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Review Paper

The Relationship Between Increased Urbanization and the Rise of Chronic Diseases

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Key Words

Chronic diseases, Hypertension, Diabetes, Urbanization, Public health, Environmental determinants, Animal models.

Abstract

Rapid urbanization has transformed social, economic, and environmental conditions worldwide, with significant effects on people's health. This paper explores how the growing urbanization correlates with the spreading of chronic diseases, in this case, hypertension and diabetes, among the city residents. With the growth of cities, lifestyle habits become more sedentary, including increased consumption of processed foods, greater exposure to air pollution, and greater psychosocial stress. The combination of these aspects leads to cardiovascular risk and metabolic dysfunction. Based on epidemiological evidence, urban health surveys, and spatial analyses, this study identifies how urban density, socioeconomic inequalities, and environmental determinants shape disease patterns in cities. These findings suggest that indeed the rates of prevalence of hypertension and diabetes are significantly elevated in the population of highly urbanized regions compared to the peri-urban or rural regions, and the population with low incomes is disguisedly impacted by the lack of access to healthcare, healthy food, and green areas. Furthermore, the study explores the role of animal models in understanding how urbanization-related factors, such as diet changes, environmental stressors, and exposure to pollutants, contribute to the development of these chronic diseases, offering insights into the underlying biological mechanisms. Also, the paper highlights the importance of built-environment factors in shaping health behaviours and outcomes. The work combines urban planning and public health as it is clear that multisectoral interventions can help to improve the healthier urban environment. The expansion of green spaces, improvements in air quality, active-transport networks, and reductions in health inequities are critical to strategies to counteract the growing epidemic of chronic diseases in fast-urbanizing areas. Finally, the concept of the nexus between urbanization and chronic disease risk is relevant for better understanding policy modalities that will support the creation of sustainable, health-promoting cities.

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Introduction

Urbanization has also become one of the most characteristic demographic trends of the 21st century, with over 50% of the world's population currently living in urban regions. Although urban areas are hubs of economic development, innovation, and improved service availability, unplanned and accelerated urban development has created novel and complex public health problems (Luo & Wang, 2022). The rising number of chronic non-communicable diseases (NCDs) and their most significant effects include hypertension and diabetes, among others, which have become a considerable challenge across much of the world (Christian et al., 2024; Hartigan, 2023). The urban environment shapes health outcomes through the influence of lifestyle behaviours, environmental exposures, socioeconomic status, and healthcare access (Lu et al., 2025). With increasing density and industrialization of cities, the population is vulnerable to risk factors increasing metabolic dysregulation, cardiovascular stress, and systemic inflammation, which are all primary contributors to the occurrence of chronic diseases (Jana & Chattopadhyay, 2022; Cacciatore et al., 2025).

Urban life is associated with a lack of physical activity, high-calorie foods, sedentary jobs, and increased psychosocial stress, which are attributed to congestion and financial strain. Additionally, the heaviness of the environment, in the form of air pollution, urban heat islands, and scarcity of green areas, only adds to the risks to health (Liang et al., 2021). These are grossly disproportionate in low-income and marginalized cities, and augment health disparities. Understanding the mechanisms underlying the interactions between urbanization and the rise in hypertension and diabetes is essential to developing effective mitigation measures as the global urban population continues to grow (Uthman et al., 2022; Sarker et al., 2024)).

Though an awareness of this problem has increased, a gap persists in the comprehensive analysis of the interplay between the effects of urban design and environmental quality with socio-behavioral factors in causing chronic disease outcomes (Xue et al., 2023). Existing studies tend to focus on single determinants rather than on combinations of city factors. This paper fills these gaps by exploring the complex relationship between urbanization and the incidence of chronic diseases in cities. Recent studies have explored how urban planning, environmental quality, and social behaviors interact to either mitigate or exacerbate the risks associated with chronic diseases. The conceptual framework presented in Figure 1 outlines the interconnected pathways, highlighting key urban determinants such as high population density, air pollution, sedentary lifestyles, and lack of green spaces, which contribute to cardiovascular stress and metabolic dysfunction, the primary contributors to hypertension and diabetes. Understanding these mechanisms is essential for designing healthier cities, emphasizing the importance of clean-air policies, accessible healthcare, active transport networks, and green infrastructure in improving public health outcomes (Ramírez et al., 2023; Anza-Ramirez et al., 2022).

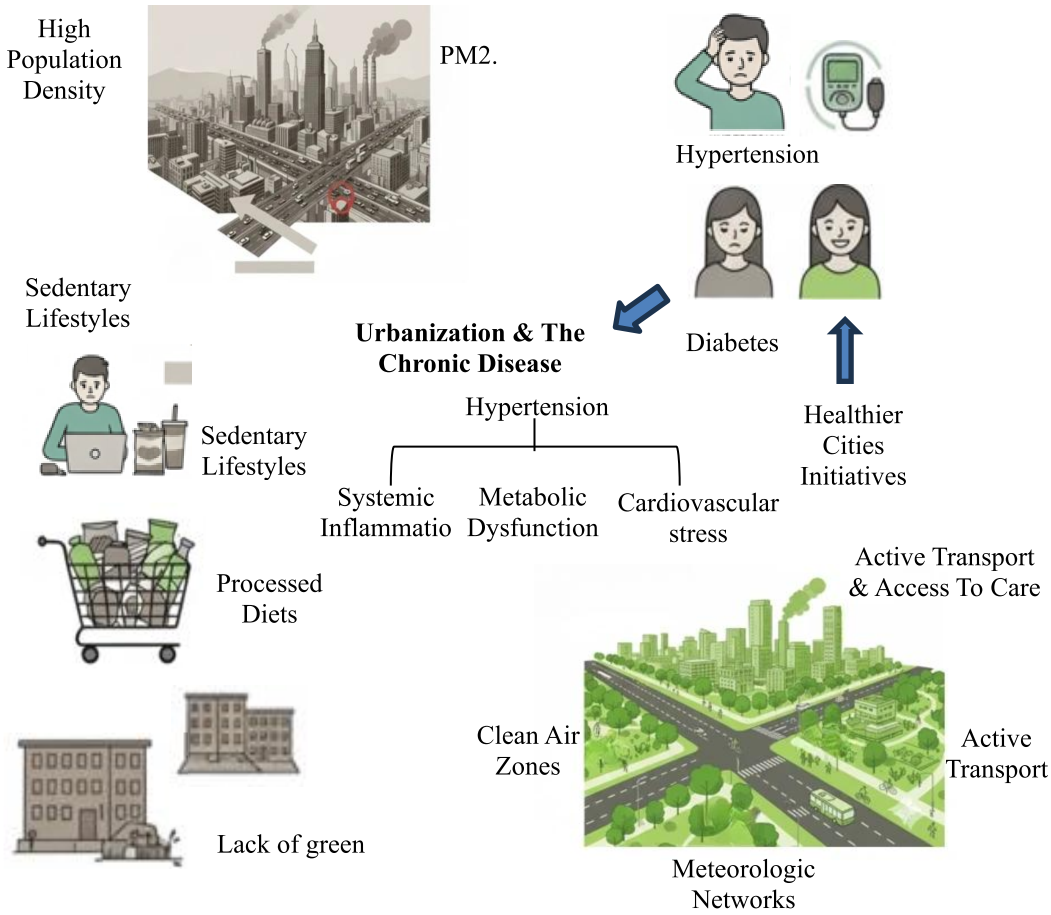

Figure 1: Conceptual Framework Linking Urbanization to the Chronic Disease Epidemic

Figure 1 explains the interconnected pathway in which urbanization adds to the increased rates of such chronic diseases as hypertension and diabetes. The presence of high population density, high PM2.5 pollution, inactive lifestyles, processed foods, and a lack of green areas are the major urban determinants of cardiovascular stress, metabolic dysfunction, and systemic inflammation (Zhao et al., 2025). The combination of these mechanisms enhances the tendencies of hypertension and diabetes among urban citizens. The framework also draws attention towards the prospect of healthier city interventions, which include clean-air policies, high-quality active transport networks, better access to care, and green infrastructure, which could mitigate these risks and enhance the population's health.

Key Contribution

- Integrates the environment, behavioural, and socioeconomic determinants to provide a multidimensional picture of chronic disease in urban settings.
- Reveals the trend of varying levels of urbanization, i.e., between core urban and peri-urban areas, in determining disease occurrence and providing spatial disparities in disease effects.
- Sheds light on the health inequities that are unfair towards the vulnerable groups and

unravels the structural problems behind the disparities.

- Offers policy-relevant data, which can be implemented to unite urban planning and public health to help create healthier and more equal cities.

Materials and Methods

Study Design and Framework

The research design adopted in this study was a mixed-methods design, incorporating quantitative and qualitative analyses of epidemiological and qualitative assessments of environmental and behavioral factors linked to urbanization. The aim was to test the hypothesis that different levels of urbanization are associated with global levels of hypertension and diabetes. A cross-sectional design was employed to estimate disease prevalence across various urban areas, including high-density urban cores, moderately urbanized districts, and peri-urban or fringe areas. These areas were chosen to enable a comparative study of how spatial variations in population density, environmental quality, and lifestyles determine the outcome of chronic diseases. The methodology integrated geospatial mapping, health survey, ecological quality, and sociodemographic data to come up with a combined knowledge about the determinants of disease in the urban context.

Selection of Study Area and Population

The research was done on three fast-developing metropolitan areas with high levels of urban growth in the recent past. In every city, the administrative wards or census tracts were stratified into categories with reference to the level of urbanization as per population density, land use patterns, availability of infrastructure, and features of the built environment. A representative sample of households was drawn to represent all of the categories as a stratified random sample so that the various social economic groups could be represented proportionally. The survey was carried out in adults aged 18 years and above, and the total number of participants was about 4,500, who were included in the study. People with a chronic history were involved to determine changes in prevalence, whereas acute and temporary residents were not to avoid consistency.

Data Sources and Data Collection Procedures

Primary and secondary data had been used. Household surveys were used as a form of primary data collection through the use of trained field researchers. The survey tool was used to measure demographics, health behavior (physical and diet, tobacco and alcohol use), occupation profile, and access to healthcare indicators. Moreover, there was a collection of standardized clinical measurements, such as systolic and diastolic blood pressure, the level of fasting blood glucose, body mass index (BMI), and the ratio of the waist to hips (Anza-Ramirez et al., 2022). The measure of blood pressure was taken with the help of automated digital sphygmomanometers that were calibrated on a weekly basis to guarantee the accuracy of the measurement, and the level of fasting glucose was determined with the help of portable glucometers according to the accepted clinical practices.

The sources of secondary data were government health records, national disease surveillance databases, city planning documents, geospatial land-use maps, and environmental monitoring station reports (Chatterjee & Singh, 2023). These sources served as additional data on the pattern of the disease incidence, air pollution levels (PM2.5, NO2 concentration), the availability of green space, and the existence of the transportation infrastructure (Ali et al., 2022). All datasets have been standardized by means of identical geographical identifiers so that they can be incorporated into the GIS framework of the study.

Indicators of Urbanization Measurement

The concept of urbanization was operationalized with the help of a composite urbanization index, which included the following elements: population density, the percentage of built-up areas, the accessibility of transportation systems, the density of commercial activity, and the indicators of environmental quality. The principal component analysis was used to standardize and weight each variable in order to have one continuous index that described the level of urbanization in each study zone.

The indicators of the environment include the average levels of air pollution/year, noise measured in decibels, and the green space areas based on satellite photos. GIS tools were used to extract built-environment parameters, including walkability, street connectivity, and land-use mix, which were validated by field observations. In analysing such urbanization metrics, behavioral determinants such as physical inactivity and unhealthy dietary patterns were investigated to determine mediating pathways (Mharchi & Maamri, 2024). The study highlights how rapid dietary transitions in developing economies contribute to metabolic health issues, reinforcing the link between urbanization-related lifestyle changes and rising chronic disease risks (Sadulla, 2025).

Health Outcome Definitions

Hypertension and diabetes were diagnosed according to the international clinical guidelines (Shrestha et al., 2025). Hypertension was considered due to systolic blood pressure 140mmHg and above, diastolic blood pressure 90mmHg and above, or the presence of antihypertensive medication (Mafakheri, 2025; Ma et al., 2025). Diabetes was considered to be fasting plasma glucose of 126mg/dl and or use of antidiabetic medication. When the medical records were available, participants who reported physician-diagnosed conditions were confirmed by examining medical records.

Statistical Analysis

There was an analysis of data by utilizing SPSS and R statistical packages. The descriptive statistics were used to describe the demographic background, presence of the disease, and the state of the environment in urban areas. Multivariate logistic regression models controlling the effect of age, sex, income, education, BMI, and lifestyle factors were used to analyze the relationship between the indices of urbanization and the prevalence of chronic diseases. The outcome measures were interaction terms that were used to determine whether socioeconomic status altered the relationship between urbanization and the outcome of the disease.

The spatial analysis was done in ArcGIS to map the patterns of disease distribution in the study areas. Hotspot analysis (Getis-Ord Gi*) was used to determine clusters of high prevalence of hypertension and diabetes, and spatial regression was used to assess the effect of environmental and infrastructural factors on disease concentration. To test the study's sensitivity, urbanization scores were recalculated with alternative weighting methods and by excluding participants with pre-existing chronic conditions to assess the robustness of the study. The study shows that mathematical modeling reinforces the decisions about the health of the population and justifies the necessity of the data-driven nature of the analysis when discussing the trends of chronic diseases in the context of rapidly urbanizing settings (Usikalua & Unciano, 2025).

Ethical Considerations

Institutional review boards of all the institutions involved in the study gave their ethical approval. All participants signed written informed consent before the data collection. All data were anonymized, and clinical measurements were disclosed to the participants; referrals were provided in case of abnormal readings.

Results

The analysis has shown that there was a strong correlation between an urbanized situation that is becoming more common in the study areas and the rates of hypertension and diabetes. The burden of chronic diseases was much higher in highly urbanized regions than in moderately urbanized and peri-urban regions. Descriptive statistics indicated that adults living in high-density urban areas had higher mean blood pressure, fasting glucose, and body mass index (BMI). Such trends were accompanied by reduced physical activity and increased exposure to environmental risks, including air pollution and noise. Table 1 has an overview of the prevalence rates in the three categories of urbanization.

Table 1: Prevalence of Hypertension and Diabetes Across Urbanization Levels

Urbanization Level	Hypertension Prevalence (%)	Diabetes Prevalence (%)	Mean PM2.5 (µg/m³)	Avg. Physical Activity (min/day)
High Urbanization	38.5	26.2	72	18
Moderate Urbanization	29.4	18.7	53	32
Peri-Urban Areas	21.1	11.5	31	49

The comparative description of prevalence rates of hypertension and diabetes presented in Table 1 reveals that the prevalence rate of the disease rises with the level of urbanization. The statistics show that the prevalence of hypertension (38.5) and diabetes (26.2) is very high in the highly urbanized areas compared to moderately urbanized areas (29.4 and 18.7) and peri-urban areas (21.1 and 11.5). It can be stated about the environmental and behavioral factors: the majority of the urbanized regions are characterized by the highest average of PM2.5

level (72 µg/m 3) and the lowest level of physical activity (18 minutes a day). Nevertheless, peri-urban areas boast much cleaner air (31 µg/m 3) and more time spent in a day (49 minutes) compared to urban areas, which influences a lower disease prevalence. Overall, Table 1 has revealed that there is a close relationship between the growing urbanization, unfavourable environmental factors, declining physical activity, and the escalating burden of chronic illnesses.

The regression models showed that the urbanization index was a strong predictor of both chronic conditions despite adjustment of demographic and lifestyle factors. The individuals under the most urbanized group were 1.8 and 2.1 times more likely to have hypertension and diabetes respectively compared to the peri-urban areas. The spatial analyses also reported that the concentration of hotspots of chronic diseases were located in the areas with great population concentration, inaccessibility of green spaces, and high car traffic. Table 2 shows the important predictors in the multivariate logistic regression model.

Table 2: Key Predictors of Hypertension and Diabetes (Multivariate Logistic Regression)

Predictor Variable	Hypertension	Diabetes	p-value
Urbanization Index	1.82	2.14	<0.001
BMI	1.37	1.52	<0.001
Daily Physical Activity	0.88	0.91	<0.01
PM2.5 Exposure	1.22	1.31	<0.01
Household Income (Low)	1.41	1.46	<0.05

The findings of the multivariate logistic regression analysis are summarized in Table 2, and the key predictors of hypertension and diabetes were identified by adjusting for demographic and lifestyle variables. The results show that higher urbanization is a significant predictor of both conditions, with odds ratios of 1.82 for hypertension and 2.14 for diabetes ($p < 0.001$), reinforcing the strong impact of urban environments. Body mass index (BMI) also emerges as a key predictor, with each unit increase in BMI increasing the risk of hypertension and diabetes by 37% and 52%, respectively.

The protective effect of daily physical activity is established, and the higher the level of activity, the lower the chance of both diseases (0.88 and 0.91), demonstrating the positive impact of active lifestyles. Exposure to elevated PM 2.5 concentrations contributes to disease risk and the physiological outcomes of air pollution on cardiovascular and metabolic health. Another factor of importance is the low household income, which is a significant risk factor not only increasing the chances of developing hypertension but also diabetes as well, which brings out the issue of socioeconomic inequality as a determinant of urban health outcomes.

In general, Table 2 indicates that the exposure to chronic diseases in urban settings is determined by the complex of environmental exposures, lifestyle choices, and socioeconomic factors, and urbanization is presented as the strongest and independent predictor.

Discussion

The results of this paper highlight the intertwined and multifaceted patterns under which urbanization determines the prevalence of hypertension and diabetes in the rapidly growing metropolitan areas. The evident gradient at the levels of urbanization implies that there is no random mixing of the chronic disease risk but is instead defined by the spatial attributes of the urban landscape, such as population density, features of the built-in infrastructure, exposure to the environment, and social determinants of health. The high prevalence rates in the highly urbanized areas can be explained by the combination of the behavioral, environmental, and socioeconomic stress factors, which together lead to the heightened vulnerability to metabolic disorders.

One of the primary trends that have been observed in this study is the close relationship between a reduction in physical activity and the consequences of the chronic disease. The many urbanized settings, albeit much more accessible to other services, are likely to restrict the chances of living an active life. Sedentary lifestyle is the reason why vehicular transport is pre-dominant, there is absence of walking space, and commuting time is long. Moreover, the living conditions are overcrowded and the opportunities to engage in recreational space are not available, so the probability of regular physical activity is also reduced. The inversely proportional relationship between the degree of daily activity and the presence of the disease is clear and it validates the global data, that the urban population is more inclined towards the pursuit of sedentary activities that cause cardio-metabolic diseases.

Environmental quality also came out as another significant risk factor of a chronic disease. Exposure to PM2.5 and other pollutants in urban cores was also much higher and regression models showed that air pollution was on its own a predictor of odds of hypertension and diabetes. Systemic inflammation, oxidative stress, and endothelial dysfunction caused by chronic exposure to particulate matter also have a direct effect on the regulation of blood pressure and glucose metabolism. These exposures can be experiencing interactions with noise pollution and urban heat islands, and augment physiological strains. Such findings have been consistent with the available literature where environmental degradation is a highly significant but commonly neglected determinant of chronic disease in cities.

These health predicaments are exacerbated by socioeconomic disparity in the urban setting. Even low-income populations, who dwell within the same general geographic location, had disproportionately high prevalence of hypertension and diabetes. This difference may be explained by the unavailability of healthcare services, poor diets due to economic factors, lack of opportunities to engage in physical activities, and increased rates of psychosocial stress. Low-income districts were particularly prone to food deserts in urban locations where one could no longer afford the luxuries of a healthy diet, which solidified the bad eating habits of consuming processed and energy-rich food items. Such findings point to the necessity of conceptualizing chronic disease as a medical problem and, at the same time, as a product of structural inequities entrenched in urban socioeconomic systems.

Further information was provided by the spatial analyses, which revealed that clusters of disease hotspots were in areas that had low environment, low-density vegetation, and excessive infrastructure. These groups indicate that the impacts of urbanization are quite localised in nature and that the local vulnerability of the neighbourhoods can be overshadowed by the average population. Such hotspots can be detected and applied to determine certain interventions such as localized pollution mitigation, community health projects, as well as improving the walkability of neighbourhoods.

It is worth noting that the evidence of this study points out to the fact that, urbanization may not always lead to adverse impacts on health; rather it is the nature, rate and equity of urbanization that impact health. Well-planned cities with green infrastructure, easy access to standards of transportation, mixed-use buildings, and equal distribution of resources can help support healthier populations. Conversely, the uncontrollable, swift and imbalanced urbanizations make more people prone to the chronic disease risk factors.

Such results defend an emerging literature that recommends the adoption of city planning and health models. Policies to improve air quality, increase green spaces, expand active-transport infrastructure, and reduce socioeconomic imbalances are necessary. Moreover, health-promoting interventions at a community level, which increase healthier lifestyles, increase access to preventive healthcare, and mitigate risks posed by the environment, have the potential to decrease the burden of chronic disease in urban areas significantly.

Generally, the paper explains that the current level of hypertension and diabetes prevalence in cities is alarming, which requires urgent multisectoral, equity-based approaches to alleviate the problem. Due to the ongoing increase in urbanization rates worldwide, resilient and health-supporting cities should be on the agenda of policymakers, planners, and health practitioners.

Future Work and Directions

The potential of future research is to enhance the insight into the role played by changing urban landscape in long-term chronic disease trends through a longitudinal study design that can follow individuals and communities over long durations. The studies would assist in clarifying the causal pathways, and they would reveal the interaction of sustained exposure to urban environmental risks (pollution, heat, and less green space) with behavioral and socioeconomic determinants to impact disease progression. Also, the area of future work should be extended to other comorbidities, such as cardiovascular disease, obesity, and mental health disorders, to explore the intimate relationship between these conditions and the city. The other important direction is the incorporation of cutting-edge geospatial technologies, and remote sensing information and machine-learning algorithms in enhancing accuracy in disease hotspots mapping and risk forecast across different urban development conditions. The most vulnerable groups, including low-income families, migrant communities, and the aging population, should also be studied in order to learn more about how structural inequity contributes to the worsening of health disparities in fast-developing metropolitan areas. Besides, urban planners, environmental scientists, public health experts, and policymakers need to have interdisciplinary partnerships to develop interventions that can help in providing simultaneous solutions to environmental quality, infrastructure design, and social determinants of health. Experimental projects on the effects of green-infrastructure development, active-transport systems, pollution control measures, and community-based health policies would be useful evidence to scalability of solutions. As cities will keep expanding, further studies need to be aimed at not only creating a catalogue of issues but also constructing practical models that will assist in establishing a healthier, fairer, and sustainable urban environment.

Conclusion

This paper gives a great indication that urbanization is directly proportional to the growing rates of chronic diseases like hypertension and diabetes in urban centers that are experiencing high rates of development. The results prove that very urbanized settings with high population density, lower physical activity, higher pollution, and strong socioeconomic disparities increase the risk of metabolic and cardiovascular diseases significantly. The study provides a combination of epidemiological, environmental markers and spatial analysis to highlight that chronical disease patterns are not distributed evenly but are rather concentrated in those neighborhoods that have poorer environmental conditions, less green areas, and fewer access to health-enhancing resources. These findings indicate that the issues related to urbanization are not limited to the personal lifestyle choices, which is a structural and systemic aspect embedded in the fabric of the city. The paper also highlights the need to tackle the underlying determinants of health using multisectoral and equity-oriented approaches. Ameliorating air quality, increasing green cover, promoting walkability, and alleviating socioeconomic differences are the key measures to the decreased charge of chronic diseases. The information highlights that urbanization, but not its nature and fairness, is the determinant of the health outcome. The significance of the inclusion of the principles of professional health in the planning and policy of cities is becoming more and more important due to the growth of large cities. Furthermore, the study emphasizes the role of animal models in understanding the mechanisms by which urbanization-related factors, such as diet changes, environmental pollutants, and increased stress, contribute to chronic diseases like hypertension and diabetes. These models help unravel the biological pathways underlying the impact of urban living on health, providing deeper insights into how urbanization itself influences disease development and progression. Finally, the results of the current study support the necessity of the concerted efforts of policy makers, city planners, practitioners of the public health, and local stakeholders. The development of healthier cities should be based on sustainable and inclusive approaches to urban political environment development, with special focus on the quality of the environment, social justice, and affordable healthcare. Through these strategies, cities would become places that facilitate, and do not compromise long-term health and well-being- so that urban expansion would be accompanied by better population health.

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