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ORIGINAL RESEARCH

Health Literacy, Mental Health and Medication Adherence among Adult Primary Care Patients: A Comparative Study between Bulgaria and Germany

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Authors' Contribution:
A – Study design;
B – Data collection;
C – Statistical analysis;
D – Data interpretation;
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Abstract

Background and Aim of Study: *Cardiovascular diseases remain the leading cause of mortality worldwide. Effective management of cardiovascular risk depends not only on medical treatment but also on patients' health literacy, psychological status and adherence to prescribed therapy. Increasing evidence suggests that psychosocial determinants play an important role in long-term cardiovascular outcomes.*
The aim of the study: to compare health literacy, mental health status and medication adherence among patients from Bulgaria and Germany and to evaluate their associations.

Material and Methods: *A cross-sectional survey was conducted among 862 adult patients from Bulgaria (n=186) and Germany (n=676). Data were collected using a structured questionnaire including measures of cardiovascular risk factors, health literacy, mental health (PHQ-based assessment) and medication adherence (Modified Medication Adherence Report Scale). Statistical analyses were performed using IBM SPSS Statistics 27.0 and MedCalc 23.5.5.*

Results: *German patients demonstrated significantly higher medication adherence scores compared to Bulgarian patients ($p<0.01$). Bulgarian participants showed a higher prevalence of moderate and severe psychological symptoms. A significant association was found between mental health status and medication adherence ($p=0.009$), with patients reporting normal psychological status demonstrating higher adherence levels. Health literacy was also significantly associated with medication adherence ($p=0.034$), particularly among German participants. No significant relationship was observed between health literacy and lifestyle score.*

Conclusions: *Health literacy and mental health are important determinants of medication adherence among adult primary care patients from Bulgaria and Germany. Integrating psychological assessment and health literacy interventions into primary care may improve cardiovascular prevention and long-term treatment outcomes. The findings also support the development of the Bulgarian-HEART Model as an integrated framework for cardiovascular risk management in primary care.*

Keywords: *cardiovascular risk, primary care, health literacy, mental health, medication adherence, Bulgaria; Germany*

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Introduction

Cardiovascular diseases (CVDs) remain the leading cause of mortality worldwide, accounting for approximately 20 million deaths annually and nearly one-third of all global deaths (Roth et al., 2020; WHO, 2025). Despite substantial advances in diagnostics, pharmacotherapy, and interventional cardiology, prevention remains the most effective strategy for reducing cardiovascular morbidity and mortality (Visseren et al., 2021).

Current European Society of Cardiology (ESC) guidelines emphasize the importance of a comprehensive approach to cardiovascular prevention, combining risk factor control, behavioural interventions, patient education, and long-term follow-up (Visseren et al., 2021).

Similarly, the World Health Organization promotes integrated cardiovascular prevention in primary care through the WHO HEARTS technical package, which provides evidence-based recommendations for cardiovascular risk assessment, treatment protocols, team-based care, and long-term monitoring (World Health Organization, 2021/2020).

Modern cardiovascular risk assessment is increasingly based on validated tools such as SCORE2 and SCORE2-OP, which allow individualized estimation of future cardiovascular risk (SCORE2 working group and ESC Cardiovascular risk collaboration et al., 2021)

However, successful cardiovascular prevention depends not only on biological risk factors but also on psychosocial and behavioural determinants of health. Among these, health literacy and mental health have received growing attention during the last decade (Berkman et al., 2011; Bueno et al., 2025; Levin-Zamir & Bertschi, 2018; Magnani et al., 2018; Nutbeam, 2000; Sørensen et al., 2012).

Health literacy refers to an individual's ability to access, understand, evaluate, and apply health-related information in order to make informed health decisions (Sørensen et al., 2012). Low health literacy has been associated with poorer health outcomes, reduced participation in preventive programmes, lower medication adherence, and increased hospitalization rates (Berkman et al., 2011; Magnani et al., 2018).

Similarly, depression and anxiety are increasingly recognized as important cardiovascular risk modifiers. Psychological distress has been linked to unhealthy lifestyle behaviours, lower treatment adherence, poorer disease control, and increased cardiovascular morbidity and mortality (Levine et al., 2021; Lichtman et al., 2014; Whooley, 2006).

The importance of this relationship has recently been emphasized in the 2025 European Society of Cardiology (ESC) Clinical Consensus Statement on Mental Health and Cardiovascular Disease (Bueno et al., 2025). The document highlights the multidirectional interaction between mental health and cardiovascular disease and recommends the systematic integration of mental health assessment, psychological screening, and multidisciplinary psycho-cardiological care into routine cardiovascular prevention and management. The ESC further advocates regular screening for depression and anxiety using validated instruments such as the Patient Health Questionnaire (PHQ) and Generalized Anxiety Disorder (GAD) scales, particularly among individuals with cardiovascular disease or elevated cardiovascular risk.

Medication adherence represents another critical component of cardiovascular prevention. Despite substantial advances in pharmacotherapy and healthcare delivery, medication non-adherence remains a major challenge worldwide. Recent evidence suggests that poor adherence continues to compromise treatment effectiveness, healthcare utilization, and long-term patient outcomes across a wide range of chronic diseases (Kardas et al., 2024). In cardiovascular prevention, inadequate adherence contributes significantly to uncontrolled risk factors, avoidable hospitalizations, and premature mortality (Brown & Bussell, 2011).

Consequently, improving medication adherence has become a key objective of contemporary chronic disease management and cardiovascular risk reduction strategies.

Although cardiovascular prevention has been extensively studied in individual countries, comparative analyses between different European healthcare systems remain limited. Bulgaria and Germany provide an interesting comparison due to differences in healthcare organization, preventive programmes, digitalization, and cardiovascular outcomes (OECD/European Observatory on Health Systems and Policies, 2025b, 2025a).

The aim of the study. To compare health literacy, mental health status, medication adherence, and lifestyle-related cardiovascular risk factors among adult primary care patients in Bulgaria and Germany and to examine the relationships between these variables. Particular attention was given to the role of psychosocial determinants in cardiovascular prevention. Based on the findings, an integrated conceptual framework (BG-HEART Model) for cardiovascular risk management in primary care was developed.

Materials and Methods

A cross-sectional comparative study was conducted among adult patients attending primary care practices in Bulgaria and Germany. Participants were recruited consecutively during routine visits in participating primary care settings and were invited to complete a structured self-administered questionnaire. In addition, some patients were contacted by email and invited to participate in the survey.

A total of 862 participants were included in the final analysis, comprising 186 individuals from Bulgaria and 676 individuals from Germany. Eligible participants were adults aged 18 years or older who were able to provide informed consent and complete the questionnaire independently. Participation in the study was not conditional on the presence of cardiovascular disease or established cardiovascular risk factors. Instead, the study aimed to assess health literacy, mental

health status, medication adherence, lifestyle behaviours, and cardiovascular risk-related characteristics in a general adult primary care population.

The questionnaire collected information on sociodemographic characteristics, including age, sex, educational attainment, and country of residence. In addition, participants provided self-reported information regarding cardiovascular risk factors and chronic health conditions, including arterial hypertension, diabetes mellitus, dyslipidaemia, obesity, smoking status, and current medication use.

Data on lifestyle behaviours included smoking habits, dietary patterns, physical activity, and other behavioural factors relevant to cardiovascular health. Information regarding medication adherence, mental health status, and health literacy was obtained using standardized assessment instruments. All questionnaires were completed anonymously, and data were analysed in aggregated form to ensure participant confidentiality.

The questionnaire was developed specifically for the purposes of the present study and was based on established concepts in cardiovascular prevention, health literacy, mental health assessment, and medication adherence. Prior to implementation, the questionnaire was reviewed by experts in public health, primary care, and cardiovascular medicine to ensure content validity and clarity of wording. The final instrument consisted of several sections covering sociodemographic characteristics, cardiovascular risk factors, lifestyle behaviours, health literacy, mental health status, and adherence to prescribed pharmacological treatment.

The selection of the assessment instruments was guided by their suitability for use in primary care settings and their feasibility in large-scale population surveys. Particular emphasis was placed on the inclusion of brief, validated instruments that could be easily administered in routine clinical practice while providing meaningful information regarding psychosocial determinants of cardiovascular health.

Mental health status was assessed using the Patient Health Questionnaire-4 (PHQ-4), an ultra-brief validated screening instrument for anxiety and depression developed by Kroenke et al. (2009). The PHQ-4 consists of four items, including two items assessing depressive symptoms (PHQ-2) and two items assessing anxiety symptoms (GAD-2). Participants rated the frequency of symptoms experienced during the previous two weeks on a four-point Likert scale ranging from 0 (“not at all”) to 3 (“nearly every day”).

The total PHQ-4 score ranges from 0 to 12, with higher scores indicating greater psychological distress. Consistent with established recommendations, participants were categorized into four groups: normal psychological status (0–2 points), mild psychological symptoms (3–5 points), moderate psychological symptoms (6–8 points), and severe psychological symptoms (9–12 points) (Kroenke et al., 2001).

Health literacy was assessed using a composite Health Literacy Score developed for the purposes of this study. The score was based on six questionnaire items evaluating participants’ ability to access, understand, evaluate, and apply health-related information in everyday healthcare situations. Specifically, participants were asked how easy or difficult it was for them to:

- understand information provided by a physician or nurse;
- understand written health information;
- assess the reliability of health information;
- find relevant health information when needed;
- use health information to make health-related decisions;
- make informed decisions regarding their own health.

Each item was rated on a four-point Likert scale ranging from 1 (“very difficult”) to 4 (“very easy”). Since higher scores directly reflected better health literacy, reverse coding was not required.

A total Health Literacy Score was calculated as the sum of the six items, resulting in a possible score range from 6 to 24 points. In addition, a mean score was calculated for each participant. Based on the mean score, participants were categorized into three levels of health literacy:

- Low health literacy: mean score <2.50.
- Moderate health literacy: mean score 2.50–2.99.
- High health literacy: mean score ≥3.00.

Due to missing responses in some questionnaires, health literacy scores were calculated only for participants with complete data for all six items (complete-case analysis).

Medication adherence was assessed using a modified version of the Medication Adherence Report Scale (MARS), a self-report instrument originally developed by Horne et al. (1999) and widely used in studies evaluating adherence to long-term pharmacological treatment. Self-reported adherence measures have demonstrated acceptable validity and feasibility in cardiovascular populations and are commonly applied in clinical and epidemiological research (Chan et al., 2020).

The modified questionnaire included four items assessing common medication non-adherence behaviours. Participants were asked how frequently they forgot to take their medication, changed the prescribed dose, stopped medication when feeling better, or discontinued treatment when feeling worse.

Responses were recorded on a five-point Likert scale ranging from “always” to “never”. Because all items reflected non-adherent behaviours, higher scores indicated better medication adherence. A total Modified MARS Score was calculated by summing the responses across all four items, resulting in a possible score range from 4 to 20 points. Higher scores reflected greater adherence to prescribed pharmacological treatment.

Statistical analyses were performed using IBM SPSS Statistics Version 27 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participant characteristics.

Categorical variables were compared using the chi-square test or Fisher’s exact test where appropriate. Differences between groups were considered statistically significant at $p<0.05$.

Results

A total of 862 participants were included in the study, comprising 186 Bulgarian patients (21.6%) and 676 German patients (78.4%). The mean age of participants was 54.79 ± 10.92 years. Women represented 64.0% of the sample, while men accounted for 36.0%.

Health Literacy: Overall, 49.4% of participants demonstrated high health literacy, 36.5% moderate health literacy, and 12.2% low health literacy. No statistically significant differences were observed between Bulgarian and German participants regarding overall health literacy levels.

Mental Health Status: Normal psychological status was observed in 38.2% of participants, while 37.4% demonstrated mild psychological symptoms. Moderate and severe symptoms were present in 10.7% and 6.1% of participants, respectively. Bulgarian participants demonstrated significantly higher proportions of moderate and severe psychological symptoms compared with German participants ($p<0.05$).

Medication adherence, measured using the Modified Medication Adherence Report Scale (MARS), was significantly higher among German patients (Table 1).

Table 1

Main Comparative Findings between Bulgarian and German Participants

Variable	Bulgaria	Germany	p-value
High Health Literacy (%)	46.4	51.4	NS
Moderate/Severe Psychological Symptoms (%)	28.0	15.5	<0.05
Mean MARS Score	17.52 ± 2.06	17.92 ± 2.15	0.009

Association between Mental Health and Medication Adherence: A statistically significant association was observed between psychological status and medication adherence ($p=0.009$).

Patients with normal psychological status demonstrated significantly higher rates of high adherence compared with participants presenting psychological symptoms (Table 2).

Table 2

Association between Mental Health Status and Medication Adherence

Mental Health Status	High Adherence n (%)	Low/Moderate Adherence n (%)	p-value
Normal psychological status	155 (45.5)	49 (32.2)	0.006
Mild psychological symptoms	129 (37.8)	76 (50.0)	0.011
Moderate psychological symptoms	39 (11.4)	13 (8.6)	0.350
Severe psychological symptoms	18 (5.3)	14 (9.2)	0.105

Note: Overall association: $p=0.009$.

Association between Health Literacy and Medication Adherence: Health literacy was significantly associated with medication adherence ($p=0.034$). Participants with high health literacy demonstrated higher adherence rates compared with individuals presenting low health literacy (Table 3).

Table 3

Association between Health Literacy and Medication Adherence

Health Literacy Level	High Adherence n (%)	Low/Moderate Adherence n (%)	p-value
Low health literacy	38 (10.6)	28 (17.3)	0.034
Moderate health literacy	129 (35.8)	66 (40.7)	0.285
High health literacy	193 (53.6)	68 (42.0)	0.014

Note: Overall association: $p=0.034$.

No statistically significant association was observed between health literacy and overall lifestyle score.

Discussion

The present study highlights the important role of psychosocial determinants in cardiovascular risk management within primary care settings.

One of the most relevant findings was the significant association between psychological status and medication adherence. Patients with normal psychological status demonstrated significantly higher levels of adherence compared with individuals presenting symptoms of anxiety or depression. These findings are consistent with previous research indicating that psychological distress negatively affects self-management behaviours, treatment adherence, and long-term cardiovascular outcomes (Lichtman et al., 2014; Whooley, 2006). The results emphasize the need for routine mental health assessment as part of comprehensive cardiovascular prevention strategies.

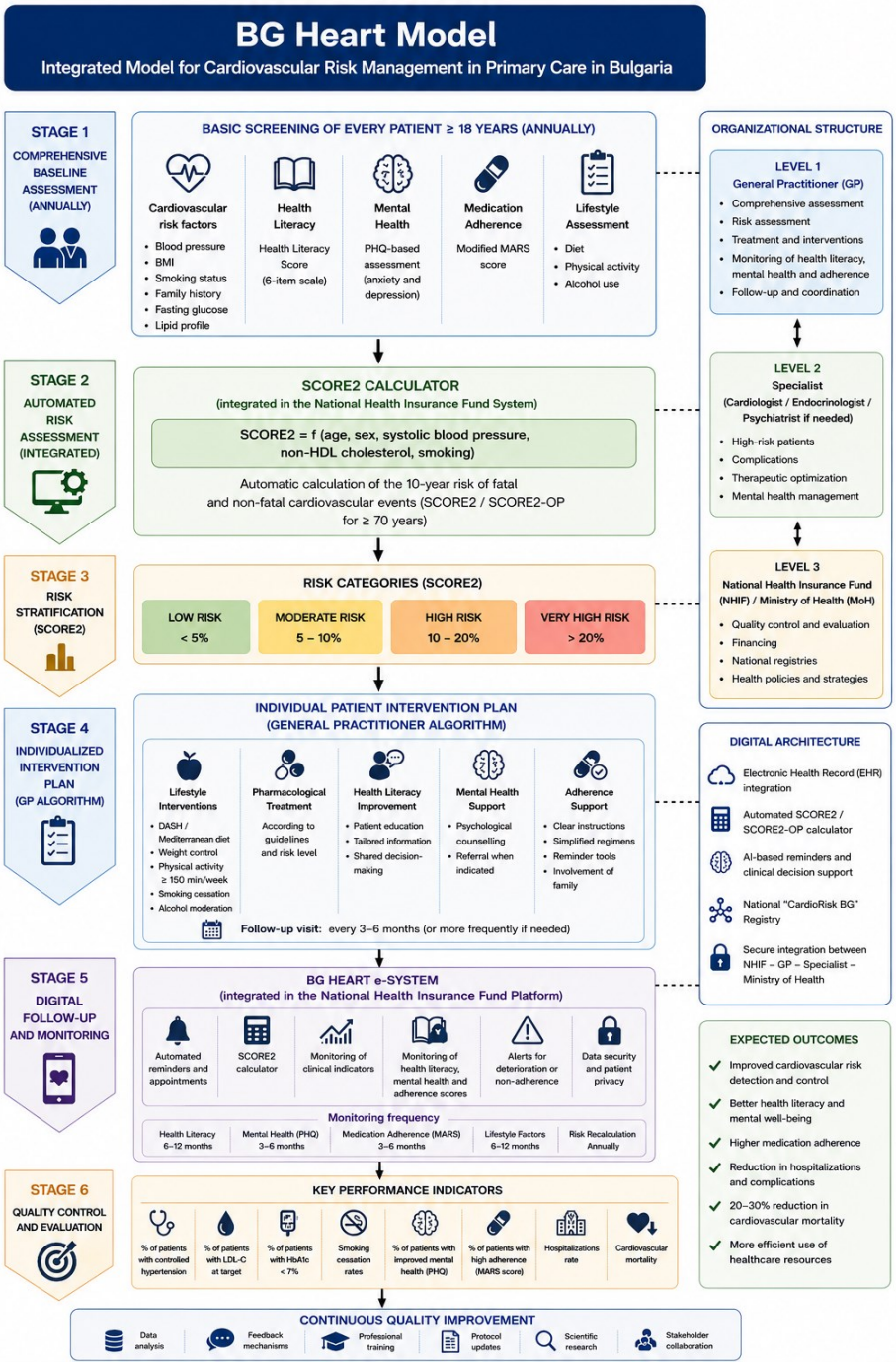
Importantly, our findings are also consistent with the recent 2025 European Society of Cardiology (ESC) Clinical Consensus Statement on Mental Health and Cardiovascular Disease (Bueno et al., 2025), which highlights the bidirectional relationship between mental health and cardiovascular disease. The ESC document recognizes depression, anxiety, chronic stress, and other psychological disorders as important modifiers of

cardiovascular risk and recommends routine mental health screening as part of cardiovascular prevention and management. The significant association observed in the present study between psychological status and medication adherence supports these recommendations and underscores the clinical relevance of integrating mental health assessment into primary care-based cardiovascular risk management.

The observed relationship between health literacy and medication adherence further supports the growing body of evidence suggesting that health literacy is a key determinant of successful disease management and cardiovascular prevention (Berkman et al., 2011; Magnani et al., 2018). Patients with higher levels of health literacy are generally better able to understand medical information, navigate healthcare systems, and actively participate in shared decision-making processes. Consequently, they are more likely to adhere to prescribed treatment regimens and engage in preventive health behaviours.

Figure 1

Bulgarian-HEART Model: An Integrated Framework for Cardiovascular Risk Management in Bulgarian Primary Care



Note. The model combines SCORE2-based cardiovascular risk assessment with health literacy evaluation, mental health screening, medication adherence monitoring, lifestyle assessment, individualized intervention planning, and digital follow-up to support comprehensive cardiovascular prevention and long-term patient management.

Interestingly, overall levels of health literacy were relatively similar among Bulgarian and German participants. Nevertheless, German patients demonstrated significantly higher medication adherence. This finding suggests that factors beyond individual health literacy may influence adherence behaviour. The differences observed between Bulgarian and German participants may also reflect broader structural characteristics of the respective healthcare systems. Germany has a long tradition of structured chronic disease management programmes (DMPs), comprehensive preventive services, and well-established digital health infrastructure. These mechanisms facilitate regular follow-up, patient education, and continuity of care, all of which have been associated with improved treatment adherence and chronic disease management.

In contrast, despite substantial progress in recent years, preventive care in Bulgaria remains challenged by regional inequalities in healthcare access, lower participation in preventive programmes, and limited implementation of structured disease management approaches. Previous European health system reports have identified cardiovascular prevention and risk factor control as areas requiring further development within the Bulgarian healthcare system (OECD/European Observatory on Health Systems and Policies, 2025b, 2025a).

These healthcare system differences may partly explain why medication adherence was higher among German participants despite comparable levels of health literacy. The findings suggest that successful cardiovascular prevention requires not only informed and motivated patients but also supportive healthcare structures that facilitate long-term engagement with preventive and therapeutic interventions.

The findings are particularly relevant for primary care physicians. Modern cardiovascular prevention should not focus exclusively on biological risk factors such as hypertension, diabetes, and dyslipidaemia. Instead, psychosocial determinants, mental health screening, and health literacy assessment should become integral parts of routine cardiovascular risk management. This approach is consistent with the World Health Organization's vision of primary health care as the foundation for integrated prevention and chronic disease management (World Health Organization and the United Nations Children's Fund (UNICEF), 2018).

The results also provide support for the development of integrated models such as the proposed Bulgarian-HEART Model, which combines systematic cardiovascular risk assessment, patient education, psychological screening, and digital support tools within primary care settings (Figure 1). Figure 1 illustrates the conceptual framework of the Bulgarian-HEART Model and its key components for integrated cardiovascular risk management in primary care.

Conclusions

Health literacy and mental health are important determinants of medication adherence among adult primary care patients.

German patients demonstrated significantly higher medication adherence, whereas Bulgarian participants reported higher levels of psychological distress.

The findings highlight the importance of integrating health literacy promotion, psychosocial assessment, and adherence monitoring into primary care cardiovascular prevention programmes.

The proposed Bulgarian-HEART Model may provide a practical framework for improving cardiovascular risk management and prevention in Bulgaria.

Study Limitations

Several limitations should be considered when interpreting the findings of the present study. First, although statistically significant associations between variables such as health literacy, mental health, medication adherence, and cardiovascular risk-related behaviours were identified, the cross-sectional design only allows the assessment of relationships at a single point in time and does not permit conclusions regarding causality or the direction of these associations. Second, all information was obtained through self-reported questionnaires, which may be affected by recall bias and social desirability bias. Third, the sample sizes of the Bulgarian and German groups were unequal, which may have influenced the statistical power of some subgroup analyses.

In addition, the Health Literacy Score and the modified MARS instrument used in this study were adapted for the specific objectives of the survey. Although both instruments were based on established theoretical frameworks and widely used concepts, further validation in larger and more diverse populations would be desirable.

Furthermore, participation rates were considerably higher in Germany, and participant recruitment proved substantially easier than in Bulgaria. This difference may reflect variations in healthcare structures, patient engagement, accessibility of primary care settings, or cultural attitudes toward participation in health-related research, and should be considered when interpreting the comparative findings.

Nevertheless, the large overall sample size and the comparative international design represent important strengths of the study and provide valuable insights into psychosocial determinants of cardiovascular prevention in primary care settings.

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Ethical Approval

The study was conducted in accordance with the principles of the Declaration of Helsinki. Participation was voluntary, and all respondents provided informed consent prior to inclusion in the study. Data were collected anonymously and analyzed in aggregated form to ensure confidentiality.

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References

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine, 155*(2), 97–107. https://doi.org/10.7326/0003-4819-155-2-201107190-00005

Brown, M. T., & Bussell, J. K. (2011). Medication adherence: WHO cares? *Mayo Clinic Proceedings, 86*(4), 304–314. https://doi.org/10.4065/mcp.2010.0575

Bueno, H., Deaton, C., Farrero, M., Forsyth, F., Braunschweig, F., Buccheri, S., Dragan, S., Gevaert, S., Held, C., Kurpas, D., Ladwig, K. H., Lionis, C. D., Maas, A. H. E. M., Merșa, C. O., Mindham, R., Pedersen, S. S., Rojnic Kuzman, M., Szmit, S., Taylor, R. S., … Makhkamova, N. (2025). 2025 ESC Clinical Consensus Statement on mental health and cardiovascular disease: Developed under the auspices of the ESC Clinical Practice Guidelines Committee. *European Heart Journal, 46*(41), 4156–4225. https://doi.org/10.1093/eurheartj/ehaf191

Chan, A. H. Y., Horne, R., Hankins, M., & Chisari, C. (2020). The Medication Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. *British Journal of Clinical Pharmacology, 86*(7), 1281–1288. https://doi.org/10.1111/bcp.14193

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology & Health, 14*(1), 1–24. https://doi.org/10.1080/08870449908407311

Kardas, P., Bennett, B., Borah, B., Burnier, M., Daly, C., Hiligsmann, M., Menditto, E., Peterson, A. M., Slejko, J. F., Tóth, K., Unni, E., & Ágh, T. (2024). Medication non-adherence: Reflecting on two decades since WHO adherence report and setting goals for the next twenty years. *Frontiers in Pharmacology, 15,* Article 1444012. https://doi.org/10.3389/fphar.2024.1444012

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Lowe, B. (2009). An ultra-brief screening scale for anxiety and depression: The PHQ-4. *Psychosomatics, 50*(6), 613–621. https://doi.org/10.1176/appi.psy.50.6.613

Levine, G. N., Cohen, B. E., Commodore-Mensah, Y., Fleury, J., Huffman, J. C., Khalid, U., Labarthe, D. R., Lavretsky, H., Michos, E. D., Spatz, E. S., Kubzansky, L. D., & On behalf of the American Heart Association Council on Clinical Cardiology; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; and Council on Lifestyle and Cardiometabolic Health. (2021). Psychological health, well-being, and the mind-heart-body connection: A scientific statement from the American heart association. *Circulation, 143*(10). https://doi.org/10.1161/CIR.0000000000000947

Lichtman, J. H., Froelicher, E. S., Blumenthal, J. A., Carney, R. M., Doering, L. V., Frasure-Smith, N., Freedland, K. E., Jaffe, A. S., Leifheit-Limson, E. C., Sheps, D. S., Vaccarino, V., & Wulsin, L. (2014). Depression as a risk factor for poor prognosis among patients with acute coronary syndrome: systematic review and recommendations: A scientific statement from the American heart association. *Circulation, 129*(12), 1350–1369. https://doi.org/10.1161/CIR.0000000000000019

Magnani, J. W., Mujahid, M. S., Aronow, H. D., Cené, C. W., Dickson, V. V., Havranek, E., Morgenstern, L. B., Paasche-Orlow, M. K., Pollak, A., Willey, J. Z., & On behalf of the American Heart Association Council on Epidemiology and Prevention; Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Peripheral Vascular Disease; Council on Quality of Care and Outcomes Research; and Stroke Council. (2018). Health Literacy and cardiovascular disease: Fundamental relevance to primary and secondary prevention: A scientific statement from the american heart association. *Circulation, 138*(2). https://doi.org/10.1161/CIR.0000000000000579

OECD/European Observatory on Health Systems and Policies. (2025a). *Country Health Profile 2025: Bulgaria. State of Health in the EU*. OECD Publishing, Paris/ European Observatory on Health Systems and Policies, Brussels. https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/12/country-health-profile-2025-country-notes_7e72146d/bulgaria_242bb908/cd5706eb-en.pdf

OECD/European Observatory on Health Systems and Policies. (2025b). *Country Health Profile 2025:*

Germany. State of Health in the EU. OECD Publishing, Paris/ European Observatory on Health Systems and Policies, Brussels. https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/12/country-health-profile-2025-country-notes_7e72146d/germany_51f2550b/a5911973-en.pdf

Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., Barengo, N. C., Beaton, A. Z., Benjamin, E. J., Benziger, C. P., Bonny, A., Brauer, M., Brodmann, M., Cahill, T. J., Carapetis, J., Catapano, A. L., Chugh, S. S., Cooper, L. T., Coresh, J., … Fuster, V. (2020). Global burden of cardiovascular diseases and risk factors, 1990–2019. *Journal of the American College of Cardiology, 76*(25), 2982–3021. https://doi.org/10.1016/j.jacc.2020.11.010

SCORE2 working group and ESC Cardiovascular risk collaboration, Hageman, S., Pennells, L., Ojeda, F., Kaptoge, S., Kuulasmaa, K., De Vries, T., Xu, Z., Kee, F., Chung, R., Wood, A., McEvoy, J. W., Veronesi, G., Bolton, T., Achenbach, S., Aleksandrova, K., Amiano, P., Sebastian, D.-S., Amouyel, P., … Di Angelantonio, E. (2021). SCORE2 risk prediction algorithms: New models to estimate 10-year risk of cardiovascular disease in Europe. *European Heart Journal, 42*(25), 2439–2454. https://doi.org/10.1093/eurheartj/ehab309

Sorensen, K., Van Den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H., & (HLS-EU) Consortium Health Literacy Project European. (2012). Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health, 12*(1), Article 80. https://doi.org/10.1186/1471-2458-12-80

Visseren, F. L. J., Mach, F., Smulders, Y. M., Carballo, D., Koskinas, K. C., Bäck, M., Benetos, A., Biffi, A., Boavida, J.-M., Capodanno, D., Cosyns, B., Crawford, C., Davos, C. H., Desormais, I., Di Angelantonio, E., Franco, O. H., Halvorsen, S., Hobbs, F. D. R., Hollander, M., … Williams, B. (2021). 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. *European Heart Journal, 42*(34), 3227–3337. https://doi.org/10.1093/eurheartj/ehab484

WHO. (2025, July 31). *Cardiovascular diseases* (CVDs). World Health Organization. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

Whooley, M. A. (2006). Depression and Cardiovascular Disease: Healing the Broken-Hearted. *JAMA, 295*(24), Article 2874. https://doi.org/10.1001/jama.295.24.2874

World Health Organization. (2020). *HEARTS technical package for cardiovascular disease management in primary health care: Risk based CVD MANAGEMENT (1st ed.).* https://www.who.int/publications/i/item/9789240001367

World Health Organization and the United Nations Children's Fund (UNICEF). (2018). A vision for primary health care in the 21st century: Towards universal health coverage and the sustainable development goals. https://iris.who.int/handle/10665/328065

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