview of stress process theory and fundamental causes, deeper dive into cumulative (dis)advantage, and a consideration alternative explanations (smoking and education – the privilege of meanings?)
- Part 2: Health and contagion, social networks by class – providing resource access versus managing lack of resources, qualitative investigations of risk-taking behaviors
- Class presentations.

Assigned Readings: [1] Dannefer, D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 58(6), S327-S337. [2] Ferraro, K. F., & Shippee, T. P. (2009). Aging and cumulative inequality: How does inequality get under the skin?. *The Gerontologist*, 49(3), 333-343. [3] Rosenquist, J. N., Fowler, J. H., & Christakis, N. A. (2011). Social network determinants of depression. *Molecular psychiatry*, 16(3), 273-281.

Optional Readings: Smith, K. P., & Christakis, N. A. (2008). Social networks and health. *Annu. Rev. Sociol.*, 34(1), 405-429.

Homework: Complete next week's readings. Sixth-week presenters' literature selection is due.

Class 12: Nov. 17 – Special topics: Recent advances in the field and interpreting empirical biosocial science research

- Bereavement and accelerated biological aging
- A note on the gender pay gap
- Fundamental cause theory, the social stratification of health, and accelerated biological aging
- TBD class choice

Assigned Readings: [1] Fekete, M. (Under Review). Gendered Vulnerability to Family Loss: Cumulative Bereavement and Accelerated Biological Aging. [2] Aiello, A. E., Mishra, A. A., Martin, C. L., Levitt, B., Gaydos, L., Belsky, D. W., ... & Harris, K. M. (2024). Familial loss of a loved one and biological aging: NIMHD social epigenomics program. *JAMA Network Open*, 7(7), e2421869. [3] Killewald, A., & Cricco, N. J. (2025). Can fertility decline help explain gender pay convergence?. *Social Forces*, 103(4), 1329-1349.

Homework: Study for final in-class exam.

Class 13: Nov. 24 – Final test and concluding discussion. (Last class)

- Cumulative, in-class examination
- Course feedback
- Concluding discussion

Homework: Take-home portion of the final examination.