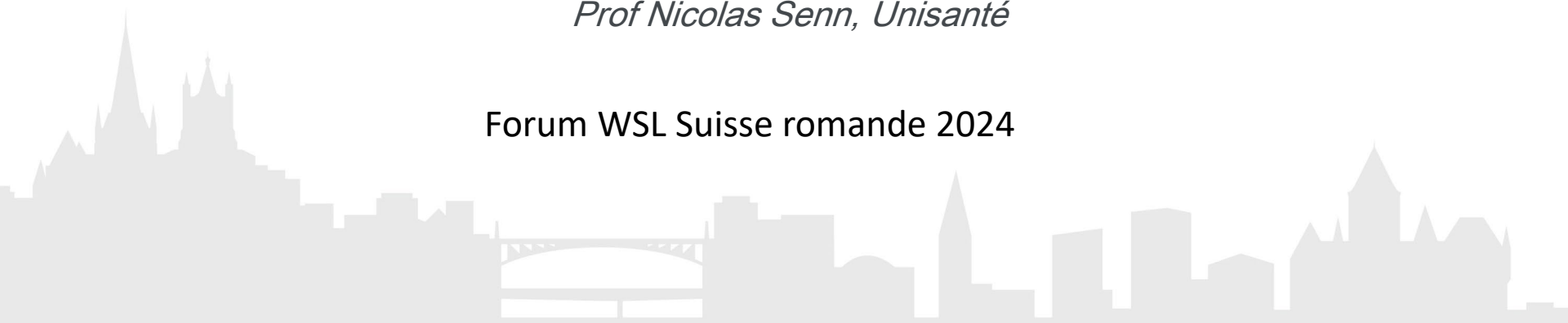


Être en bonne santé en ville

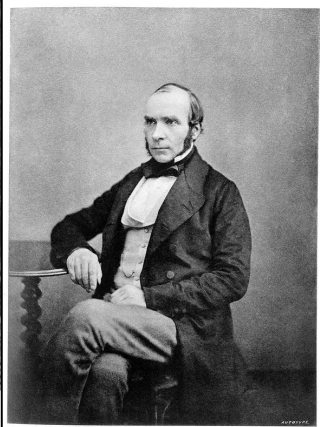
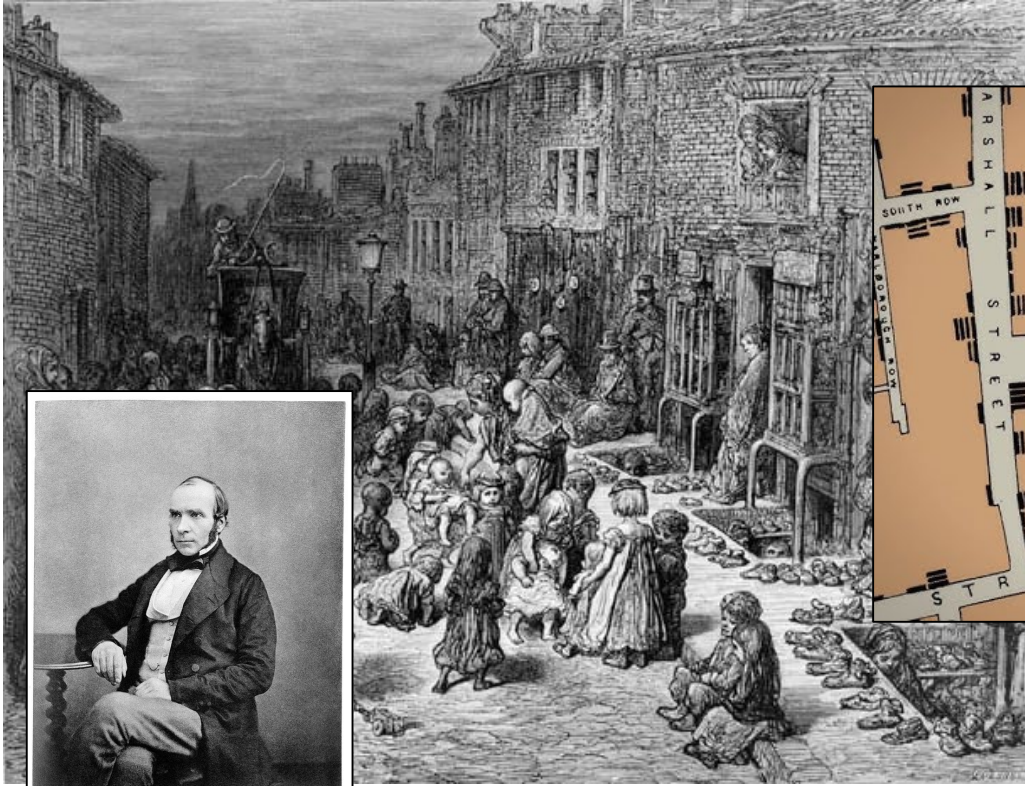
...et comment les espaces verts y contribuent

Prof Nicolas Senn, Unisanté

Forum WSL Suisse romande 2024

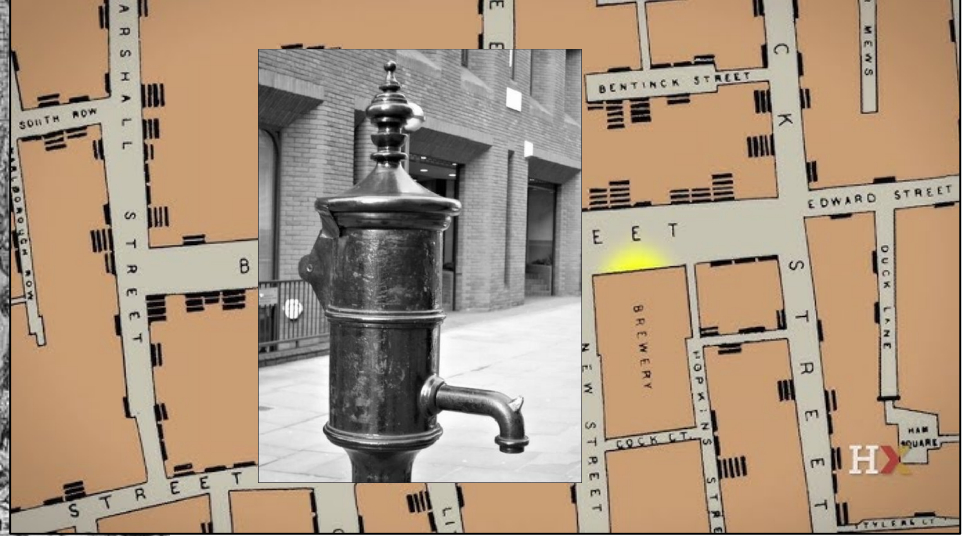


La santé en ville... En 1854 le Choléra



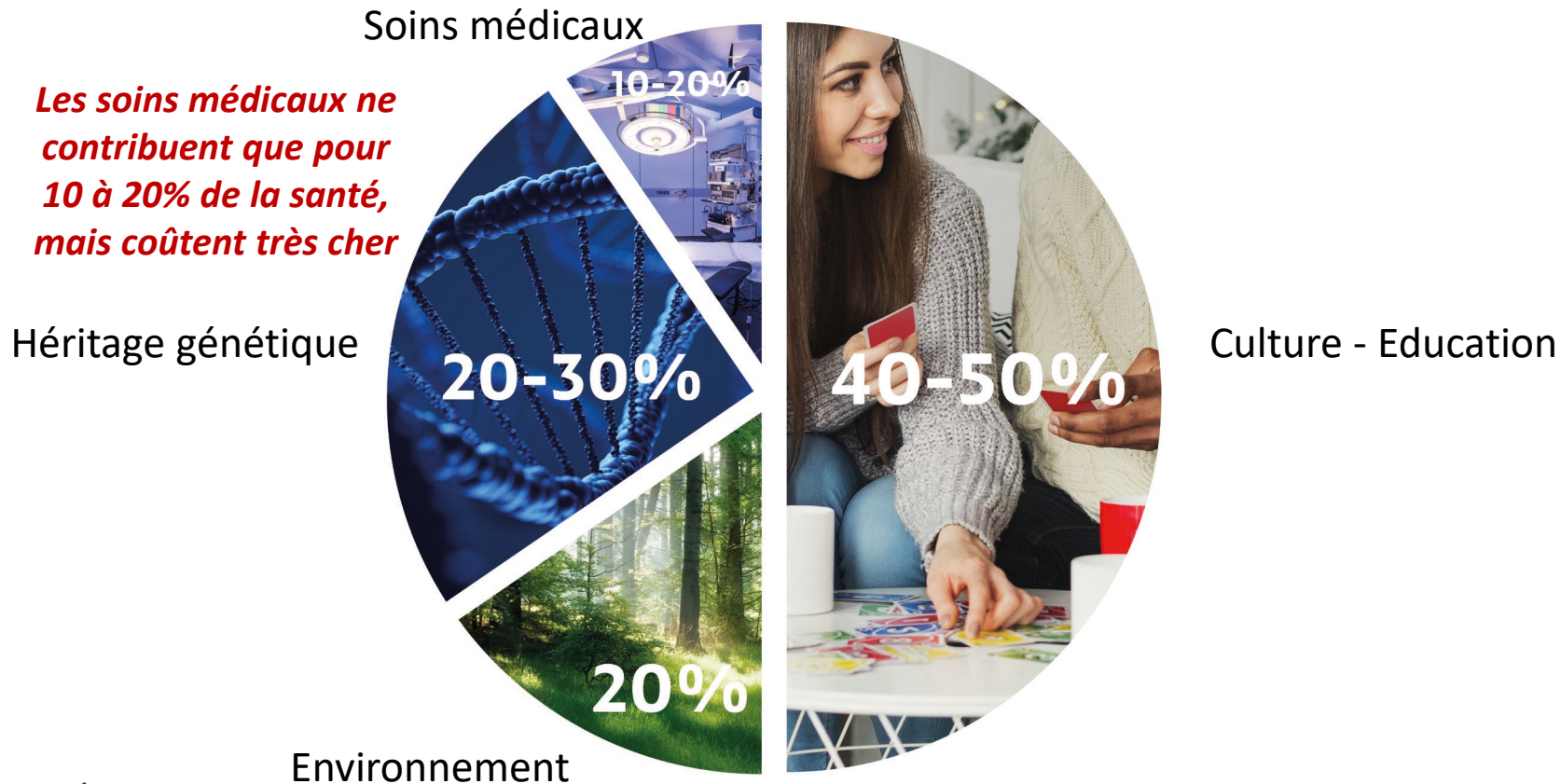
John Snow

(Phototype from a *Grandson Portrait*, 1856, and *Autograph*
Facsimile—B. W. E.)



Les liens (complexes) entre santé et environnement

Ce qui fait notre santé



De multiples concepts pour caractériser la relation de l'humain à la nature

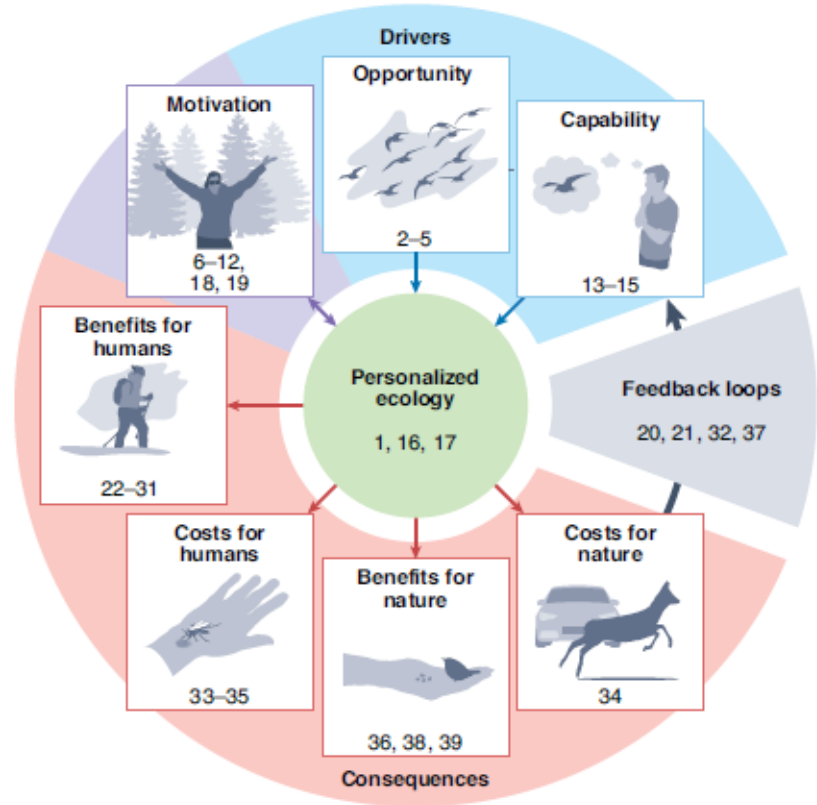


Fig. 2 | A unified conceptual framework for understanding the dynamics of direct human-nature interactions. This consists of four

Parmi les nombreux concepts...

- Biophilie
- Écologie personnalisée
- Hypothèse des vieux amis
- Syndrome de déficit de nature
- Théorie de la restauration de l'attention
- Hypothèse du réensemencement du microbiome
- Interventions basées sur la nature
-

Effet sur la mortalité de l'exposition à la végétation

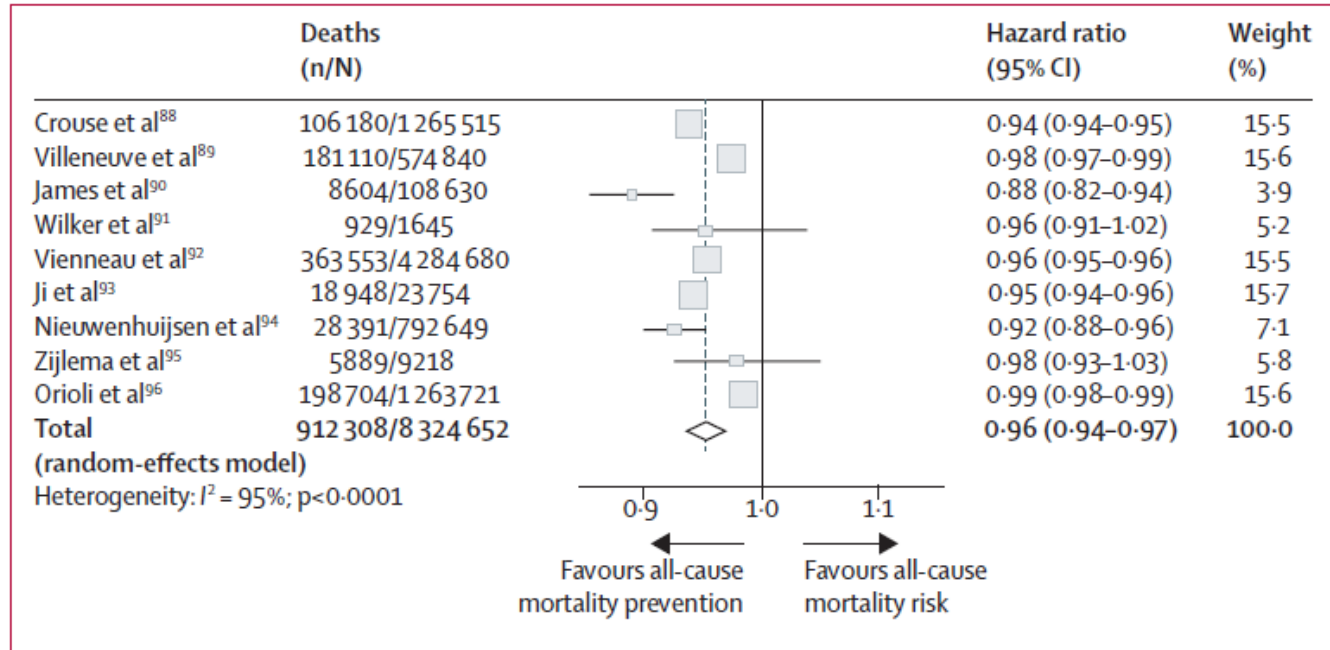
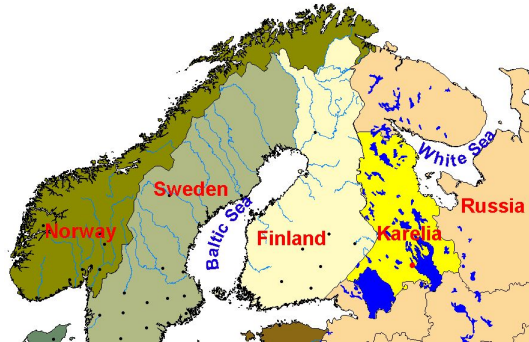


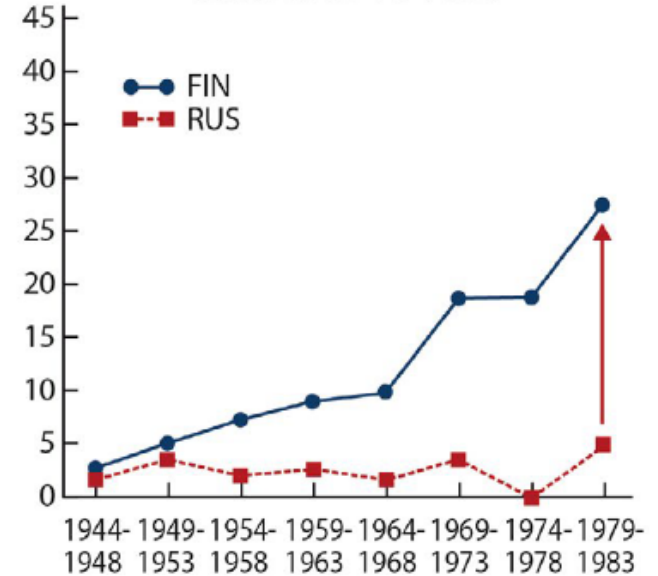
Figure 2: Meta-analysis of the association between greenness and all-cause mortality for each 0.1 increment of normalised difference vegetation index in less than 500 m from the participant's residence

The size of the square for each estimated hazard ratio in the plot is proportional to the weight of the study, which indicates its relative impact on the calculations of the common effect. Some 95% CI lines are not visible because the data have narrow CIs.

Allergie au bouleau et biodiversité en Carélie



**Sensitization to birch pollen in adults
in Finnish and Russian Karelia
born in 1944-1983**



Ref: Haahtela, T. (2019). "A biodiversity hypothesis."

**Comment expliquer les liens entre la
santé et la biodiversité/nature?**

Exposition

Niveau de
biodiversité /nature

Comportements
et habitudes

Expériences,
valeurs et
représentations

“exposition” globale à la biodiversité

Effets

Effets directs

Réduit ou augmente les risques
Restaurer les capacités (attention,...)
Améliore les capacités (activité physique,...)

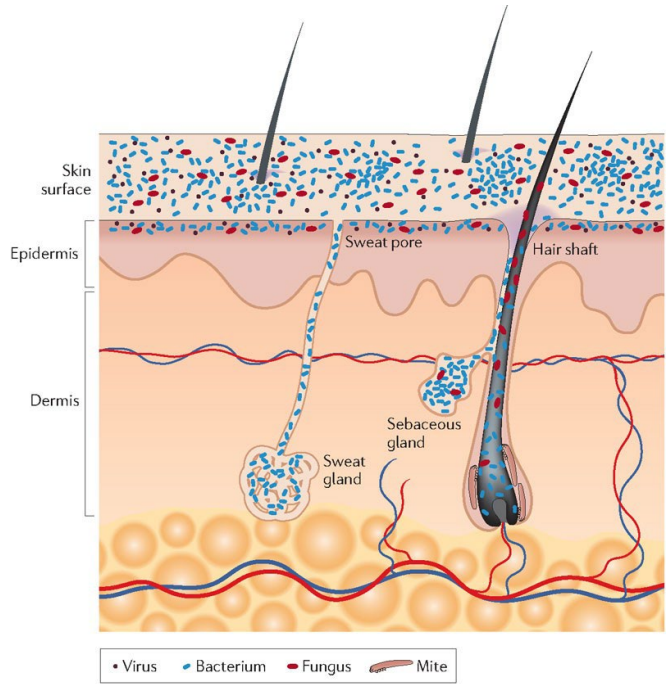
Les médiateurs

microbiote

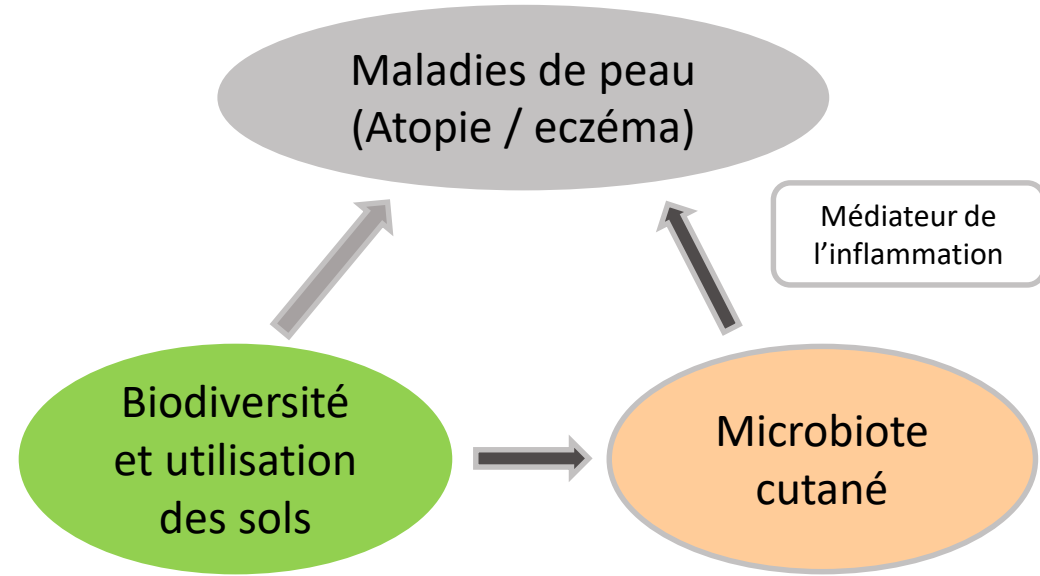
épigénétique

Santé et bien-être

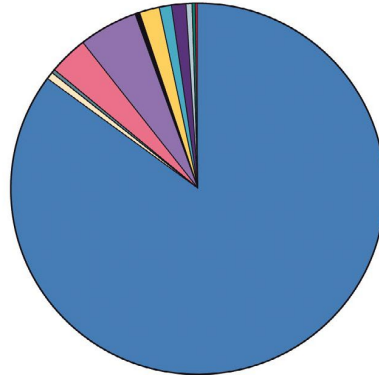
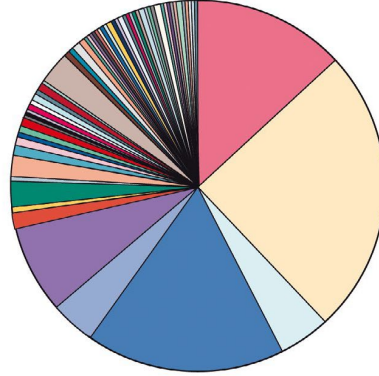
La qualité de notre microbiote dépend de l'environnement



Nature Reviews | Microbiology



Biodiversité, microbiote et maladies de peau



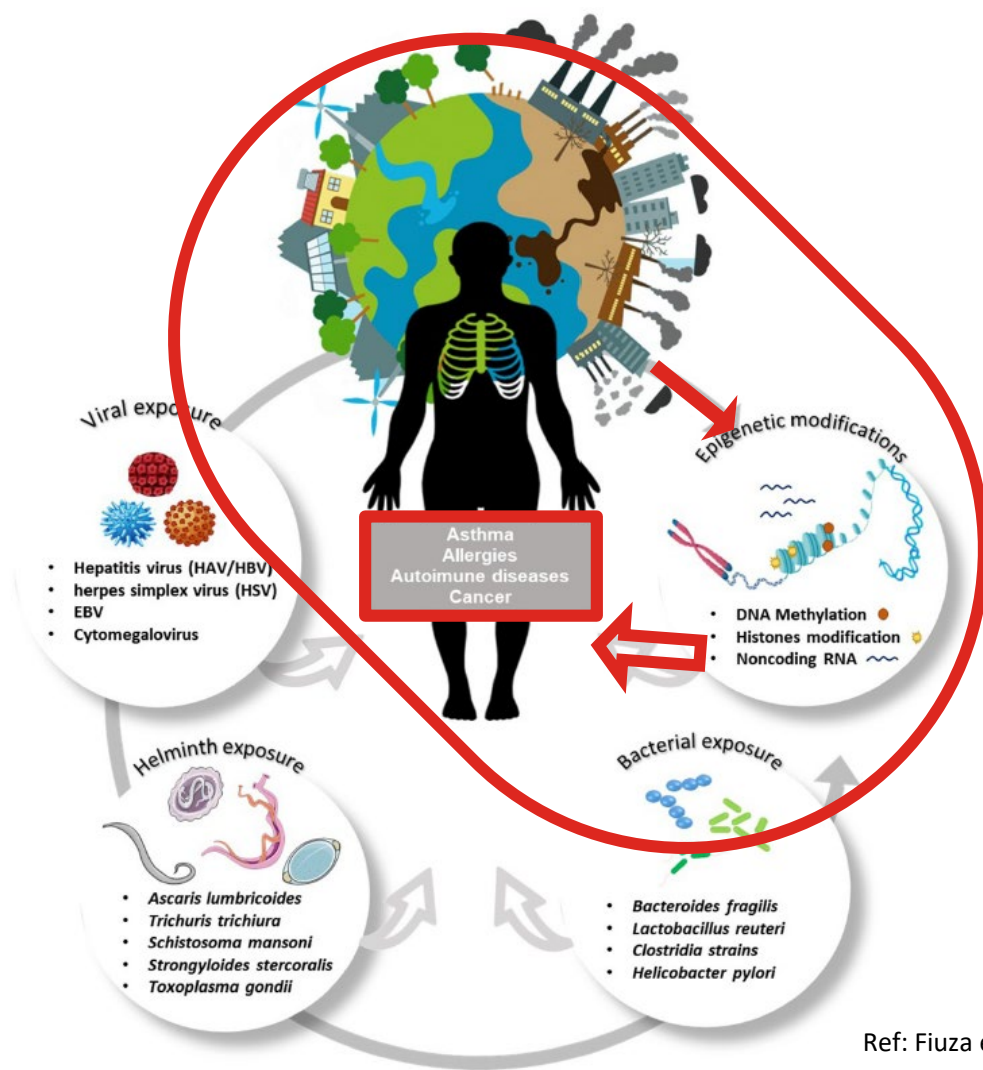
Épigénétique

Modification de l'expression de certains gènes, sans modification de l'ADN lui-même (c'est réversible!)



Va avoir un impact sur le vieillissement (=horloge biologique) et l'apparition de certaines maladies

unisanté



La santé en ville

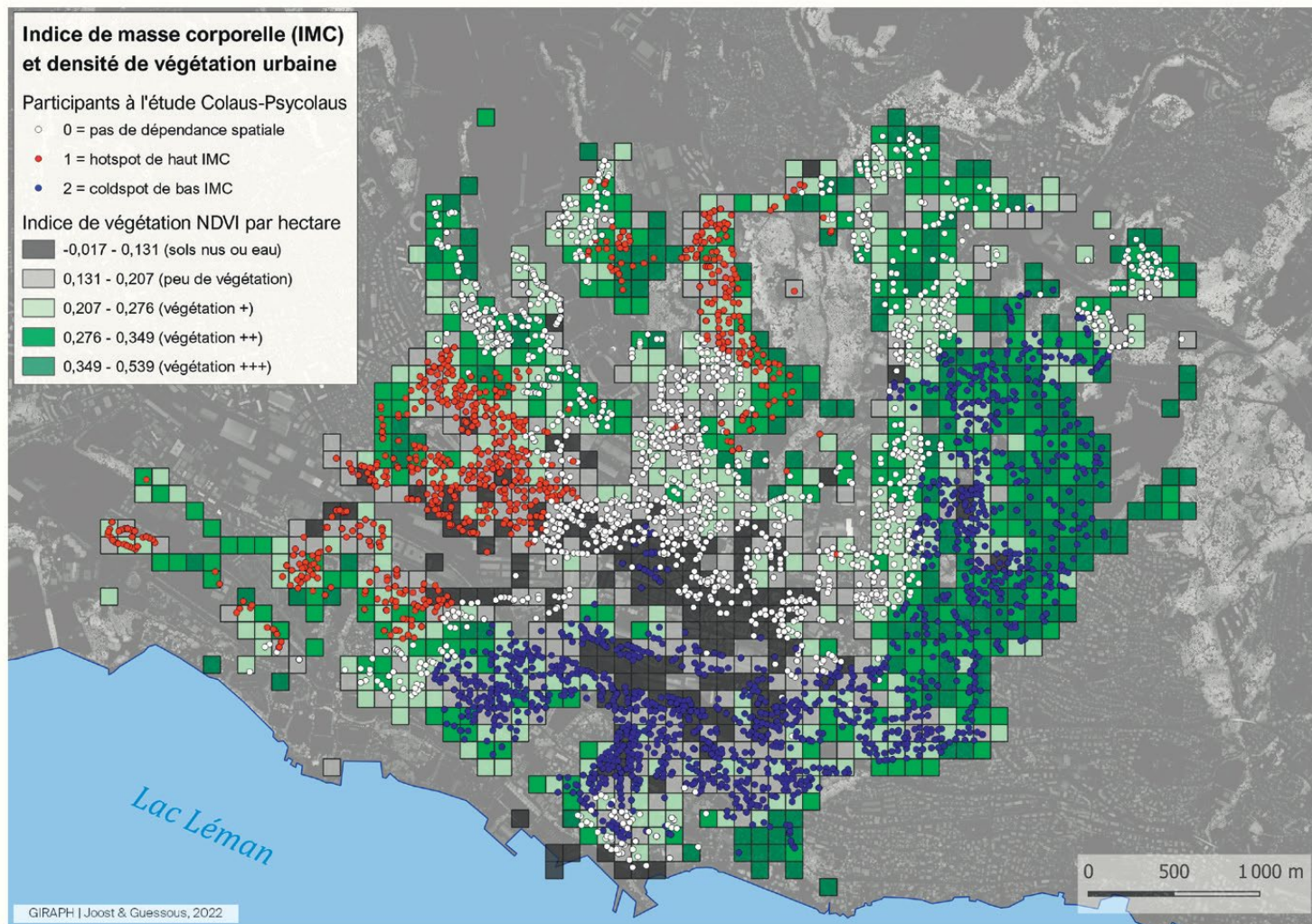
Indice de masse corporelle (IMC) et densité de végétation urbaine

Participants à l'étude Colaüs-Pyscolaus

- 0 = pas de dépendance spatiale
- 1 = hotspot de haut IMC
- 2 = coldspot de bas IMC

Indice de végétation NDVI par hectare

- -0,017 - 0,131 (sols nus ou eau)
- 0,131 - 0,207 (peu de végétation)
- 0,207 - 0,276 (végétation +)
- 0,276 - 0,349 (végétation ++)
- 0,349 - 0,539 (végétation +++)



Chapitre 18 Géomédecine
environnementale pour la mise
en relation des données de
santé avec les caractéristiques
des lieux de résidence -
Stéphane Joost et al.



la santé en ville (1): Espaces verts

TABLE 2 | Greenspace interventions identified across articles included in the review (Switzerland, 2024).

Intervention type	Corresponding studies
Greenspace	
<i>Land openly accessible to the public that are designed to provide a natural environment for community members and access to spaces for recreation uses</i>	
Access or proximity to greenspace, greenness	(6,14–52)
<i>Degree to which individuals, communities, or environments are connected to and surrounded by greenspaces and vegetation, common proxy measures include the NDVI</i>	
Parks and community gardens	(53–60)
<i>Park: public garden or area of land for recreation Community gardens: small plots of land integrated in urban neighborhoods managed collaboratively by residents</i>	
Urban greenspace or infrastructure	(5–8,10,18,21,56,61–72)
<i>Vegetated land that surrounds or separates areas of concentrated residential or commercial activity</i>	
Density, diversity and quality of greenspace	(7,8,51,61,62,68,73–84)
<i>Includes the density and diversity of biotic integrity (such as species richness and heterogeneity, and habitat heterogeneity), or pleasing aesthetic aspects of greenspaces, such as depth and lushness</i>	
Playground	(14,32,85–87)
<i>Public space designed for engagement of children in play, recreation and physical activity</i>	
Blue space	
<i>Visible surface waters in public space, including streams, lakes, rivers, waterfalls, etc.</i>	
Access or exposure to blue space	(23,35,51,88–92)
Green and blue space	
Exposure to green and blue space	(10,20,21,32,35,62,88,93–96)
Nature-based interventions	
Physical activity and exercise interventions	(97–110)
<i>Health interventions focused on promoting physical activity in greenspaces</i>	
Walkability and cycling routes	(111–113)
<i>Walkability: ease and convenience with which people can walk within a particular environment</i>	
Nature-based therapy (green care)	(22,97,114–123)
<i>Also known as green prescription or nature prescription which refers to a recommendation from a health or social professional for a patient to spend a fixed amount of time in a natural setting</i>	
Contact with nature	(7,8,18,124–126)
<i>Direct and intentional engagement or interaction between individuals and the natural environment</i>	
Confounding factors	
Income and socioeconomic status	(7,8,24,61,113,127)
Gender	(8,128,129)
Ethnicity	(127,130)

Un grand nombre
d'interventions
différentes étudiées

Espaces verts urbains et mortalité

- Selon l'OMS: les espaces verts (min 0.5 hectares) devraient être à accessible à moins 300m de distance linéaire du lieu de résidence.
- Une étude estime à 43'000 le nombre de décès prématurés/an évitables dans env. 1000 villes européennes si la recommandation de l'OMS était respectée (selon NDVI)

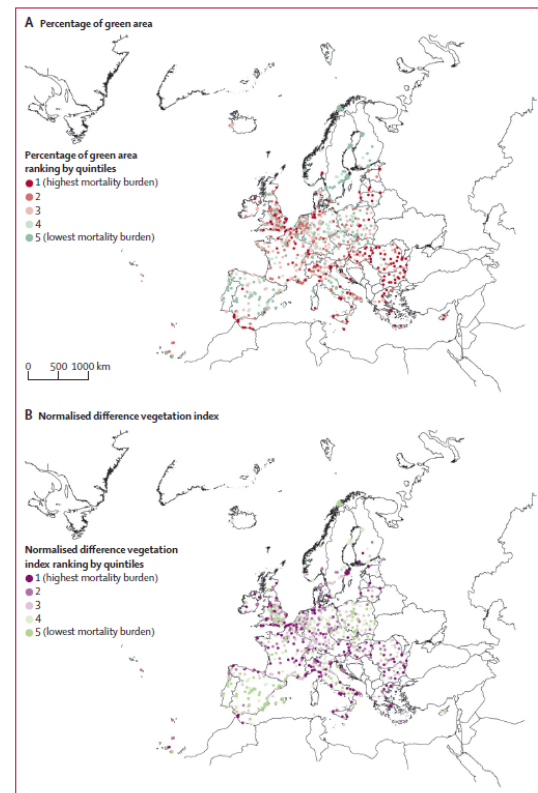


Figure 3: Cities and greater cities ranked from highest (first quintile) to the lowest (fifth quintile) mortality burdens based on the principal component analysis score

	Impact group (quintile)	City ranking	NDVI level (mean)	Target NDVI	Population below target NDVI (%)	Annual preventable deaths (n; 95% CI)	Annual preventable age-standardised mortality rate (deaths per 100 000 inhabitants; 95% CI)	Annual preventable impact on deaths (%; 95% CI)	Years of life lost (per 100 000 inhabitants; 95% CI)
Brussels (Belgium)	1	5	0.47	0.52	78.5	426 (321-632)	54 (41-80)	5.0% (3.8-7.4)	464 (350-688)
Copenhagen (Denmark; greater city)	1	9	0.53	0.55	76.5	437 (329-649)	46 (35-69)	4.0% (3.0-5.9)	462 (348-685)
Budapest (Hungary)	1	12	0.49	0.51	76.6	746 (562-1109)	50 (37-74)	3.5% (2.6-5.2)	450 (339-669)
Paris (France; greater city)	1	17	0.42	0.48	86.4	1918 (1446-2850)	36 (27-53)	4.9% (3.7-7.3)	378 (285-561)
Athens (Greece; greater city)	1	18	0.29	0.32	87.7	1431 (1074-2141)	42 (32-63)	3.5% (2.6-5.2)	485 (364-726)
Riga (Latvia)	1	28	0.50	0.50	72.4	227 (170-338)	42 (32-63)	2.9% (2.2-4.3)	432 (325-644)
Tallinn (Estonia)	1	61	0.51	0.51	70.8	108 (81-161)	37 (28-55)	2.8% (2.1-4.2)	355 (267-529)
Vienna (Austria)	1	69	0.47	0.49	61.4	464 (349-690)	34 (26-51)	3.0% (2.3-4.5)	322 (242-479)
London (UK; greater city)	1	72	0.52	0.54	76.6	1712 (1288-2550)	33 (25-49)	3.6% (2.7-5.3)	266 (200-397)
Bucharest (Romania)	1	77	0.40	0.44	78.5	470 (353-703)	38 (29-57)	2.7% (2.1-4.1)	301 (226-451)
Amsterdam (Netherlands)	1	108	0.49	0.51	69.5	187 (141-279)	33 (25-49)	3.0% (2.3-4.5)	255 (192-381)
Sofia (Bulgaria)	1	146	0.48	0.48	73.7	247 (185-371)	35 (26-52)	2.2% (1.6-3.2)	269 (202-403)
Stockholm (Sweden; greater city)	1	150	0.58	0.54	65.5	329 (248-490)	28 (21-42)	2.9% (2.2-4.3)	237 (179-353)
Rome (Italy)	1	155	0.47	0.44	68.5	649 (488-970)	26 (20-39)	2.6% (2.0-3.9)	287 (215-428)
Berlin (Germany)	1	168	0.53	0.54	65.2	763 (573-1139)	28 (21-42)	2.4% (1.8-3.6)	274 (206-409)
Oslo (Norway)	2	239	0.53	0.53	55.3	185 (78-456)	28 (23-43)	3.4% (1.6-3.4)	198 (118-385)
Zurich (Switzerland; greater city)	2	268	0.56	0.55	60.1	107 (81-160)	22 (17-33)	2.4% (1.8-3.6)	205 (155-306)
Vilnius (Lithuania)	2	269	0.55	0.50	52.4	99 (75-148)	26 (19-38)	1.9% (1.4-2.8)	230 (173-344)
Dublin (Ireland; greater city)	2	282	0.62	0.57	58.8	174 (131-259)	26 (19-38)	2.2% (1.7-3.3)	177 (133-262)
Lisbon (Portugal; greater city)	2	301	0.38	0.35	72.1	355 (266-533)	22 (16-33)	1.9% (1.5-2.9)	234 (176-351)
Bratislava (Slovakia)	2	314	0.51	0.51	61.2	68 (51-102)	26 (19-39)	1.8% (1.4-2.7)	200 (150-299)
Luxembourg (Luxembourg)	3	359	0.52	0.49	50.8	14 (11-21)	21 (16-31)	2.1% (1.6-3.2)	180 (135-269)
Zagreb (Croatia)	3	366	0.60	0.53	52.7	143 (107-214)	23 (18-35)	1.7% (1.3-2.6)	195 (146-292)
Warsaw (Poland)	3	495	0.49	0.47	62.6	271 (203-406)	18 (14-27)	1.5% (1.2-2.3)	187 (140-281)
Valletta (Malta)	3	518	0.24	0.25	75.0	24 (18-37)	19 (14-28)	1.6% (1.2-2.4)	162 (121-244)
Helsinki (Finland; greater city)	4	521	0.52	0.47	55.3	128 (96-191)	17 (13-26)	1.7% (1.3-2.6)	153 (115-228)
Madrid (Spain; greater city)	4	538	0.32	0.32	66.6	620 (465-932)	15 (12-23)	1.7% (1.3-2.5)	156 (117-235)
Ljubljana (Slovenia)	4	561	0.58	0.51	49.0	34 (26-51)	15 (11-23)	1.6% (1.2-2.4)	148 (111-221)
Prague (Czech Republic)	4	562	0.55	0.51	44.1	175 (132-262)	17 (13-26)	1.4% (1.1-2.2)	147 (110-219)
Reykjavik (Iceland)	4	616	0.37	0.38	64.9	20 (15-29)	15 (11-23)	1.6% (1.2-2.4)	120 (90-181)
Lefkosia (Cyprus)	5	835	0.23	0.23	68.2	11 (8-17)	8 (6-12)	0.7% (0.5-1.0)	52 (39-79)

NDVI=normalised difference vegetation index.

Table 2: Preventable mortality burden due to the increase in normalised difference vegetation index (NDVI) in the 31 European capitals, from highest (top) to lowest (bottom) burden

Jardins communautaires

Effects of a community gardening intervention on diet, physical activity, and anthropometry outcomes in the USA (CAPS): an observer-blind, randomised controlled trial

Jill S Litt, Katherine Alaimo*, Kylie K Harrall, Richard F Hamman, James R Hébert, Thomas G Hurley, Jenn A Leiferman, Kaigang Li, Angel Villalobos, Eva Coringrato, Jimikaye Beck Courtney, Maya Payton, Deborah H Glueck*



Ref: [Biodiversity and Allotments: Gardening in harmony with Nature - apse](#)

Interventions basées sur la nature

NIHR | National Institute for Health Research

European Centre for Environment & Human Health

UKRI Medical Research Council



A HANDBOOK FOR NATURE ON PRESCRIPTION TO PROMOTE MENTAL HEALTH

<https://www.eceh.org/research/nature-prescription-handbook/>
FULLAM, J, HUNT, H, LOVEALL, R, HUSK, K, BYNG, R, RICHARDS, D, BLOOMFIELD, D, WARBER, S, TARRANT, M, LLOYD, J, ORR, M, BURNS, L, GARSIDE, R. (2021)

la santé en ville (2): Les infrastructures de mobilité



Limites des études actuelles

- Souvent basée sur *Normalized Difference Vegetation Index (NDVI)* plus que biodiversité
- Hétérogénéité des mesures de santé et d'exposition
- Etudes observationnelles /modélisation
- Peu d'étude sur une approche co-bénéfices

TABLE 2 | Identified mobility interventions (Switzerland, 2024).

Intervention type	Corresponding studies
Built environment	
<i>Human-made features and physical infrastructure in which people live, work and carry out recreational activities</i>	
Walking infrastructure	(8–21)
Cycling infrastructure	(22–35)
Walking and cycling infrastructure	(36–46)
Access and proximity	(12, 14, 20, 28, 47–53)
<i>The distance between the current location and target location as well as the ease with which it can be covered</i>	
Play-infrastructure	(40, 52, 54–56)
<i>Includes for example, playgrounds, outdoor areas facilitating children's play, as well as sports facilities</i>	
Car-related infrastructure	(43, 44, 57–60)
<i>Includes for example, car parking, crossroads and busy roads</i>	
Pollution and noise exposure	(51, 61–79)
<i>Exposure to particulate matter less than 2.5 µm and to traffic noise exceeding national guidelines</i>	
Physical activity and active travel	
Travel to school	(47, 80–94)
Commuting to work	(57, 95–112)
Physical activity	(61–64, 113–137)
Confounding factors	
Income and socioeconomic status	(16, 17, 19, 37, 42, 48, 86, 93, 95, 138–140)
Gender	(23, 27, 39, 53, 92)
Ethnicity	(91)

Pour une approche intégrée de la santé et de l'urbanisme



Conclusion

- Passablement d'étude montrant les liens entre aménagement urbains (espaces verts, infrastructures de mobilité) et la santé
- Une marge importante, même en Suisse, pour améliorer l'accès aux espaces verts de la population dans les villes
- Nécessaire de développer des interventions conjointes de l'urbanisme, l'environnement et la santé (approches co-bénéfices)

«Le monde inquiet dénonce
l'invasion des êtres venus
d'ailleurs. Étrangers, plantes,
animaux, comment osez-vous
gagner nos terres ?»

Gilles Clément, *Eloge des
vagabondes*



Coloco | Image : Gilles Clément