UNIVERSITY OF BERN

FINAL REPORT

NCCS - IMPACTS - HEALTH (PROJECT 4)

Impacts of climate change on health, well-being and performance of humans and animals and on food safety in Switzerland

Module	**1. The resilience of the healthcare system - focus on heat**
Task	**1.2 Heat-vulnerability mapping in the cities of Bern, Basel, and Zurich**
Version	**1**
Name	**Heat-vulnerability mapping in the cities of Bern, Basel, and Zurich**
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NCCS-Impacts

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Abstract

Urbanisation and the growing urban population have intensified the urban heat island (UHI) effect, posing health risks. Although its impacts are not evenly distributed, understanding of the spatial distribution of vulnerable populations to the UHI effect remains limited. To bridge this knowledge gap, we aim to 1) evaluate demographics and socioeconomic factors contributing to increased UHI exposure and 2) analyse the spatial distribution of vulnerability by developing the Heat Vulnerability Index (HVI) in three Swiss cities (Basel, Bern, and Zurich).

We collected individual-level population and household statistics (STATPOP) and company-level business statistics (STATENT) from the Swiss Federal Statistical Office. We used high-resolution simulated summer night-time temperature data in 2020 to calculate UHI intensity as the temperature difference between the inner city and the rural surroundings. We assessed how many critical infrastructures (healthcare facilities, schools and playgrounds) are in High UHI areas, defined as districts exceeding the city-wide average UHI intensity. We evaluated the UHI exposure on residents and workers by comparing the average number of populations between Extreme UHI areas and Non-Extreme UHI areas, with Extreme UHI areas defined as districts experiencing UHI intensity higher than the 90^{th} percentile of the city-wide level. Subsequently, we developed a Heat Vulnerability Index (HVI) by selecting key indicators having higher mortality risks from the UHI effect proved by previous studies: older adults (aged ≥ 65 years), females, and individuals with the lowest socio-economic status. We then created a bivariate map overlapping two layers of UHI and HVI and developed a web-based interactive tool to visualise the health risks of the UHI effect.

Our results showed distinct UHI exposure and vulnerability patterns across different Swiss cities. Although our bivariate maps showed partly similar patterns between cities, such as concentrated vulnerability in densely populated urban cores, there were also city-specific variations. For example, Bern exhibited high UHI and high HVI in its central area, while Zurich experienced high UHI intensity in the city centre but had a relatively lower number of vulnerable populations. Analysis of the workers' exposure revealed that three cities consistently showed a higher average number of workers in the service sector within Extreme UHI areas than Non-Extreme UHI areas, likely due to the concentration of the service sector workers in urban centres where UHI intensity is typically high. These differences highlight the need for heat health risk assessments that consider the local context.

Our study examined the interaction between UHI exposure, demographics, and socio-economic status in determining heat risks to health in Swiss cities. It offered a comprehensive assessment framework for heat vulnerability explicitly tailored for key stakeholders such as urban planners and public health officers.

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R shiny app: https://urban-heat-vulnerability.ispm.unibe.ch/

Code on GitHub: https://github.com/sjlee-unibe/urban_heat_vulnerability

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1. Context of the study

Urbanisation and the corresponding increase in urban population have exacerbated the Urban Heat Island (UHI) effect. Despite the increasing health risks associated with the UHI effect, our understanding of the extent of exposure and the spatial distribution of vulnerabilities to the UHI effect remains limited. To address this gap, this research aims to assess UHI exposure and vulnerabilities at the neighbourhood level across three Swiss cities (Bern, Basel, and Zurich) utilising high-resolution simulated temperature data. We develop the Heat Vulnerability Index (HVI) based on existing evidence on UHI-related mortality risks in Switzerland. By doing so, we can identify hotspots where the UHI effect has potentially heightened health risks by considering the population characteristics and the spatial patterns of UHI exposure. This study builds upon the foundational work conducted by Professor Edouard Davin and his team at the Wyss Academy, aiming to refine methodologies focusing on the health implications of the UHI effect in three Swiss cities.

2. Study setting

The analysis was conducted exclusively within the urban areas of the three Swiss cities: Bern, Basel, and Zurich. By including only the urban areas, we ensured a focused examination of UHI exposure and vulnerability within densely populated regions where the UHI effect is most pronounced.

The study period was limited to the summer of 2020, primarily because simulated night-time temperature data for the three cities were available. This timeframe provided a snapshot of UHI dynamics within the selected cities, facilitating a comprehensive understanding of the spatial distribution of UHI exposure and vulnerability during a specific period. Additionally, using similar temperature data between cities facilitated comparability across the three cities in analysing UHI impacts.

3. Data

3.1. Demographic and socio-economic data

The Swiss Federal Statistical Office provided individual-level population and household statistics, known as 'STATPOP,' from 2012 to 2021. This dataset includes demographic information such as sex, age, marital status, and the geographical location of households at the building level. For this study, we used the STATPOP data in 2020 to ensure temporal consistency with the temperature data employed.

Furthermore, the Swiss-SEP index, an area-based indicator reflecting the socioeconomic position in Switzerland, was integrated into this study (Panczak et al., 2023). This index provides a comprehensive measure of socio-economic status, including income, education level, and professional status. In this study, we rescaled the Swiss-SEP index for each city to assess each individual's relative socio-economic position within their respective city. Consequently, individuals were categorised into city-specific terciles of the Swiss-SEP index, with a value of 3 representing the highest socio-economic status (least deprived) and 1 indicating the lowest socio-economic status (most deprived) within the context of each city. Following the rescaling process, we linked the STATPOP data with the city-specific Swiss-SEP index based on the geographical location of individuals' households. This linkage explored the relationship between demographic characteristics, socio-economic status, and vulnerability to the UHI effect.

For the information on workers, we collected statistics on the Swiss economy, the so-called 'STATENT', from the Swiss Federal Statistical Office for the year 2020. This data provides

information on the number of companies, the number of employees, and the number of employed men and women. Additionally, it includes details on the economic sector based on the General Classification of Economic Activities (NOGA 2008), the type, and the location of each company at the building level. Using STATENT data, we calculated the total number of workers and the number of workers in each economic sector (agricultural, industry, and service sectors) for each district in every city in 2020.

3.2. Infrastructure data

We utilised publicly available geo-data to evaluate exposure to infrastructure, including hospitals, nursing homes, day-care and night-care centres for the elderly and individuals with disabilities, kindergartens, elementary schools, and playgrounds. Supporting Information S4 presents the original titles and sources of each dataset, along with the most recent update date at the time of download. The types of hospitals (e.g., acute hospitals, psychiatric clinics, rehabilitation clinics, etc.) vary by city. All included healthcare facilities (i.e., hospitals, nursing homes, and care centres) are detailed in the supporting information (S5-S6).

3.3. Temperature data

Initially, we planned to utilise high-resolution modelled urban temperature data from the Climatology group, led by Prof. Stefan Brönniman, at the University of Bern. However, due to the unavailability of this dataset in other cities, we opted to substitute it with simulated night-time (4 a.m.) air temperatures at 2 meters above ground during the summer of 2020 obtained from the FITNAH 3D model (Gross, 1989; Gross, 1993; Gross, 2002). This climate data was developed based on model calculations and basic data related to the study area. The FITNAH model was employed for the modelling process, incorporating data on terrain height, usage structure, and vegetation height.

The spatial resolution of the temperature data varied depending on the city: Bern (5m x 5m, Fig 1), Basel (10m x 10m), and Zurich (25m x 25m). The simulated night-time temperature data utilised in this study was intended to represent summer high-pressure weather conditions with limited exchange. Such conditions are frequently linked to above-average heat loads in residential areas. By simulating these specific weather conditions, our objective was to capture the thermal dynamics of urban environments during summer periods.

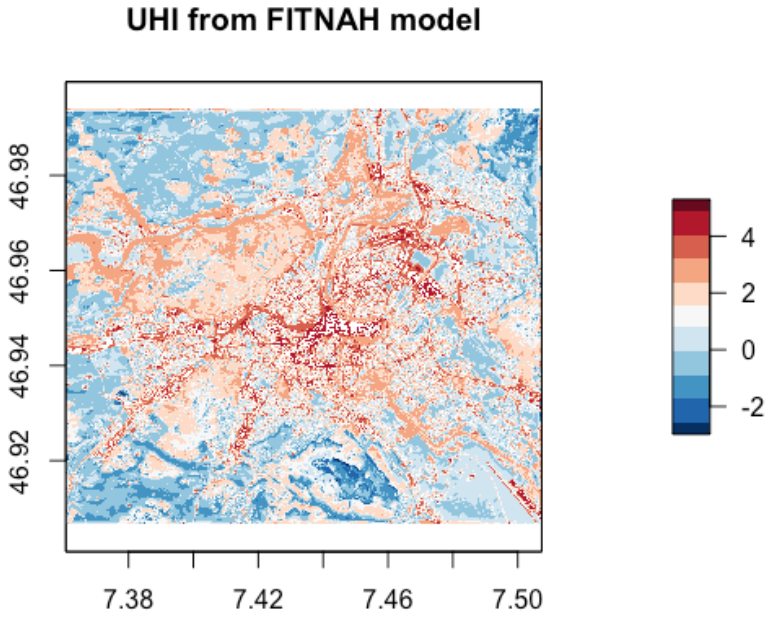

Figure 1. Map of UHI intensity of the city of Bern calculated by the night-time temperature with the FITNAH model.

4. Method

4.1. Hazard assessment

We initially calculated the UHI intensity using the raster of night-time temperature data for 2020. According to Gubler et al. (2021) and Burger et al. (2021), we established a rural reference point for each city (Table 1). Subsequently, we derived the raster of UHI intensity as the difference in air temperature between any grid cell (T_{urban}) in the urban area of the respective cities and the grid cell ($T_{rural\ sation}$) of the rural reference station by Equation 1. Lastly, we computed the district-mean UHI intensity in the year 2020. This approach enabled us to accurately represent the spatial distribution of UHI effects within the city.

$$UHII = T_{urban} - T_{rural\ sation} \quad \text{(Equation 1)}$$

Subsequently, we calculated each city's city-wide average and 90th percentile of UHI intensity. Next, we identified "High UHI areas," which are districts experiencing higher UHI intensity than the city-wide average, and "Extreme UHI areas," where districts exhibit higher UHI intensity than the 90th percentile of the city-wide level.

Table 1. Information on the rural reference station utilised for each city in calculating UHI intensity.

City	Station	Coordinates in CH1903 (in WGS84)
Bern	Zollikofen	2601934 / 1204410 (46.990744 / 7.464061)
Basel	Binningen	2610909 / 1265612 (47.541142 / 7.583525)
Zurich	Affoltern	2681433 / 1253548 (47.427694 / 8.517953)

4.2. Exposure assessment

For the exposure assessment, we calculated the number of population and workers in each district using STATPOP and STATENT data in the year 2020 to ensure comparability with the temperature data. We analysed from three perspectives: 1) infrastructure, 2) residents, and 3) workers.

4.2.1. Exposure of infrastructure

We focused on evaluating the exposure of healthcare facilities (including hospitals and nursing homes for older adults), schools (elementary schools and kindergartens), and playgrounds to the UHI effects. Initially, we computed the UHI intensity for each infrastructure. However, as the simulated temperature data did not include building temperatures, we selected temperature grid cells within a 50-meter buffer area from the centroid of each infrastructure building and calculated the average value of the selected grid cells. We quantified the number of infrastructures within High UHI areas to ascertain the extent of exposure of healthcare facilities, schools, and playgrounds to the UHI effect. Additionally, we conducted a one-sample t-test to compare the UHI intensity of each infrastructure against the city-wide average UHI intensity for each city.

4.2.2. Exposure of residents and workers

To assess the residents' exposure, we first quantified key demographic indicators by district, known from previous research to be associated with higher UHI-related mortality risks. These indicators included the total population, the older adult population (aged ≥ 65 years), females, and individuals with a low socio-economic status. We then compared the average population number within each demographic group across the Extreme UHI areas and the other districts (i.e., Non-extreme UHI areas). The calculation of the average number of populations involved summing the population of all districts within each UHI category (Extreme and Non-Extreme UHI areas) and then dividing this sum by the total number of districts in the respective UHI category using the following equation:

$$\bar{P} = \frac{\sum_{i=1}^{n} P_i}{n}$$

where $\bar{P}$ is the average population number and P_i is the population of the i-th district within Extreme or Non-Extreme UHI areas. n is the total number of districts within extreme or Non-Extreme UHI areas.

Additionally, we used the same method as in the residents' exposure assessment to evaluate the workers' exposure to the UHI effect. Here, we quantified the total number of workers and the number of workers by sectors of the economy in each district. The sectors of the economy were divided into primary (agricultural sector), secondary (industry sector), and tertiary (service sector) industry. We then compared the average number of workers in each group between the Extreme UHI and Non-Extreme UHI areas.

4.3. Heat Vulnerability Assessment

4.3.1. Heat Vulnerability Determinants

To develop HVI for Swiss cities, we identified highly vulnerable subgroups of the population using available evidence on mortality risk associated with the UHI effect in Swiss cities.

Wehrli (2024) evaluated the influence of daytime, night-time temperature and UHI effect on all-cause mortality in the city of Bern. The study found heightened all-cause mortality risk associated with high UHI in the older adult population (aged ≥ 65 years), males, and individuals with a low socio-economic status. However, for night-time temperature, the results showed an increased risk of mortality in the older adult population, females, and those with a high socio-economic status.

Wicki et al. (2024) investigated the relationship between daily maximum temperature and heat-related mortality across eight Swiss cities, uncovering an elevated mortality risk among the older adult population (aged ≥ 75 years), females, and individuals with high socio-economic status. Upon stratification by UHI status, areas experiencing UHI exhibited a higher risk of mortality compared to non-UHI areas. Notably, within UHI areas, the older adult population (aged ≥ 75 years) and females demonstrated an increased risk compared to their counterparts. However, the study did not specifically analyse the association with UHI as exposure or examine variation among different Swiss cities.

Although Wehrli (2024) found that individuals with higher socio-economic status had higher mortality risks from the UHI effect, this study was limited to Bern, which may not be generalised to other cities in Switzerland. Additionally, several studies have highlighted the vulnerability of populations with low socio-economic status to heat in urban areas across different countries (Niu et al., 2021; Nayak et al., 2018). Consequently, we identified three key

determinants for establishing HVI: 1) the older adult population (≥ 65 years), 2) females, and 3) individuals with the lowest socio-economic status (lowest tercile of SEP-Index).

4.3.2. The construction of the HVI

To construct HVI, we adapted the methodologies from the Centers for Disease Control and Prevention (CDC) approach used for constructing the Social Vulnerability Index (Flanagan et al., 2011). The variables considered for the HVI include the old adult population (aged ≥ 65), females, and individuals with the lowest socio-economic status (the lowest tercile of SEP-Index). We calculated the percentile rank for each variable across all districts in each city with a non-zero population using Equation 2:

$$Percentile\ Rank = \frac{(Rank-1)}{(N-1)} \quad \text{(Equation 2)}$$

Here, N represents the total number of districts for each city. In the case of ties, the lowest rank is assigned. Rankings range from 0 to 1, where 0 indicates the district with the least vulnerability for a particular variable, while 1 indicates the district with the highest vulnerability. Subsequently, we computed the overall percentile rank by summing up the percentile rankings for each variable. This process was iterated for the individual cities.

4.4. Mapping the results

4.4.1. Bivariate map

Bivariate mapping involves categorising spatial objects based on the values of two variables in our study, UHI and HVI. The colour legend of the bivariate map is based on the values of the two variables in question, which are divided into discrete classes. In this study, we utilised a classification system employing 1/3-quantile breaks for UHI intensity and HVI in each city, resulting in nine distinct combinations, as depicted in Fig 2. The colour scheme and legend were inspired by Biesecker et al. (2020) to ensure visual distinguishability on the bivariate map.

High UHI / Low HVI	High UHI / Medium HVI	High UHI / High HVI
Medium UHI / Low HVI	Medium UHI / Medium HVI	Medium UHI / High HVI
Low UHI / Low HVI	Low UHI / Medium HVI	Low UHI / High HVI

Figure 2. 3×3 classification and colour legend of bivariate mapping based on UHI and HVI values.

4.4.2. Interactive map development

After we developed a bivariate map and individual maps for the results of exposure assessment, HVI, and UHI, we created the interactive map using the **leaflet** and **mapview** packages in Rstudio. This platform was selected because it supports end-users in understanding the spatial distribution of vulnerabilities to UHI and allows for an interactive user experience. Additionally, we created a pop-up window providing information on the names of districts, the HVI and percentile rankings of each variable, and the district-mean UHI intensity of the selected district. In the case of the layer of infrastructure exposure assessment, we showed types and the mean UHI intensity of selected infrastructure.

Two interactive maps were generated for each city, each offering perspectives on residents and work environments. The residents-based map comprises seven layers displaying the district-mean UHI intensity, HVI, a bivariate map integrating UHI and HVI, the percentile ranking of each variable (older adult population, females, and individuals with the lowest socio-economic status), and information on the type of infrastructure (healthcare facilities, schools, and playgrounds). Conversely, the workers-based map consists of four layers showing the total number of workers and the breakdown by sectors (agricultural, industry, and service sectors). Users can zoom in and out to explore different districts and access comprehensive information about each district across all layers via a pop-up window activated upon clicking the district area.

5. Results

In this section, we present the results organised by city, delineated into three sections: 1) hazard and exposure assessment on infrastructure, 2) exposure assessment on residents and work environment, and 3) combined vulnerability-hazard assessment.

Table 2. Mean and standard deviation (SD) of UHI intensity (°C) across infrastructure types.

	City-mean (SD)	City-90th	HF-mean (SD)	School-mean (SD)	Playgrounds-mean (SD)
Bern	1.75 (1.45)	2. 96	2.29 (0.86)	2.26 (0.72)	1.93 (0.75)
Basel	3.02 (1.25)	4.77	4.02 (1.00)	3.53 (1.00)	2.64 (1.18)
Zurich	5.52 (1.74)	7.05	6.05 (0.59)	6.08 (0.67)	5.78 (0.96)

Table 3. The number of infrastructures located in High UHI areas.

	Hospitals	Nursing homes for elderly	Elementary schools	Kindergarten	Playgrounds
Bern	18 (78%)	27 (66%)	48 (86%)	89 (70%)	73 (59%)
Basel	10 (83%)	38 (86%)	61 (64%)	115 (72%)	30 (43%)
Zurich	93 (67%)	42 (89%)	324 (89%)	915 (81%)	109 (62%)

5.1. Bern

5.1.1. Hazard and exposure of infrastructure

In Bern, the mean UHI intensity across the city was recorded at 1.75°C and the 90th percentile at 2.96°C, with this relative value serving as a threshold for identifying high and Extreme UHI areas. Notably, UHI intensity was more pronounced in the city centre districts, particularly in Obere Altstadt (UHI: 3.75°C) and Monbijou (UHI: 3.39°C).

When examining healthcare facilities, the average UHI intensity in Bern was 2.29°C (Table 2). The city accommodated 23 hospitals and 41 nursing homes for the older adult population, with approximately 78% (18) of hospitals and 66% (27) of nursing homes situated in High UHI areas (Fig 3 and Table 3).

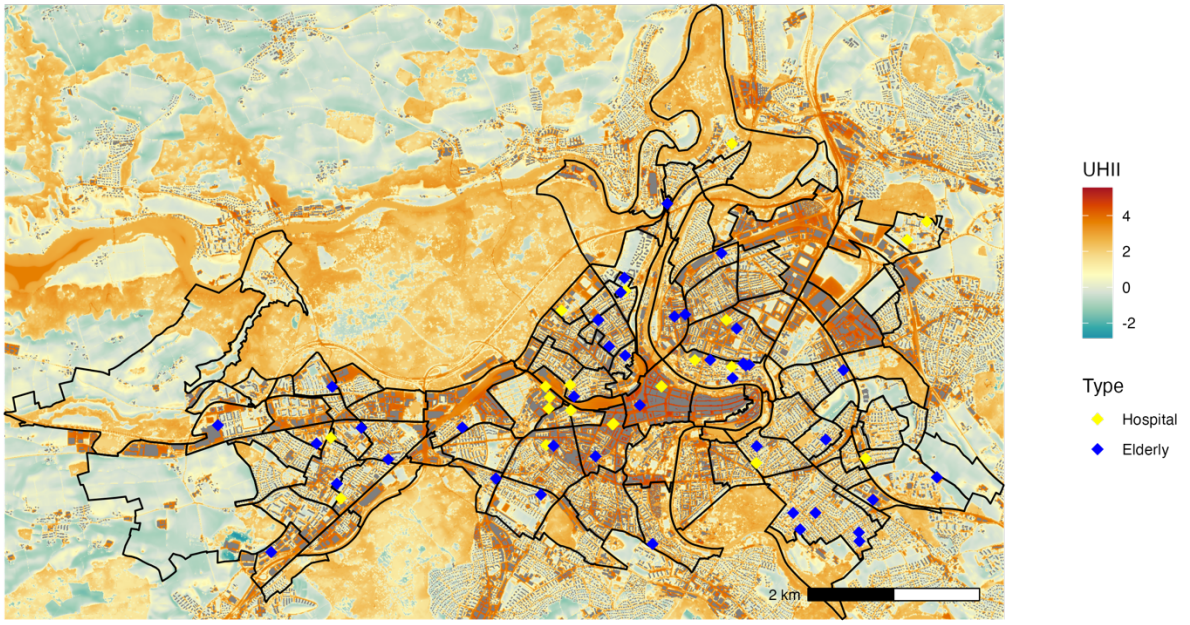

Figure 3. The UHI intensity alongside the distribution of healthcare facilities within the city of Bern. Yellow points denote hospitals, while blue points represent nursing homes for the older adult population.

The average UHI intensity was 2.26°C, with 56 elementary schools and 127 kindergartens presented in Bern. Among these, 86% (48) of elementary schools and 70% (89) of kindergartens were in High UHI areas. As for playgrounds, the average UHI intensity was comparatively lower at 1.93°C. The city of Bern accommodated 123 playgrounds, with 59% (73) situated in High UHI areas. The results of the one-sample t-test revealed that all types of infrastructure experienced higher UHI intensity compared to the city-wide average UHI intensity (supporting information S1).

5.1.2. Exposure of residents and work environment

The total number of residents in the city of Bern in 2020 was 143,988. Of these, 23,401 (16.3%) were older people, 74,765 (51.9%) were females, and 47,174 (32.8%) were individuals with the lowest socio-economic status.

The city-wide UHI intensity at the 90th percentile was 2.96°C, and 11 districts out of 108 districts were classified as Extreme UHI areas. On average, 1,297 residents lived in an Extreme UHI area, while 1,394 people resided in a Non-Extreme UHI area (Table 4). Analysing demographic distribution, we found that, on average, approximately 192 older adults, 622 females, and 375 individuals with the lowest socio-economic status resided in an Extreme UHI area of Bern (Table 4).

Table 4. The average number of residents in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	Non-Extreme UHI
Total population (%)	12,969 (9.0%)	131,019 (91.0%)
Number of districts	10	94
Average per district		
- Total population	1,296.90	1,393.82
- Older adult (≥ 65 yrs)	191.80	228.54
- Female	621.60	729.24
- Low SES	375.10	461.95

Examining spatial patterns, the highest number of older adult population (aged ≥ 65 years) in Extreme UHI areas was observed in the Obere Altstadt district (426 individuals), followed by Untere Aldstadt (402) and Monbijou (332) within Extreme UHI areas (Fig 4, B). Similarly, the highest number of females resided in the Monbijou district (1,584), followed by Weyermannshaus (1,105) and Untere Aldstadt (1,039) (Fig 4, C). Conversely, the district Weyermannshaus had the highest number of individuals with the lowest socio-economic status, totalling 1,840 residents, at least three times higher than the numbers found in other districts within Extreme UHI areas (Fig 4, D).

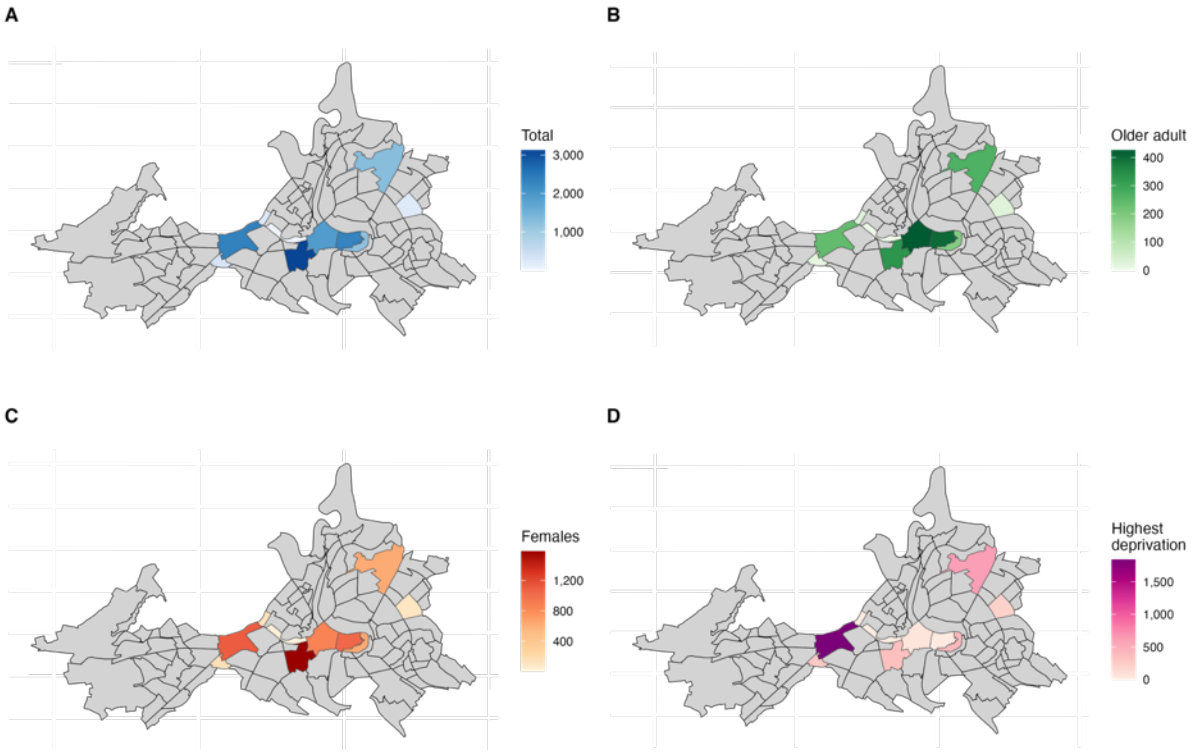

Figure 4. Residents' exposure analysis in the city of Bern: 11 districts in colour were included in Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) Total population of by districts, b) the number of older adult population per district, c) the number of females per district, and d) the number of residents with the lowest socio-economic status within Extreme UHI areas.

In the city of Bern, out of 189,133 workers, 92.5% (174,943) were employed in the service sector (Tertiary industry). In contrast, 7.5% (14,110) worked in the industry sector (Secondary industry) and 0.04% (80) in the agricultural sector (Primary industry) (supporting information S2).

On average, 7,662 workers worked in an Extreme UHI area, approximately seven times higher than those in a Non-Extreme UHI area (1,092) (Table 5). In the service sector, 7,184 workers were exposed to Extreme UHI areas, compared to 999 individuals in Non-Extreme UHI areas (Table 5). The Obere Altstadt district has the highest number of workers in Extreme UHI areas, with 30,774 workers, primarily in the service sector (30,337) (Fig 5, A and D). The Wankdorffeld district had the highest number of workers in the industry sector within Extreme UHI areas, employing 2,223 individuals (Fig 5, B).

Table 5. The average number of workers in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	**Non-Extreme UHI**
Total workers (%)	84,281 (44.6%)	104,852 (55.4%)
Number of districts	11	96
Average per district		
- Total	7,661.91	1,092.21
- Agricultural sector	0.55	0.77
- Industry sector	477.45	92.27
- Service sector	7,183.91	999.17

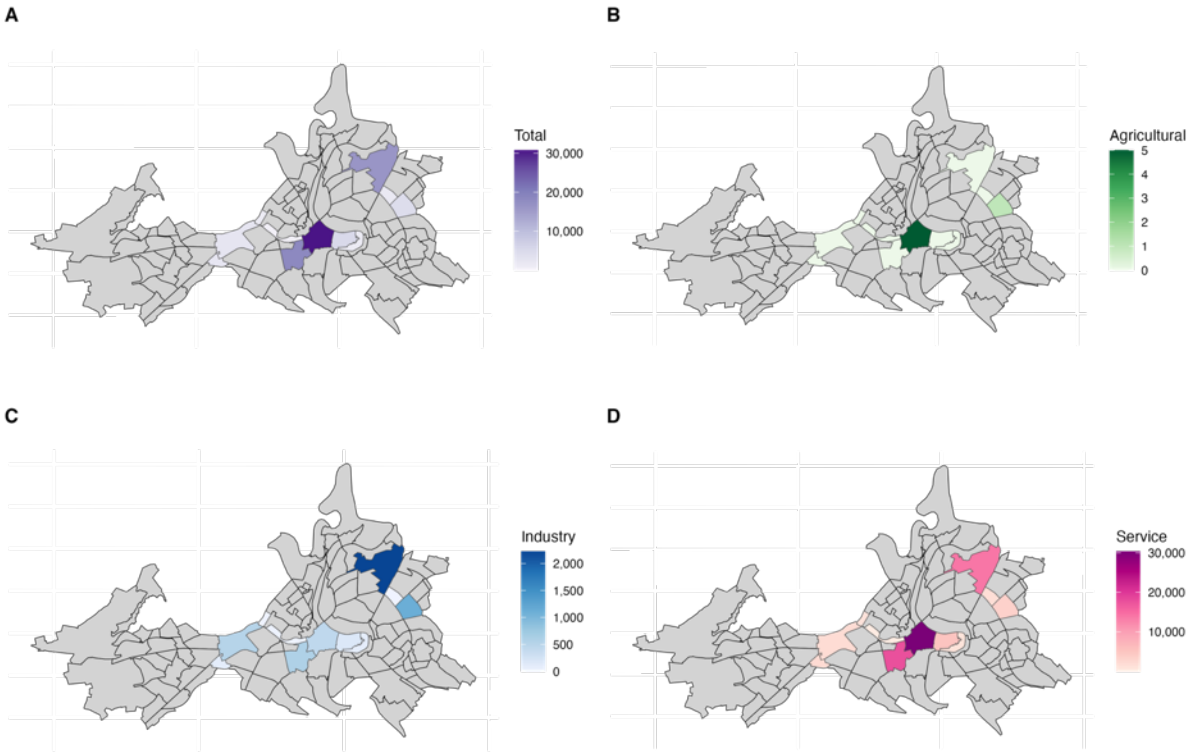

Figure 5. Workers' exposure analysis in the city of Bern: 11 districts in colour were included in Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) Total number

of workers per district, B) the number of workers in the agricultural sector, C) workers in the industry sector, and D) workers in the service sector within Extreme UHI areas.

5.1.3. Combined vulnerability-hazard assessment

The bivariate map analysis showed that districts in Bern experiencing high risks, represented by a dark brown colour indicating both High UHI and High HVI, were distributed across the city. However, the factors contributing to their high risks varied among different districts.

The hot spots with higher risks to heat (medium/high UHI and HVI) were the districts in the central and western parts of the city. In the central area, the districts including Obere Altstadt (UHI: 3.75°C; HVI: 0.69) and Untere Altstadt (UHI: 3.17°C; HVI: 0.68) exhibited medium to high HVI and high intensity of UHI surpassed that of other districts, which led to high heat risk (see Fig 6).

Conversely, in the Mattenhof (UHI: 2.39°C; HVI: 0.99) and the Spitalacker districts (UHI: 2.47°C; HVI: 0.88), although UHI intensity was lower compared to the Aldstadt districts, a higher HVI was observed due to the significant presence of females and older adult population. Likewise, the districts in the western part of the city, like Untermatt (UHI: 2.69°C; HVI: 0.77) and Weyermannshaus (UHI: 3.01°C; HVI: 0.81), experienced relatively lower UHI intensity. However, the high number of individuals with the lowest socio-economic status intensified the heat risk.

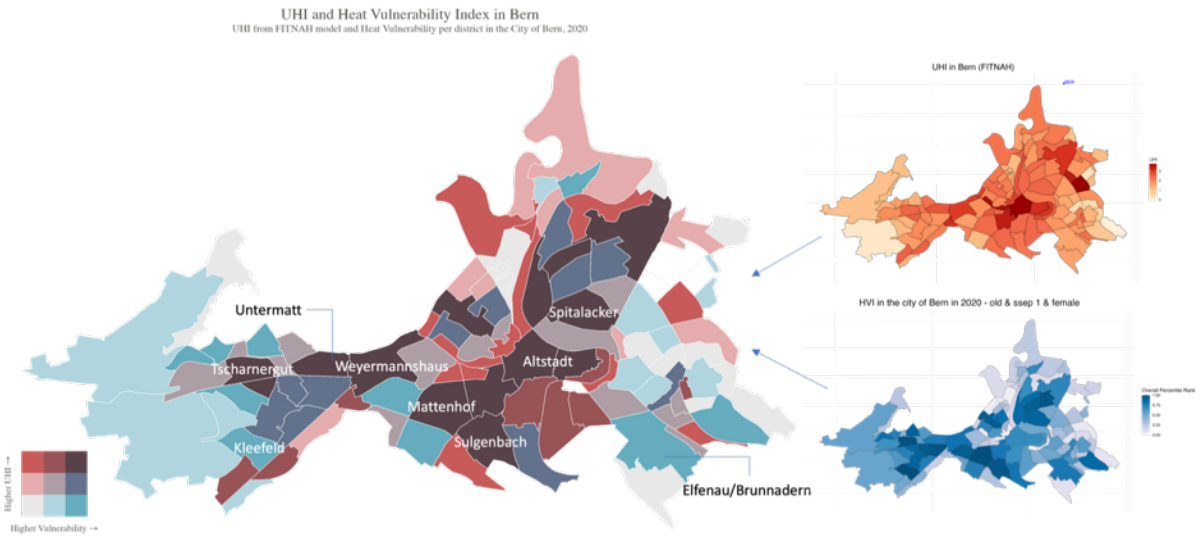

Figure 6. 3 x 3 bivariate map, and UHI and HVI maps for the city of Bern. The bivariate map uses a 3 × 3 grid to categorize areas based on combinations of High, Medium, and Low values for both HVI and UHI.

5.2. Basel

5.2.1. Hazard and exposure of infrastructure

The urban landscape of Basel exhibited distinct variations in UHI intensity across different areas of the city. The city-wide average UHI intensity was measured at 3.02°C, and the 90th percentile UHI intensity (the threshold for Extreme UHI areas) was 4.77°C for the city of Basel (Table 2). Notable spikes were observed, particularly in the old town area of Grossbasel, the

southern part of the river, including the districts Geschäftsviertel, Peter, and Leonhard, where it reached a peak of approximately 5.40°C (Fig 7). Furthermore, districts adjacent to the river, notably in Kleinbasel on the northern side of the river (near the districts Theodor and Klingental), exhibited relatively elevated UHI intensity levels (Fig 7).

A comprehensive infrastructure exposure assessment revealed that healthcare facilities experienced the highest levels of UHI intensity among other types of infrastructure, with an average of 4.02°C (Table 2 and Fig 7). The city accommodated 12 hospitals and 44 nursing homes for the older adult population, with 83% (10) of hospitals and 86% (38) of nursing homes located in High UHI areas (Table 3).

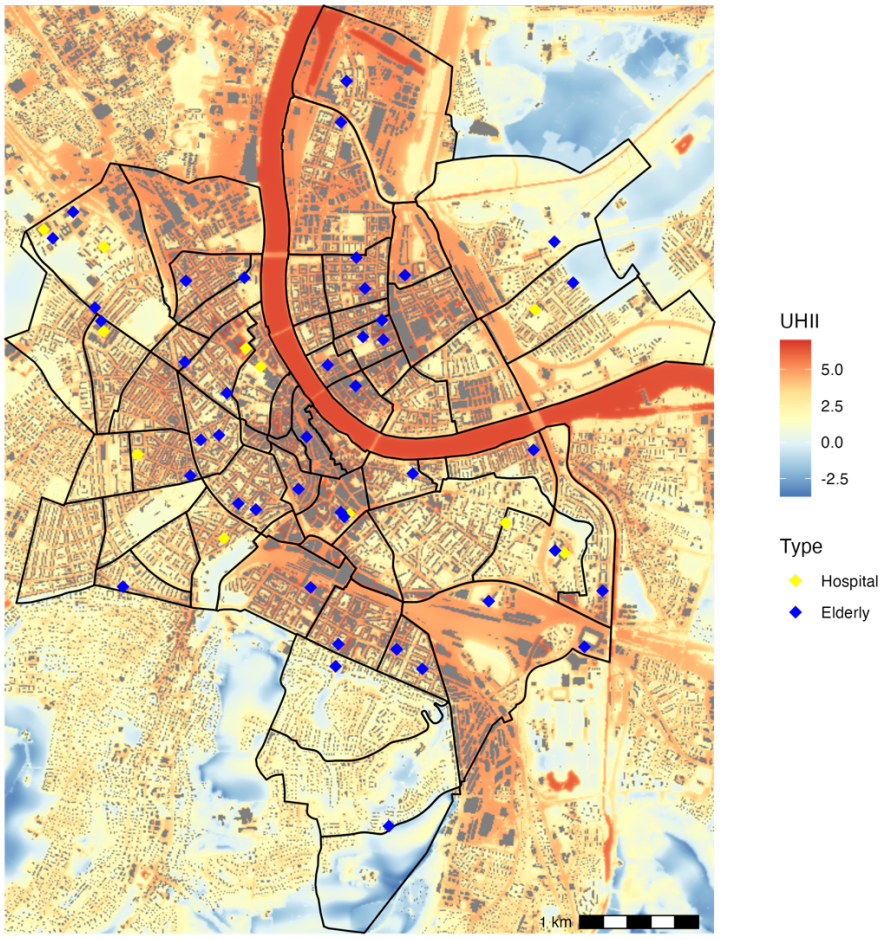

Figure 7. The UHI intensity alongside the distribution of healthcare facilities within the city of Basel. Yellow points denote hospitals, while blue points represent nursing homes for the older adult population. The provided data for the river shows Extreme UHI intensity, which is most likely due to the modelling method.

Schools also experienced a significant UHI impact, with an average intensity of 3.53°C (Table 2). There were 96 elementary schools and 159 kindergartens, with a notable proportion—64% (61) elementary schools and 72% (115) kindergartens—located in High UHI areas (Table 3). Conversely, playgrounds experienced relatively lower UHI intensity, averaging 2.64°C. The city of Basel had 70 playgrounds, with 43% (30) in High UHI areas.

The one-sample t-test results revealed that healthcare facilities and schools experienced significantly higher UHI intensity than the city-wide average. However, the mean UHI intensity of playgrounds was statistically lower than the city-wide average (supporting information S1).

5.2.2. Exposure of residents and work environment

In 2020, the city of Basel had a population of 180,246. This included 33,035 (18.3%) older adults, 92,461 (51.3%) females, and 59,457 (33.0%) individuals with the lowest socio-economic status.

There were 59 districts in the city of Basel, 6 of which were Extreme UHI areas (defined as above the 90th percentile). On average, 1,343 people resided in an Extreme UHI area, while 3,249 people lived in a Non-Extreme UHI area. Approximately 169 older adults, 612 females, and 561 individuals with the lowest socio-economic status resided in Extreme UHI areas (Table 6).

Table 6. The average number of residents in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	**Non-Extreme UHI**
Total population (%)	8,058 (4.5%)	172,188 (95.5%)
Number of districts	6	53
Average per district		
- Total population	1,343.00	3,248.83
- Older adult (≥ 65 yrs)	169.00	604.17
- Female	612.17	1,675.25
- Low SES	561.00	1,058.32

The assessment of resident-based exposure showed different geographical distributions of demographics across Extreme UHI areas in the city of Basel. The district Messe in the Kleinbasel had the highest population (4,715) among other districts in Extreme UHI areas (Fig 8, A). Although the UHI intensity in the old town area of Grossbasel (the districts Geschäftsviertel, Peter, and Leonhard) was the highest in the city, the number of residents was small compared to the surrounding districts (Fig 8, A).

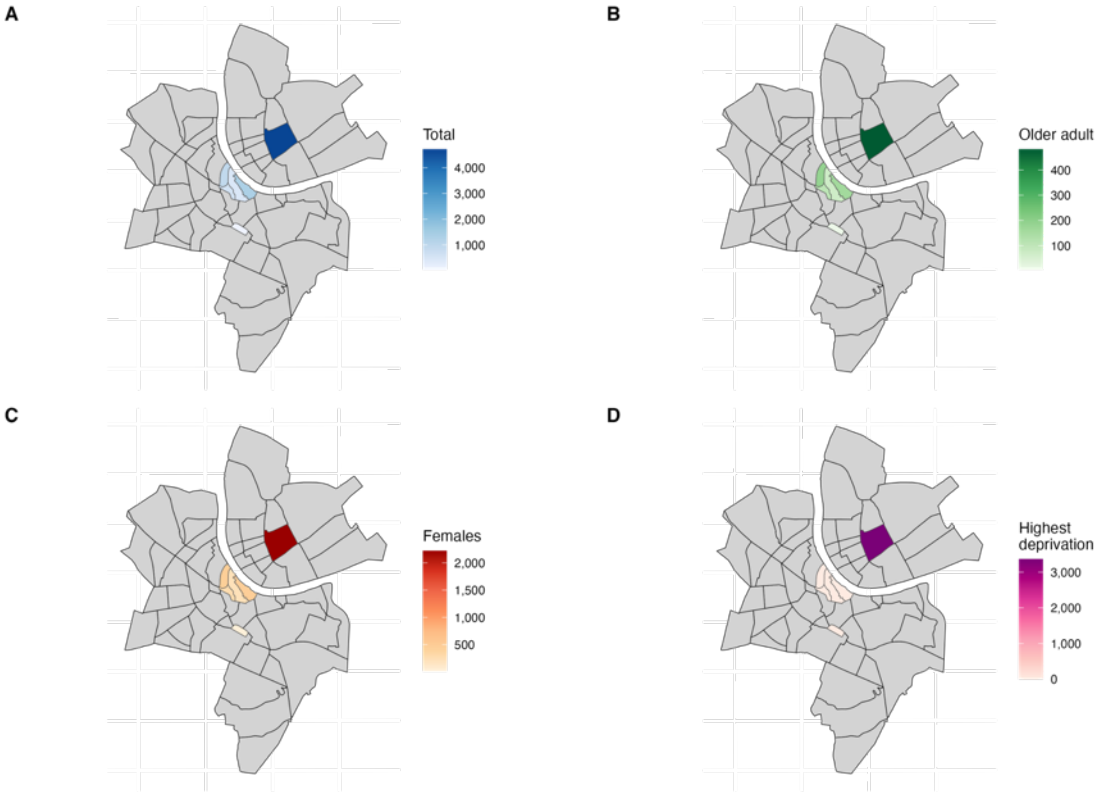

Figure 8. Residents' exposure analysis in the city of Basel: 6 districts in colour were included within Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) Total population of by districts, b) the number of older adult population per district, c) the number of females per district, and d) the number of residents with the lowest socio-economic status within Extreme UHI areas.

In the city of Basel, a total of 180,272 people were employed. 81.78% (147,425) were employed in the service sector, 18.19% (32,797) in the industry sector, and 0.03% (50) in the agricultural sector (supporting information S2).

Table 7. The average number of workers in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	**Non-Extreme UHI**
Total workers (%)	18,632 (10.3%)	161,640 (89.7%)
Number of districts	6	53
Average per district		
- Total	3,105.33	3,049.81
- Agricultural sector	1.33	0.79
- Industry sector	129.67	604.13
- Service sector	2,974.33	2,444.89

On average, 3,105 workers were in Extreme UHI areas, showing a slightly higher number than Non-Extreme UHI areas (3,050) (Table 7). The population working in the service sector was concentrated in the old town area in Grossbasel (Fig 9, D), where the UHI intensity is highest within the city. The combination of high UHI intensity and a large population employed in the

service sector led to a higher average number of workers in Extreme UHI areas than in Non-Extreme UHI areas (Table 7).

The number of populations employed in the industry sector was highest in the city of Basel compared to other Swiss cities (Basel: 32,797; Zurich: 26,816; Bern: 14,110) (supporting information S2). About 56% of employees in the industry sector within Basel worked in two districts (Solitude: 9,289; Lysbüchel: 9,158), included in Non-Extreme UHI areas. As a result of this geographical distribution, the average number of workers in the industry sector was lower in Extreme UHI areas (130) than in Non-extreme UHI areas (604).

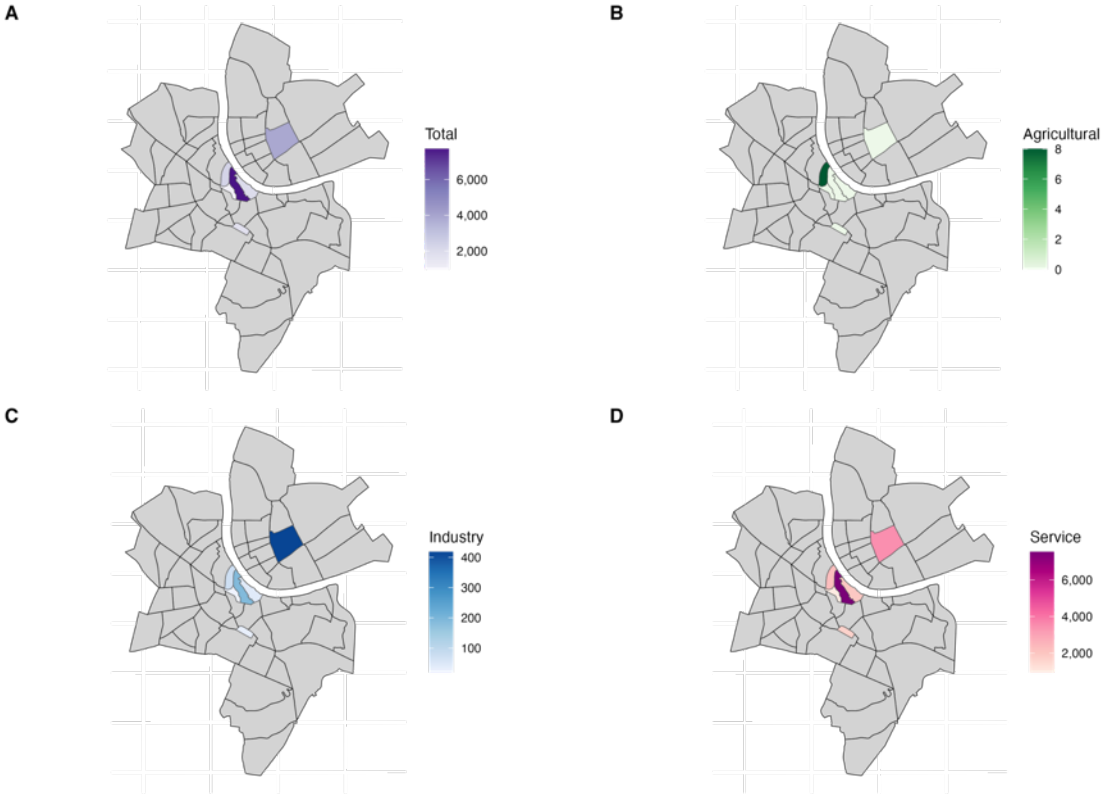

Figure 9. Workers' exposure analysis in the city of Basel: 6 districts in colour were included within Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) Total number of workers per district, B) the number of workers in the agricultural sector, C) workers in the industry sector, and D) workers in the service sector within Extreme UHI areas.

5.2.3. Combined vulnerability-hazard assessment

Districts with high heat risk, exhibiting High UHI and HVI (coloured dark brown in Fig 10), were concentrated in Kleinbasel. Key districts included Klybeck (UHI: 4.44°C; HVI: 0.98), Bläsi (UHI: 4.61°C; HVI: 0.97), Messe (UHI: 4.77°C; HVI: 0.74), and Thierstein (UHI: 4.41°C; HVI: 1.00).

Factors increasing heat risk were different across districts. In the southern part of the city, the district Thierstein stands out with the highest HVI. This heightened vulnerability was attributed to a combination of factors, including a high number of older adult population, a large female population, and individuals with low socio-economic status. In the district Klybeck in Kleinbasel, the highest number of individuals with the lowest socio-economic status amplified

the vulnerability to heat. Conversely, in the district of Messe, while showing relatively lower HVI compared to districts Klybeck and Bläsi, higher UHI intensity exacerbated heat risks.

Despite the districts in the old town area of the Grossbasel (Geschäftsviertel and Peter) exhibiting the highest UHI intensity in the city, their HVI scores were lowest due to the small number of residents, resulting in lower heat risks.

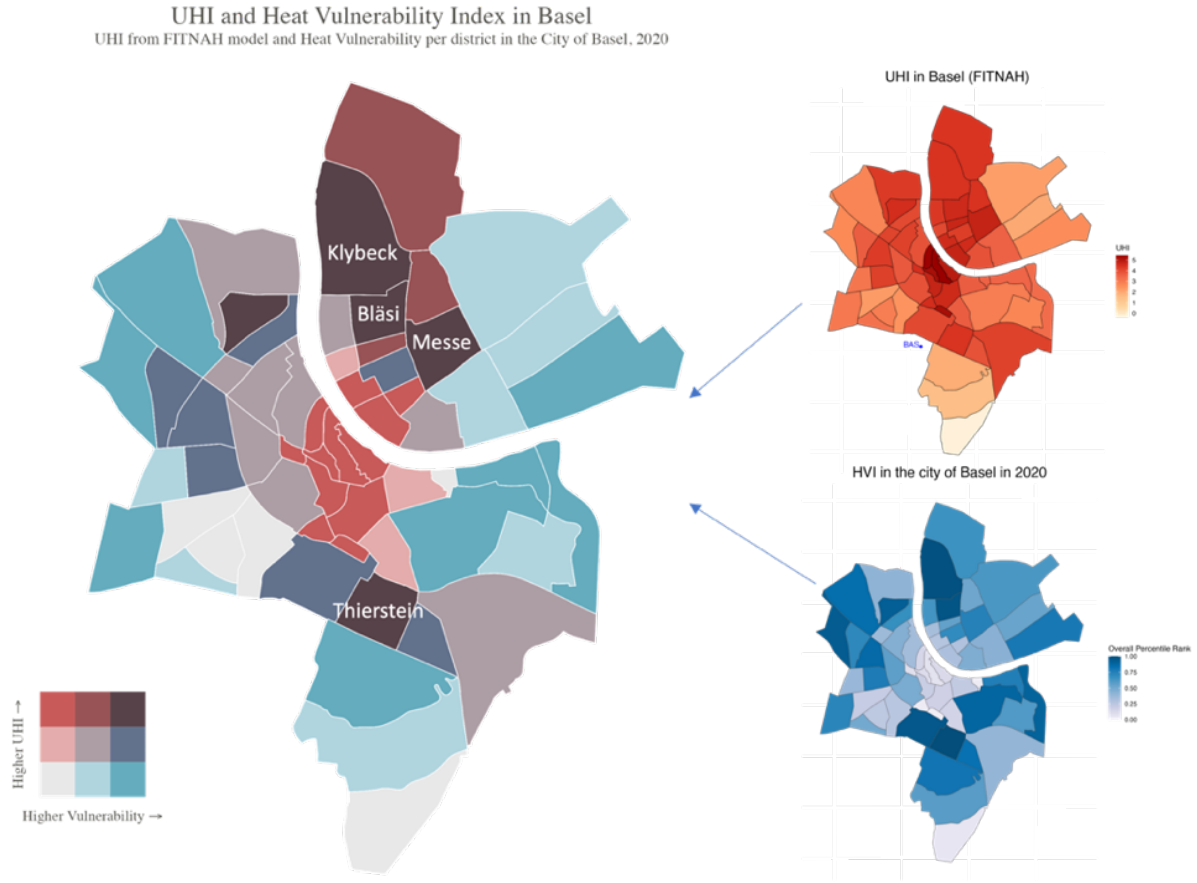

Figure 10. UHI and HVI maps, and 3 x 3 bivariate map for the city of Basel.

5.3. Zurich

5.3.1. Hazard and exposure of infrastructure

In 2020, the city of Zurich exhibited the highest city-wide average (5.52°C) and 90th percentile (7.05°C) UHI intensity compared to other cities (Table 2). Notably, the central districts of City (7.27°C), Lindenhof (7.11°C), and Escher Wyss (7.14°C) experienced particularly elevated UHI intensities.

Within High UHI areas, there were a total of 138 hospitals and 47 nursing homes, with approximately 62% (86) of hospitals and 60% (28) of nursing homes for older adults situated in High UHI areas (Fig 11). Similarly, of the 366 elementary schools and 1123 kindergartens, approximately 55 to 60% were located in High UHI areas (Table 3). Although playgrounds exhibited a relatively lower average UHI intensity of 5.78°C compared to other types of infrastructure, a significant portion, 55% (96 out of 175), were still found within High UHI areas. A one-sample t-test revealed that all types of infrastructure in Zurich exhibited

statistically significant higher UHI intensities compared to the city-wide average (supporting information S1)

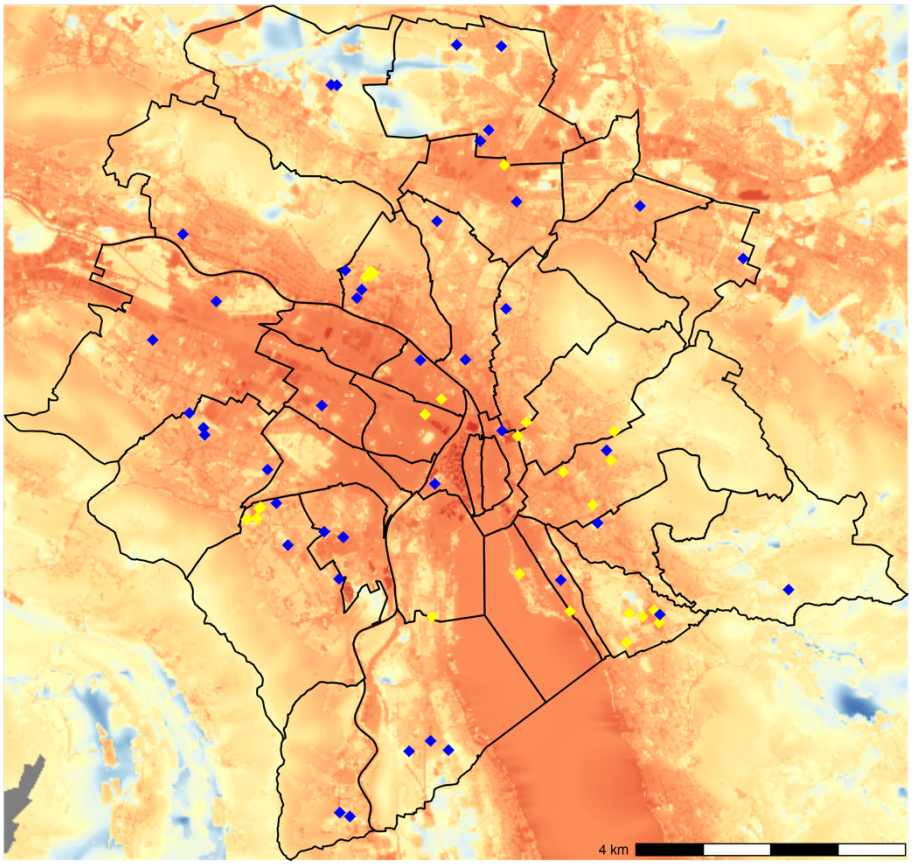

Figure 11. The UHI intensity alongside the distribution of healthcare facilities within the city of Zurich. Yellow points denote hospitals, while blue points represent nursing homes for the older adult population. The provided data for the river shows Extreme UHI intensity, which is most likely due to the modelling method.

5.3.2. Exposure of residents and work environment

In 2020, the city of Zurich had 441,028 residents, including 62,059 (14.1%) older adults, 219,559 (49.8%) females, and 146,661 (33.3%) individuals with the lowest socio-economic status.

The 90th percentile UHI intensity was 7.05°C, and four districts out of 34 in the city centre were included in the extreme UHI. Due to the small number of residents in the city centre, the average number of residents in Extreme UHI areas (5,966) was much lower than that in Non-Extreme UHI areas (13,905). About 543 of the older adult population, 2,560 females, and 1,659 individuals with the lowest economic status lived in Extreme UHI areas (Table 8).

Table 8. The average number of residents in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	Non-Extreme UHI
Total population (%)	23,864 (5.4%)	417,164 (94.6%)
Number of districts	4	30
Average per district		
- Total population	5,966.00	13,905.47
- Older adult (≥ 65 yrs)	543.75	1,996.13
- Female	2,559.50	6,977.37
- Low SES	1,658.50	4,667.57

Among the four districts in Extreme UHI areas, Langstrasse had the highest number of residents, with 12,008, followed by Escher Wyss (6,446), City (4,383), and Lindenhof (1,027) (Fig 12). All the key demographic indicators with high vulnerability were highest in the Langstrasse district (older adults: 869; females: 5,219; lowest socio-economic status: 5,273). On the contrary, no residents had the lowest socio-economic status in the Lindenhof and City districts.

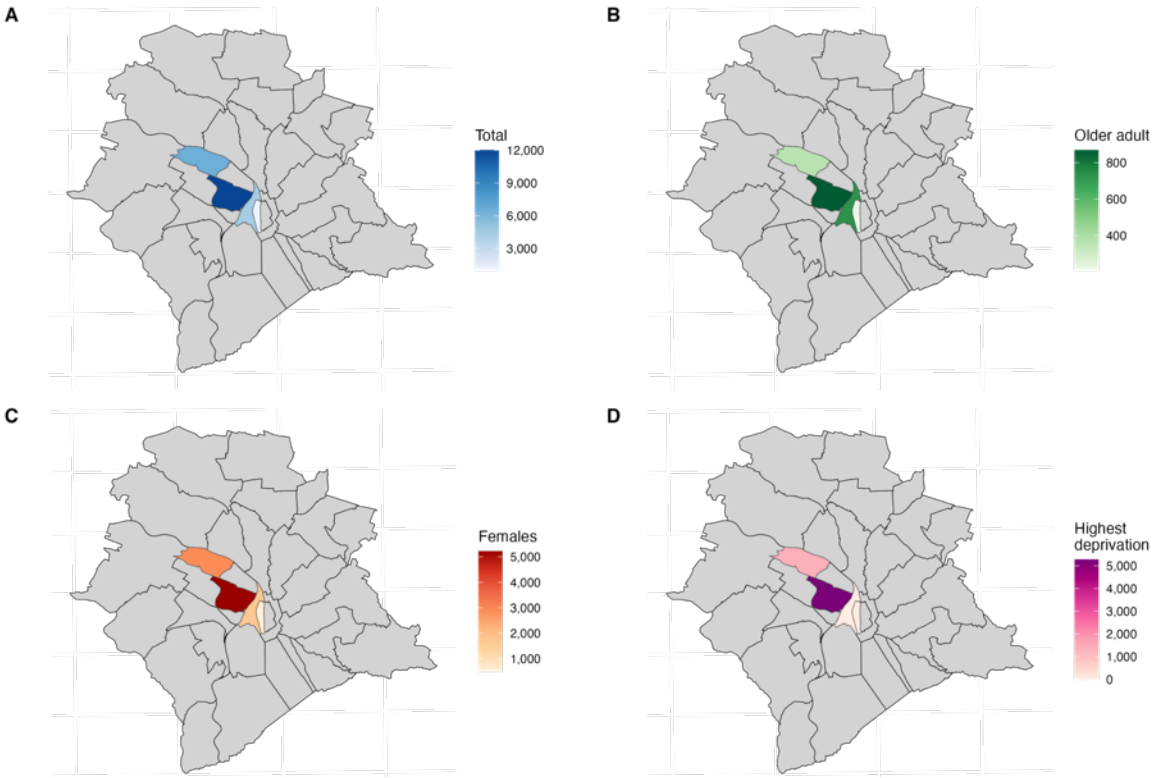

Figure 12. Residents' exposure analysis in the city of Zurich: 4 districts in colour were included in Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) Total population of by districts, b) the number of older adult population per district, c) the number of females per district, and d) the number of residents with the lowest socio-economic status within Extreme UHI areas.

The city of Zurich had the highest number of workers (495,223) among the three Swiss cities (supporting information S2). About 94.55% (468,233) worked in the service sector, 5.41% (26,816) in the industry sector, and 0.04% (174) in the agricultural sector. On average, 27,383 employees worked in an Extreme UHI area, while 12,856 of the population worked in a Non-Extreme UHI area (Table 9).

Table 9. The average number of workers in Extreme and Non-Extreme UHI areas.

	Extreme UHI Areas	**Non-Extreme UHI**
Total workers (%)	109,535 (22.1%)	385,688 (77.9%)
Number of districts	4	30
Average per district		
- Total	27,383.75	12,856.27
- Agricultural sector	0.50	5.73
- Industry sector	922.25	770.90
- Service sector	26,461.00	12,079.63

In Zurich, approximately 23% of the service sector's employees worked in Extreme UHI areas. Because of the intensity of extreme UHI and the large number of workers in this sector, the average number of employees exposed to extreme UHI reached 26,461, more than double the count in Non-Extreme UHI areas (12,080).

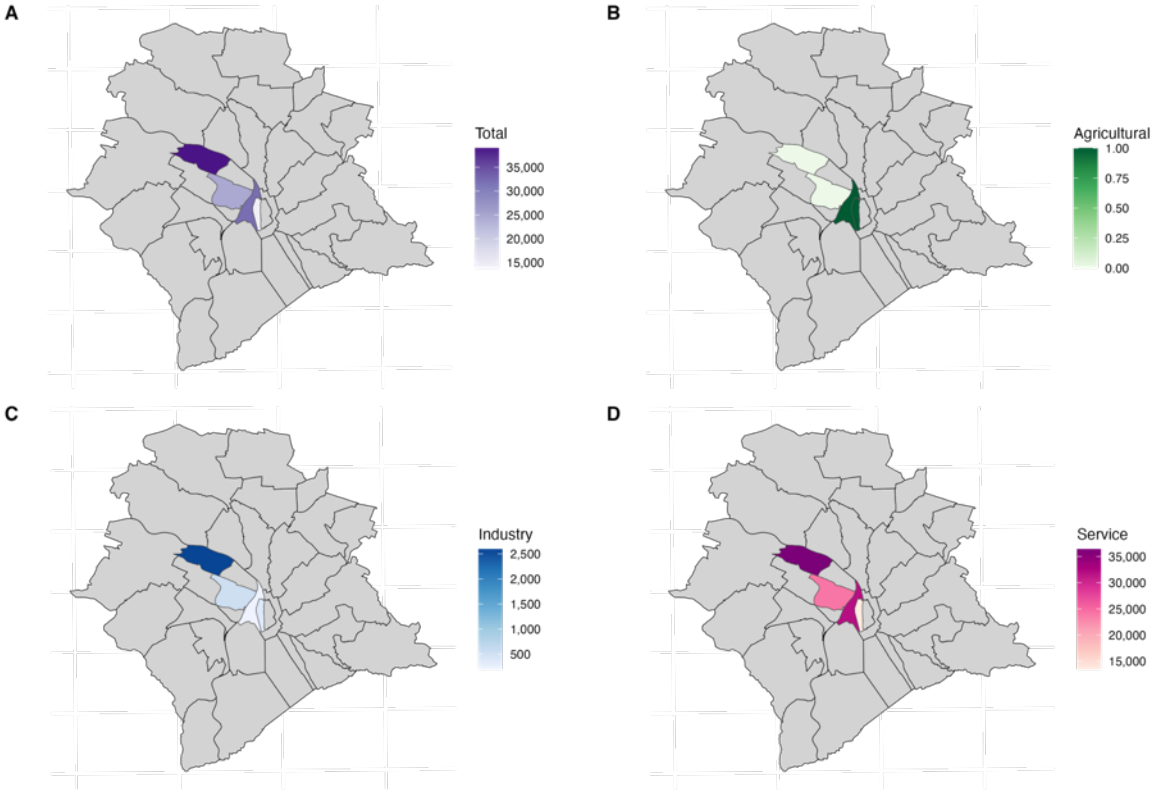

Figure 13. Workers' exposure analysis in the city of Zurich: 4 districts in colour were included in Extreme UHI areas, while grey districts indicate Non-Extreme UHI areas. A) The total number of workers per district, B) the number of workers in the agricultural sector, C) workers in the industry sector, and D) workers in the service sector within the extreme UHI area.

5.3.3. Combined vulnerability-hazard assessment

Despite Zurich's overall higher UHI intensity compared to Bern and Basel, the variations in UHI intensity between districts within the city were relatively minor. Consequently, no districts exhibited both High UHI and High HVI concurrently (Fig 14). While the city's central areas experienced elevated UHI levels, the low presence of the older adult population, females, and individuals with the lowest socio-economic status contributed to a comparatively low vulnerability to heat. In contrast, northern districts such as Höngg, Affoltern, and Seebach demonstrated lower UHI intensity. However, they exhibited higher vulnerability, underscoring the influence of factors beyond UHI in determining heat risk within these regions.

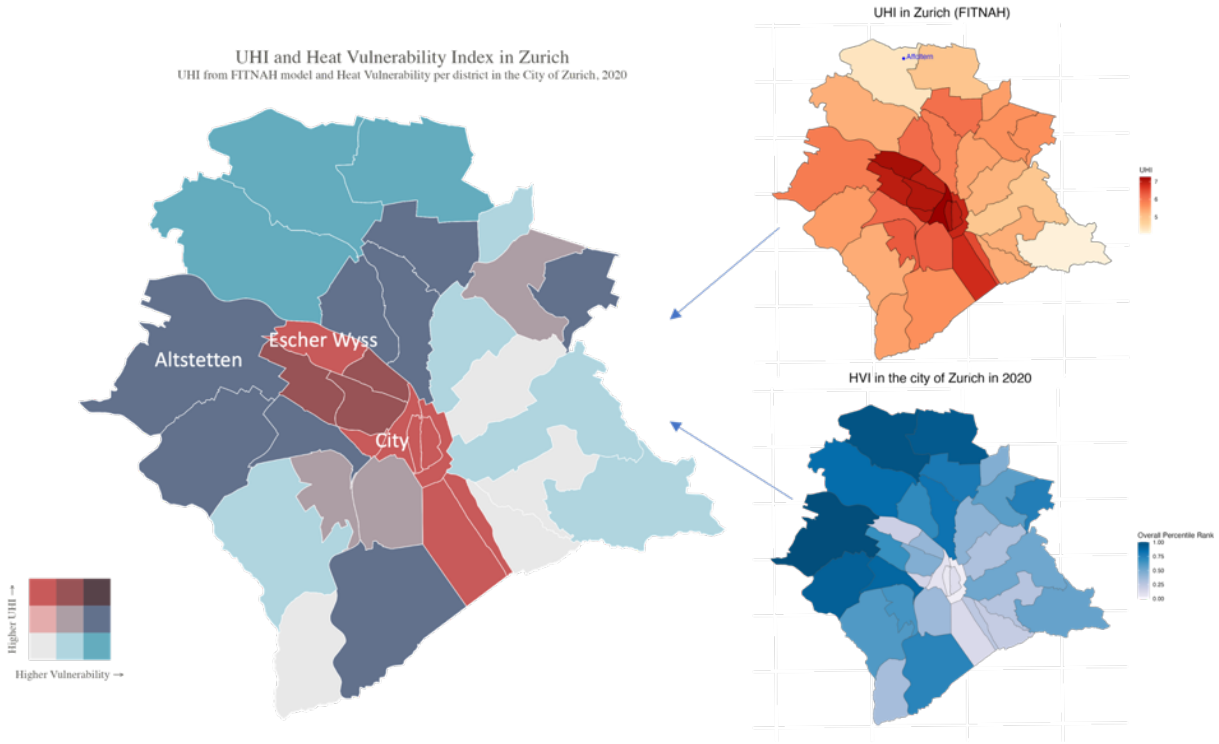

Figure 14. UHI and HVI maps, and 3 x 3 bivariate map for the city of Zurich.

5.4. Interactive map

Utilising the **leaflet** and **mapview** packages in Rstudio, we developed an interactive map to visually present our study's findings and offer a comprehensive overview of the urban climate landscape (Fig 15).

Our interactive map offers several key features to enhance user engagement and facilitate a deeper exploration of the study results:

1) Zoom and Pan: Users can zoom in and out of the map and pan across different areas, enabling a detailed examination of specific regions of interest.
2) Tooltips: By simply clicking on tooltips, users can access detailed information about specific districts. This feature provides additional context and insights, enriching the user's understanding of the composition of UHI and HVI.
3) Multiple layers: The map includes multiple layers that users can toggle between, allowing for a comprehensive analysis of various variables. This functionality enables users to explore different aspects of the UHI effect and vulnerability-associated factors.

Our interactive map incorporates a variety of data layers, each providing valuable insights into different aspects of UHI and vulnerability. These layers include:

1) Bivariate map with UHI and HVI: This map visually represents the relationship between UHI intensity and HVI, offering a comprehensive view of areas with high UHI and HVI.
2) District-mean UHI intensity: This layer presents an overview of the average UHI intensity across various districts, highlighting areas with varying levels of UHI intensity within the city.
3) Heat Vulnerability Index: Users can access the HVI values for each district, aiding in identifying regions experiencing high vulnerability to urban heat. Upon clicking on a district, the user can examine the overall percentile rank and the respective percentile ranking of each demographic variable. This feature enables users to understand which specific components contribute to the elevated vulnerability to heat within each district.
4) Percentile ranking for heat vulnerability determinants: These comprised three layers: the older adult population, females, and individuals with the lowest socio-economic status. The ranking provides insights into the spatial distribution patterns of each demographic variable.
5) Infrastructure: This layer provides detailed information on the type, location and mean UHI intensity of each infrastructure (healthcare facilities, schools, and playgrounds). It assists users in identifying neighbourhoods where preventive measures are necessary to mitigate the health risks associated with UHI.
6) Distribution of workers: These layers present data on the total number of workers and their distribution across each district's different economic sectors (service, industrial, and agricultural). They help users understand the spatial distribution of exposure to UHI regarding the work environment and economic activity across the city.

These interactive maps will be available on the NCCS website to ensure broad accessibility and promote public engagement. By providing easy access to scientific research results, we aim to empower stakeholders, researchers, policymakers, and the public with comprehensive insights into urban climate dynamics and vulnerability to heat.

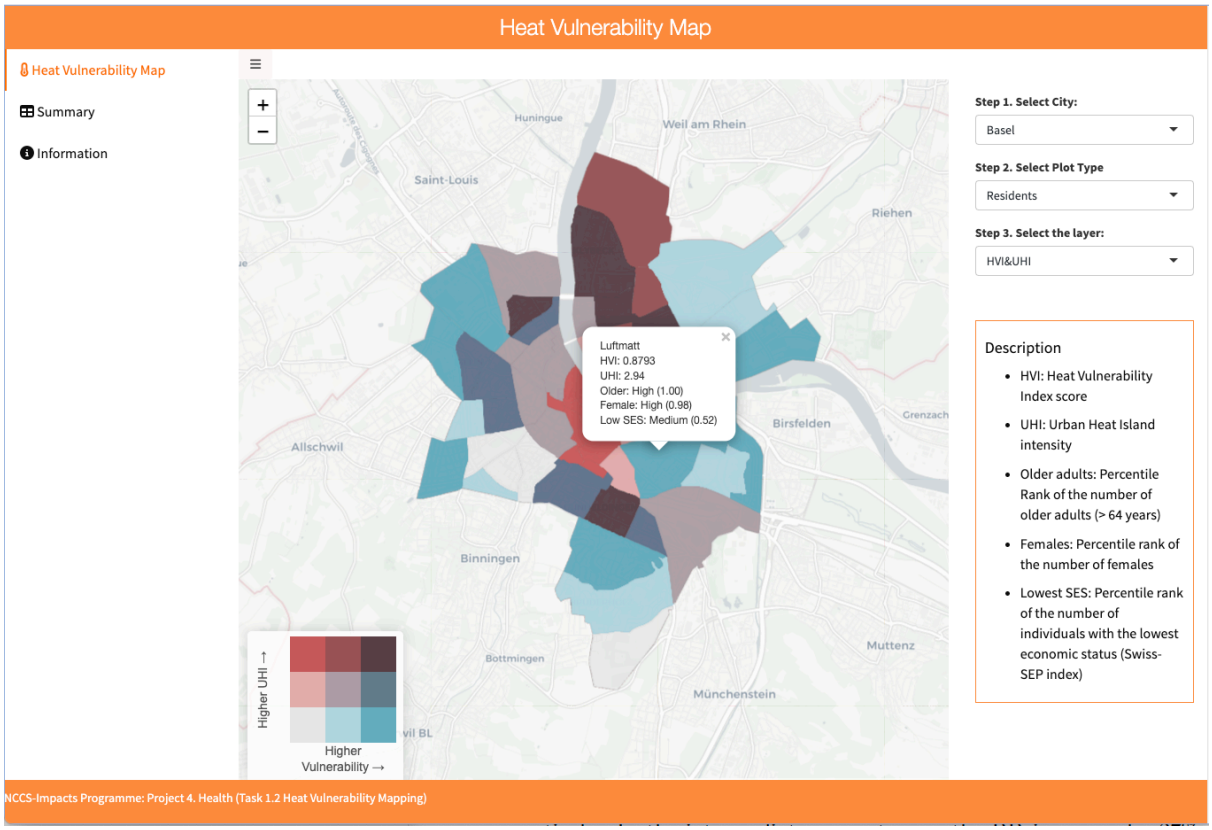

Figure 15. Example of the interactive map

6. Discussion

The present study assessed heat risks in the Swiss cities of Bern, Basel, and Zurich, revealing distinct patterns in UHI exposure and vulnerability across the cities. Building upon previous epidemiological studies, we developed HVI tailored to the Swiss context, drawing upon demographic and socio-economic factors influencing heat-related mortality risks (Wehrli, 2024; Wicki et al., 2024).

This study used individual-level population census data to assess the spatial distribution of UHI exposure and vulnerable populations to the UHI effect. Although previous studies in Switzerland have examined mortality risks within UHI areas (Wicki et al., 2024) and identified specific subgroups with higher UHI-related mortality risks (Wehrli, 2024), these studies did not assess the spatial patterns of such vulnerable populations.

Our bivariate maps allow us to display two variables – UHI and HVI – simultaneously, helping to identify geographical areas with higher health risks from the UHI effect. These maps showed distinct spatial distributions of vulnerable subgroups across different cities. This observation aligns with previous research, which indicates that heat vulnerability levels varied by region, with urban centres often exhibiting higher levels of vulnerability (Reid et al., 2009). Our bivariate maps revealed some common patterns, such as concentrated vulnerability in densely populated urban cores, although these patterns varied by city. For example, Bern exhibited high UHI and HVI in its central area, while Zurich presented a different pattern, with high UHI intensity in the city centre but vulnerable populations concentrated in the northern parts.

It is important to note that these results are relative within each city. When comparing the absolute number of vulnerable residents between cities, Zurich had the highest number,

followed by Bern and Basel. These relative variations in spatial patterns between cities highlight the need for a contextualised assessment of heat risks, considering the local specifics of each urban area.

Our analysis showed that critical infrastructures with concentrated vulnerable populations (hospitals and nursing homes for elders) experienced higher UHI intensity than the city-wide average level. In Switzerland, the population aged 65 or older is projected to comprise 30% of the total population by 2060 (Lewis & Ollivaud, 2020). Furthermore, based on the CH2018 scenario, Burgstall et al. (2021) have shown that urban populations will be more exposed to high temperatures and tropical nights, regardless of emission scenarios. The combination of rising temperatures and a growing number of vulnerable populations, such as older adults, is likely to exacerbate the impact of heat on health in urban areas of Switzerland.

Our analysis of workers' exposure across three cities consistently showed a higher average number of service sector workers within Extreme UHI areas than in Non-Extreme UHI areas. This distribution can be attributed to the concentration of the service sector workforce in urban centres, where the UHI intensity was typically high. Given that approximately 77% of employed persons in Switzerland are engaged in the service sector (FSO 2023), our findings underscore the necessity of drafting guidelines and implementing preventive measures tailored to the work environment.

To our knowledge, this study is the first assessment of the spatial distribution of heat risks at a fine-scale level within Swiss cities. Leveraging high-resolution temperature data, we captured the inner-city variability of UHI exposure. Furthermore, by employing the temperature data provided by governmental offices in a uniform format in multiple Swiss cities (supporting information S3), our comprehensive methods can be extended to other cities in Switzerland. Secondly, by utilising the existing evidence on the UHI-related mortality risk in Switzerland, the contextualisation of HVI components to Swiss urban populations ensures their relevance. Lastly, developing an interactive platform offers public access to crucial insights for identifying vulnerable neighbourhoods and the determinants exacerbating heat risks at the district level.

While we comprehensively assessed heat vulnerability in the context of the type of infrastructure (healthcare facilities, schools, and playgrounds), residents, and workers, this study has potential limitations. First, our reliance on simulated temperature data for a singular year (2020) constrained our ability to analyse temporal changes in heat risks. Additionally, we could not include crucial factors like access to air conditioning and other infrastructural conditions due to a lack of relevant data.

7. Conclusion

In conclusion, our study evaluated the multifaceted interplay between UHI exposure, demographics, and socio-economic status in shaping heat risks within Swiss cities. Our findings serve as a foundational resource for policymakers, urban planners, and public health officers, guiding the formulation of targeted interventions to mitigate the adverse impact of urban heat on public health at the local level.

Supporting information

S1. The results of the one-sample t-test for each city

Table 1.1. One sample t-test for the city of Bern

Types	n	Mean	SD	t-statistic	*p*
Healthcare	64	2.29	0.86	5.00	< .001***
Playground	123	1.93	0.75	2.64	.009**
School	183	2.26	0.72	9.67	< .001***

Table 1.2. One sample t-test for the city of Basel

Types	n	Mean	SD	t-statistic	*p*
Healthcare	56	4.02	1.00	7.45	< .001***
Playground	70	2.64	1.18	-2.69	.009**
School	255	3.53	1.00	8.09	< .001***

Table 1.3. One sample t-test for the city of Zurich

Types	n	Mean	SD	t-statistic	*p*
Healthcare	186	6.05	0.59	12.23	< .001***
Playground	175	5.78	0.96	3.56	< .001***
School	1489	6.08	0.67	32.28	< .001***

S2. The number of total workers and workers by sector for each city (%)

City	Total	Agricultural	Industry	Service
Bern	189,133	80 (0.04)	14,110 (7.46)	174,943 (92.50)
Basel	180,272	50 (0.03)	32,797 (18.19)	147,425 (81.78)
Zurich	495,223	174 (0.04)	26,816 (5.41)	468,233 (94.55)

S3. The websites for Klimaanalysekarten by cities

a. Bern: https://map.bern.ch/stadtplan/
b. Basel: https://map.geo.bs.ch/
c. Zürich: https://maps.zh.ch/
d. Geneva: https://map.sitg.ch/app/
e. Luzern: https://www.geo.lu.ch/map/klimakarten?VIEW=KNA

S4. Details of the infrastructure data included in the analysis: the original title and source of the dataset, along with the most recent update date at the time of download.

	Bern	Basel	Zurich
Hospitals	Spitäler und Kliniken, Kanton Bern (Jun 2023)	Spitäler, Kanton Basel-Stadt (Oct 2018)	Spital, Stadt Zürich (Dec 2023)
Nursing homes for elderly and people with disability	Standorte der Leistungserbringung in den Bereichen Alter, Kanton Bern (Jun 2023)	Alterspflegeheime, Kanton Basel-Stadt (Jan 2019)	Gesundheitszentrum, Stadt Zürich (May 2016)
Kindergartens	Kindergärten, Stadt Bern (Aug 2022)	Schulstandorte, Kanton Basel-Stadt (Nov 2023)	Schulanlagen, Stadt Zürich (Sep 2023)
Elementary schools	Volksschulen, Stadt Bern (Aug 2022)	Schulstandorte, Kanton Basel-Stadt (Nov 2023)	Schulanlagen, Stadt Zürich (Sep 2023)
Playgrounds	Spielplätze, Stadt Bern (Oct 2023)	Basel Info: Interessante Orte (POI), Kanton Basel-Stadt (Jun 2023)	Spielgerätekataster, Stadt Zürich (Sep 2021)

S5. List of Hospitals Considered in the Analysis

Name	E_KOORD	N_KOORD	District	type	City
Adullam	2610604	1267734	St.Johann	Hospital	Basel
Bethesda	2613450	1266387	Gellert	Hospital	Basel
Felix Platter	2609565	1268255	Wasgenring-Ost	Hospital	Basel
Geburtshaus GmbH	2610578	1266511	Paulus	Hospital	Basel
Hildegard	2612953	1266639	Gellert	Hospital	Basel
Merian Iselin Klinik	2609852	1267217	Blauen	Hospital	Basel
Rehab	2609059	1269112	Friedmattviertel	Hospital	Basel
Schmerzklinik	2611637	1266717	Aeschen	Hospital	Basel
St. Claraspital	2613202	1268437	Kleinriehen-Nord	Hospital	Basel
Universitäre Psychiatrische Kliniken	2609567	1268966	Friedmattviertel	Hospital	Basel
Universitäts Kinderspital beider Basel	2610764	1268112	St.Johann	Hospital	Basel
Universitätsspital	2610888	1267956	St.Johann und Universität	Hospital	Basel
Ambulatorium Effingerstrasse Bern	2599774	1199444	Monbijou	Hospital	Bern
Ambulatorium Klinik SGM Bern	2600336	1199881	Obere Altstadt	Hospital	Bern
Ambulatorium Moserstrasse Bern	2601091	1200658	Spitalacker	Hospital	Bern
Ambulatorium Privatklinik Meiringen Bern	2600330	1199881	Obere Altstadt	Hospital	Bern
Ambulatorium Zieglerstrasse Bern	2599273	1199601	Villette	Hospital	Bern

Engeriedspital	2599914	1201000	Burgerheim	Hospital	Bern
Gemeindepsychiatrisches Zentrum Morgenstrasse Bern	2596585	1198571	Bümpliz Süd	Hospital	Bern
Inselspital	2599014	1199622	Inselspital	Hospital	Bern
Klinik Althaus und Tageskliniken Grünthalhaus Bern	2603435	1201810	Waldau	Hospital	Bern
Klinik Beau-Site	2600724	1200189	Altenberg	Hospital	Bern
Klinik Bolligenstrasse Bern	2603205	1201596	Waldau	Hospital	Bern
Klinik Murtenstrasse Bern	2599026	1199755	Inselspital	Hospital	Bern
Klinik Permanence	2596469	1199280	Bümpliz Dorf	Hospital	Bern
Klinik Soteria	2599267	1199899	Donnerbühl/Stadtbach	Hospital	Bern
Lindenhofspital	2599165	1200770	Neufeld	Hospital	Bern
Salem-Spital	2601154	1200111	Altenberg	Hospital	Bern
Sonnenhofspital	2602719	1199040	Sonnenhof	Hospital	Bern
Soteria FETZ	2599761	1199437	Monbijou	Hospital	Bern
Soteria Lobhaus	2598978	1199879	Inselspital	Hospital	Bern
Soteria Tageszentrum	2598985	1199195	Mattenhof	Hospital	Bern
Spital Tiefenau	2601157	1202720	Tiefenau	Hospital	Bern
Stationen Oranienburg-Belvoir	2601358	1200138	Altenberg	Hospital	Bern
Therapiestation Alpenstrasse Bern	2601441	1198985	Gryphenhübeli/Thunplatz	Hospital	Bern
Adipositas-Zentrum	2679979	1246673	Friesenberg	Hospital	Zurich
Ambulantes Perioperatives Zentrum, APZ	2679979	1246673	Friesenberg	Hospital	Zurich
Angiologie	2679979	1246673	Friesenberg	Hospital	Zurich
Augenklinik	2679979	1246673	Friesenberg	Hospital	Zurich
Beckenbodenzentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Bereich Betrieb	2679979	1246673	Friesenberg	Hospital	Zurich
Bereich Finanzen	2679979	1246673	Friesenberg	Hospital	Zurich
Bereich Informatik	2679979	1246673	Friesenberg	Hospital	Zurich
Bereich Pflege	2681675	1250346	Wipkingen	Hospital	Zurich
Brust- und Gynäkologisches Krebszentrum	2679979	1246673	Friesenberg	Hospital	Zurich
Brustzentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Cafeteria Frauenklinik	2679826	1246656	Friesenberg	Hospital	Zurich
Checkupzentrum Hirslanden	2684639	1245289	Seefeld	Hospital	Zurich
Chirurgische Facharztabteilung	2679979	1246673	Friesenberg	Hospital	Zurich
Chirurgische Klinik	2681675	1250346	Wipkingen	Hospital	Zurich
Chirurgische Kliniken	2679979	1246673	Friesenberg	Hospital	Zurich
Darmkrebs- und Pankreaszentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Diabetesberatung	2681675	1250346	Wipkingen	Hospital	Zurich
Dialysestation Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Dialysestation Waid	2681709	1250328	Wipkingen	Hospital	Zurich
Dialysezentrum Oerlikon	2683663	1251932	Oerlikon	Hospital	Zurich

Endokrinologie und Diabetologie	2679979	1246673	Friesenberg	Hospital	Zurich
Epilepsie-Zentrum	2685478	1244823	Weinegg	Hospital	Zurich
Ergotherapie	2681675	1250346	Wipkingen	Hospital	Zurich
Ergotherapie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Ernährungsberatung	2681675	1250346	Wipkingen	Hospital	Zurich
Ernährungsberatung Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Festsaal Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Frauenheilkunde	2683990	1248104	Oberstrass	Hospital	Zurich
Frauenklinik Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Frauensprechstunde	2681675	1250346	Wipkingen	Hospital	Zurich
Gastroenterologie und Hepatologie	2681675	1250346	Wipkingen	Hospital	Zurich
Gastroenterologie und Hepatologie	2679979	1246673	Friesenberg	Hospital	Zurich
Gefässchirurgie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Gefässzentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Gynäkologisches Krebszentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Hospiz Zürcher Lighthouse	2684977	1246873	Hottingen	Hospital	Zurich
HR Recruiting Center Stadtspital Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
HR Service Center Waid und Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Human Resources	2681675	1250346	Wipkingen	Hospital	Zurich
Human Resources Stadtspital Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
Impfzentrum Triemli	2680017	1246822	Friesenberg	Hospital	Zurich
Infektiologie, Spitalhygiene und Personalmedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Anästhesiologie	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Anästhesiologie	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Dermatologie und Venerologie	2682484	1248220	Langstrasse	Hospital	Zurich
Institut für Intensivmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Intensivmedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Labormedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Nephrologie	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Notfallmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Notfallmedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Pathologie	2679979	1246673	Friesenberg	Hospital	Zurich
Institut für Radiologie und Nuklearmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Radiologie und Nuklearmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Institut für Radiologie und Nuklearmedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Interprofessioneller Konsiliardienst für Palliative Care	2679979	1246673	Friesenberg	Hospital	Zurich
Kinderklinik Triemli	2679979	1246673	Friesenberg	Hospital	Zurich

Kinderkrippe - Stadtspital Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Kindernotfall Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Kinderspital Zürich	2684538	1247363	Hottingen	Hospital	Zurich
Klinik am Zürichberg	2685248	1247535	Hottingen	Hospital	Zurich
Klinik für Belegärzt*innen	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik für Belegärzt*innen	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Herzchirurgie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Kardiologie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Medizinische Onkologie und Hämatologie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Orthopädie, Hand- und Unfallchirurgie	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik für Orthopädie, Hand- und Unfallchirurgie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Radio-Onkologie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Urologie	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik für Urologie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik für Viszeral-, Thorax- und Gefässchirurgie	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik für Viszeral-, Thorax- und Gefässchirurgie	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik Hirslanden	2685967	1245121	Weinegg	Hospital	Zurich
Klinik im Park	2682585	1245206	Enge	Hospital	Zurich
Klinik Innere Medizin	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik Innere Medizin	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik Innere Medizin	2681675	1250346	Wipkingen	Hospital	Zurich
Klinik Innere Medizin	2679979	1246673	Friesenberg	Hospital	Zurich
Klinik Susenberg	2685298	1247968	Fluntern	Hospital	Zurich
Konferenzzentrum Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Lichthof Waid	2681602	1250268	Wipkingen	Hospital	Zurich
Logopädie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Logopädie Waid	2681675	1250346	Wipkingen	Hospital	Zurich
Medizinische Bibliothek	2679979	1246673	Friesenberg	Hospital	Zurich
Medizinische Direktion	2679979	1246673	Friesenberg	Hospital	Zurich
Medizinische Interdisziplinäre Tagesklinik, MIT	2679979	1246673	Friesenberg	Hospital	Zurich
Musiktherapie	2681675	1250346	Wipkingen	Hospital	Zurich
Neurochirurgie / Wirbelsäulenchirurgie	2679979	1246673	Friesenberg	Hospital	Zurich
Neurologie	2679979	1246673	Friesenberg	Hospital	Zurich
Onkologie und Hämatologie	2681675	1250346	Wipkingen	Hospital	Zurich
Operationstrakt (OP Plattform)	2679979	1246673	Friesenberg	Hospital	Zurich
Patientenaufnahme Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Personalrestaurant Stadtspital Zürich Waid	2681675	1250346	Wipkingen	Hospital	Zurich
Pflege Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Physiotherapie	2681675	1250346	Wipkingen	Hospital	Zurich

Physiotherapie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Pneumologie und Schlafmedizin	2679979	1246673	Friesenberg	Hospital	Zurich
Prokto Zürich	2681675	1250346	Wipkingen	Hospital	Zurich
Prokto Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
Psychiatrische Universitätsklinik Zürich	2685519	1245258	Weinegg	Hospital	Zurich
Pyramide am See	2683890	1245847	Seefeld	Hospital	Zurich
Restaurant Stadtspital Zürich Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Rheumatologie	2679979	1246673	Friesenberg	Hospital	Zurich
Rheumatologie im Waid	2681675	1250346	Wipkingen	Hospital	Zurich
Schulthess Klinik	2685721	1245214	Weinegg	Hospital	Zurich
Seelsorge Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Sitzungszimmer A005	2681675	1250346	Wipkingen	Hospital	Zurich
Sozialdienst	2681675	1250346	Wipkingen	Hospital	Zurich
Sozialdienst Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Spitalapotheke	2681675	1250346	Wipkingen	Hospital	Zurich
Spitalapotheke	2679827	1246657	Friesenberg	Hospital	Zurich
Spitaldirektion	2679979	1246673	Friesenberg	Hospital	Zurich
Spitalpark Waid	2681662	1250283	Wipkingen	Hospital	Zurich
Stadtspital Triemli Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
Stadtspital Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
Stadtspital Zürich	2679979	1246673	Friesenberg	Hospital	Zurich
Stadtspital Zürich Europaallee	2682484	1248220	Langstrasse	Hospital	Zurich
Stadtspital Zürich Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Stadtspital Zürich Triemli Pavillon E1	2680033	1246843	Friesenberg	Hospital	Zurich
Stadtspital Zürich Waid	2681675	1250346	Wipkingen	Hospital	Zurich
Stadtspital Zürich Waid, Kongressforum	2681675	1250346	Wipkingen	Hospital	Zurich
Sune-Egge Krankenstation	2682724	1248450	Gewerbeschule	Hospital	Zurich
Therapien und Beratungen	2681675	1250346	Wipkingen	Hospital	Zurich
Thoraxchirurgie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Uniklinik Balgrist	2685890	1245309	Weinegg	Hospital	Zurich
Universitäre Klinik für Akutgeriatrie	2681675	1250346	Wipkingen	Hospital	Zurich
Universitäre Klinik für Altersmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Universitäre Klinik für Altersmedizin	2681675	1250346	Wipkingen	Hospital	Zurich
Universitätsspital	2683861	1247899	Fluntern	Hospital	Zurich
Viszeralchirurgie Triemli	2679979	1246673	Friesenberg	Hospital	Zurich
Waidforum	2681675	1250346	Wipkingen	Hospital	Zurich
Zentrale Sterilgutversorgungsabteilung (ZSVA)	2681675	1250346	Wipkingen	Hospital	Zurich
Zentrallabor	2681675	1250346	Wipkingen	Hospital	Zurich
Zentrum für Notfallmedizin	2679979	1246673	Friesenberg	Hospital	Zurich

Zentrum für Palliative Care	2681675	1250346	Wipkingen	Hospital	Zurich
Zentrum für Schmerzmedizin Triemli	2679979	1246673	Friesenberg	Hospital	Zurich

S6. List of nursing homes and care centres included in the analysis

Name	E_KOORD	N_KOORD	district	type	City
Abteilung Langzeitpflege Kanton Basel-Stadt	2611275	1267365	Geschäftsviertel	Elderly	Basel
Adullam	2610604	1267734	St.Johann	Elderly	Basel
Alban-Breite	2613189	1267255	Zürcherstrasse	Elderly	Basel
Alterszentrum am Bruderholz	2611520	1265432	Thiersteinerrain	Elderly	Basel
Alterszentrum Burgfelderhof	2609136	1269039	Friedmattviertel	Elderly	Basel
Alterszentrum Falkenstein	2612251	1265409	Delsbergerallee	Elderly	Basel
Alterszentrum Weiherweg	2610296	1267038	Blauen	Elderly	Basel
Alterszentrum zum Lamm	2611689	1267795	Theodor	Elderly	Basel
Atrium Tagesheim	2611767	1268616	Bläsi	Elderly	Basel
Bürgerspital Tagesheim Weiherweg	2610537	1267380	Spalen	Elderly	Basel
Casavita Hasenbrunnen	2610848	1266753	Steinen	Elderly	Basel
Casavita Kannenfeld	2609490	1268454	Friedmattviertel	Elderly	Basel
Casavita Lehenmatt	2613771	1266067	Lehenmatte	Elderly	Basel
Casavita Vincentianum	2610383	1267341	Spalen	Elderly	Basel
dandelion	2611912	1268349	Claramatte	Elderly	Basel
dandelion Tagesheim	2611912	1268349	Claramatte	Elderly	Basel
Gellert Hof	2613370	1266407	Gellert	Elderly	Basel
Generationenhaus Neubad	2609727	1266103	Holee	Elderly	Basel
Gustav Benz Haus	2611922	1268185	Claramatte	Elderly	Basel
Holbeinhof	2610700	1266803	Steinen	Elderly	Basel
irides AG	2611207	1266926	Steinen	Elderly	Basel
Johanniter	2610751	1268706	Pestalozzi	Elderly	Basel
Ländliheim	2612170	1267056	Alban	Elderly	Basel
Marienhaus	2611695	1268876	Bläsi	Elderly	Basel
Momo	2611543	1265617	Thierstein	Elderly	Basel
neues Marthastift	2609307	1269261	Friedmattviertel	Elderly	Basel
Senevita Erlenmatt	2612105	1268728	Erlenmatt	Elderly	Basel
Senevita Gellertblick	2612811	1265981	St.Jakob-Dreispitz	Elderly	Basel
St. Christophorus	2611612	1270364	Kleinhüningen	Elderly	Basel
St. Elisabethenheim	2613522	1268665	Kleinriehen-Nord	Elderly	Basel
St. Johann	2610249	1267997	Kannenfeld	Elderly	Basel
Sternenhof	2611565	1266729	Aeschen	Elderly	Basel
Sternenhof	2611592	1266692	Aeschen	Elderly	Basel
Sternenhof	2612034	1265576	Delsbergerallee	Elderly	Basel
Sternenhof	2612035	1265574	Delsbergerallee	Elderly	Basel

Sternenhof	2610258	1268680	Landskron	Elderly	Basel
Sternenhof Tagesheim Egliseeholz	2613364	1269010	Eglisee	Elderly	Basel
Sternenhof Tagesheim Luzernerring	2609544	1268342	Wasgenring-Ost	Elderly	Basel
Stiftung Rheinleben	2611453	1267971	Klingental	Elderly	Basel
Südpark	2611309	1266097	Margarethen	Elderly	Basel
Tertianum AG	2613618	1265596	St.Jakob-Dreispitz	Elderly	Basel
Wesley Haus	2611751	1268208	Claramatte	Elderly	Basel
Wiesendamm	2611565	1270017	Klybeck	Elderly	Basel
zum Wasserturm	2611969	1264085	Batterie-Nord	Elderly	Basel
Alters- und Pflegeheim Oranienburg	2601359	1200134	Altenberg	Elderly	Bern
Alters- und Pflegewohnheim Engeried	2599858	1200981	Burgerheim	Elderly	Bern
Altersheim Mon Soleil	2599909	1200242	Alpenegg	Elderly	Bern
Alterswohn- und Pflegeheim Jolimont	2600401	1202019	Kleiner Bremgartenwald	Elderly	Bern
Alterswohnheim Fellergut	2596301	1199212	Fellergut	Elderly	Bern
Alterszentrum Mattenhof	2599072	1199186	Mattenhof	Elderly	Bern
Alterszentrum Viktoria AG	2600903	1200191	Altenberg	Elderly	Bern
Band-Genossenschaft	2595826	1199659	Tscharnergut	Disability	Bern
BeWo Plus Bern	2599305	1199239	Mattenhof	Disability	Bern
BeWo Plus Bern, Pension HeDa	2599546	1198629	Sulgenbach	Disability	Bern
Blinden- und Behindertenzentrum Bern	2599594	1200655	Brückfeld	Disability	Bern
Blinden- und Behindertenzentrum Bern AG	2599594	1200655	Brückfeld	Elderly	Bern
Blinden- und Behindertenzentrum Bern Wohnhaus A	2599594	1200662	Brückfeld	Elderly	Bern
Der Burgerspittel am Bahnhofplatz	2600080	1199661	Obere Altstadt	Elderly	Bern
Der Burgerspittel im Viererfeld	2599900	1201151	Burgerheim	Elderly	Bern
Domicil Ahornweg	2599722	1200349	Brückfeld	Elderly	Bern
Domicil Alexandra	2602647	1198070	Elfenau/Brunnadern	Elderly	Bern
Domicil Baumgarten	2596538	1198743	Bümpliz Dorf	Elderly	Bern
Domicil Egelmoos	2602254	1199259	Egelmoos	Elderly	Bern
Domicil Kompetenzzentrum Demenz Bethlehemacker	2596484	1199877	Bethlehemacker	Elderly	Bern
Domicil Kompetenzzentrum Demenz Elfenau	2601873	1198401	Elfenau/Brunnadern	Elderly	Bern
Domicil Lentulus	2598924	1198615	Hardegg/Weissenstein	Elderly	Bern
Domicil Mon Bijou	2599563	1199063	Monbijou	Elderly	Bern
Domicil Schönegg	2600229	1198038	Sandrain/Schönau	Elderly	Bern
Domicil Schwabgut	2596825	1199396	Schwabgut	Elderly	Bern
Domicil Spitalackerpark	2601212	1200557	Spitalacker	Elderly	Bern
Domicil Steigerhubel	2598005	1199400	Weyermannshaus	Elderly	Bern
Domicil Wildermettpark	2602641	1198173	Elfenau/Brunnadern	Elderly	Bern
Domicil Wyler	2601035	1201439	Wyler	Elderly	Bern

ElfenauPark	2602133	1198402	Elfenau/Brunnadern	Elderly	Bern
Interessengemeinschaft Sozialpsychiatrie Bern IGS	2599734	1198388	Sulgenbach	Disability	Bern
Lorrainehof – Wohnen und Pflege	2600485	1200699	Lorraine	Elderly	Bern
Pension Hochhaus	2596150	1199293	Fellergut	Disability	Bern
rehaclub	2598531	1198349	Hardegg/Weissenstein	Disability	Bern
Schweizerischer Blinden- und Sehbehindertenverband - SBV	2598530	1199398	Weyermannshaus	Disability	Bern
Senevita Bümpliz	2597139	1199027	Stöckacker	Elderly	Bern
Senevita Dammweg	2600610	1200723	Lorraine	Elderly	Bern
Senevita Wangenmatt	2595771	1197943	Wangenmatt	Elderly	Bern
Senevita Westside	2595148	1199427	Brünnen	Elderly	Bern
Senioren-Appartements Egghölzli	2602806	1198555	Weltpost	Elderly	Bern
Seniorenvilla Grüneck	2601447	1199181	Gryphenhübeli/Thunplatz	Elderly	Bern
Seniorenvilla Sarepta	2601318	1200126	Altenberg	Elderly	Bern
Stiftung Schulungs- und Wohnheime Rossfeld	2601010	1202907	Tiefenau	Disability	Bern
Terra Vecchia	2604056	1198677	Solacher/Melchenbühl	Disability	Bern
Tertianum Fischermätteli	2598397	1198804	Fischermätteli	Elderly	Bern
Tertianum Résidence	2599311	1199763	Donnerbühl/Stadtbach	Elderly	Bern
tilia Elfenau	2601955	1198208	Elfenau/Brunnadern	Elderly	Bern
tilia Wittigkofen	2603553	1198817	Wittigkofen	Elderly	Bern
Verein Nordlicht	2601027	1201256	Breitenrain	Disability	Bern
Wohnen - Pflege Altenberg	2601165	1199978	Altenberg	Elderly	Bern
Wohnen - Pflege Oranienburg	2601290	1200150	Altenberg	Elderly	Bern
Wohngemeinschaft DrehPunkt	2600225	1202656	Felsenau	Disability	Bern
Wohnheim Acherli	2595824	1199828	Ackerli	Disability	Bern
Zentrum Choisy	2599161	1199516	Kinderklinik/Frauenspital	Disability	Bern
Zentrum Schönberg AG	2602460	1200072	Schönberg-Ost	Elderly	Bern
Ausbildung	2683303	1252290	Seebach	Elderly	Zurich
Ausbildung	2683303	1252290	Seebach	Elderly	Zurich
Fachstelle für Freiwilligenarbeit	2683303	1252290	Seebach	Elderly	Zurich
Gesundheitszentren für das Alter	2683303	1252290	Seebach	Elderly	Zurich
Gesundheitszentrum für das Alter Bachwiesen	2679184	1248021	Albisrieden	Elderly	Zurich
Gesundheitszentrum für das Alter Balderen	2681212	1242293	Leimbach	Elderly	Zurich
Gesundheitszentrum für das Alter Bombach	2678877	1250903	Höngg	Elderly	Zurich
Gesundheitszentrum für das Alter Bullinger-Hardau	2680945	1248353	Hard	Elderly	Zurich
Gesundheitszentrum für das Alter Bürgerasyl-Pfrundhaus	2683628	1247978	Hochschulen	Elderly	Zurich
Gesundheitszentrum für das Alter Doldertal	2685184	1247685	Hottingen	Elderly	Zurich
Gesundheitszentrum für das Alter Dorflinde	2683844	1251386	Oerlikon	Elderly	Zurich
Gesundheitszentrum für das Alter Eichrain	2683618	1253701	Seebach	Elderly	Zurich

Gesundheitszentrum für das Alter Entlisberg	2682244	1243207	Wollishofen	Elderly	Zurich
Gesundheitszentrum für das Alter Gehrenholz	2680981	1246474	Friesenberg	Elderly	Zurich
Gesundheitszentrum für das Alter Grünau	2679373	1249902	Altstetten	Elderly	Zurich
Gesundheitszentrum für das Alter Herzogenmühle	2685681	1251323	Schwamendingen-Mitte	Elderly	Zurich
Gesundheitszentrum für das Alter Käferberg	2681295	1250363	Wipkingen	Elderly	Zurich
Gesundheitszentrum für das Alter Kalchbühl	2682830	1243224	Wollishofen	Elderly	Zurich
Gesundheitszentrum für das Alter Klus Park	2685050	1246604	Hirslanden	Elderly	Zurich
Gesundheitszentrum für das Alter Langgrüt	2680137	1247399	Albisrieden	Elderly	Zurich
Gesundheitszentrum für das Alter Laubegg	2681202	1245772	Friesenberg	Elderly	Zurich
Gesundheitszentrum für das Alter Limmat	2682411	1249028	Gewerbeschule	Elderly	Zurich
Gesundheitszentrum für das Alter Mathysweg	2678974	1248241	Albisrieden	Elderly	Zurich
Gesundheitszentrum für das Alter Mattenhof	2687217	1250541	Hirzenbach	Elderly	Zurich
Gesundheitszentrum für das Alter Mittelleimbach	2681363	1242236	Leimbach	Elderly	Zurich
Gesundheitszentrum für das Alter Oberstrass	2683687	1249793	Oberstrass	Elderly	Zurich
Gesundheitszentrum für das Alter Riesbach	2685976	1245242	Weinegg	Elderly	Zurich
Gesundheitszentrum für das Alter Selnau	2682627	1247187	City	Elderly	Zurich
Gesundheitszentrum für das Alter Stampfenbach	2683083	1249035	Unterstrass	Elderly	Zurich
Gesundheitszentrum für das Alter Sydefädeli	2681467	1249953	Wipkingen	Elderly	Zurich
Gesundheitszentrum für das Alter Trotte	2681539	1250078	Wipkingen	Elderly	Zurich
Gesundheitszentrum für das Alter Wildbach	2684502	1245755	Mühlebach	Elderly	Zurich
Gesundheitszentrum für das Alter Witikon	2687892	1245612	Witikon	Elderly	Zurich
Gesundheitszentrum für das Alter Wolfswinkel	2681084	1253126	Affoltern	Elderly	Zurich
HR Marketing und Gewinnung	2683303	1252290	Seebach	Elderly	Zurich
Pflegewohngruppe Brunnenpark	2682659	1251097	Unterstrass	Elderly	Zurich
Pflegewohngruppe Felsenrain	2683429	1252454	Seebach	Elderly	Zurich
Pflegewohngruppe Grünmatt	2680440	1246275	Friesenberg	Elderly	Zurich
Pflegewohngruppe Hausäcker	2678428	1249330	Altstetten	Elderly	Zurich
Pflegewohngruppe Köschenrüti	2682953	1253722	Seebach	Elderly	Zurich
Pflegewohngruppe LieniHof	2682564	1243361	Wollishofen	Elderly	Zurich
Pflegewohngruppe Sunnige Hof	2679202	1247916	Albisrieden	Elderly	Zurich
Pflegewohngruppe Triemlipark	2680269	1246898	Friesenberg	Elderly	Zurich
Pflegewohngruppe Wolfswinkel	2681169	1253121	Affoltern	Elderly	Zurich
Pflegewohngruppen	2681265	1246392	Alt-Wiedikon	Elderly	Zurich
Schulungszentrum Gesundheit	2681265	1246392	Alt-Wiedikon	Elderly	Zurich
Schulungszentrum Gesundheit der Stadt Zürich	2681265	1246392	Alt-Wiedikon	Elderly	Zurich

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