



PRESSURE POINTS

Call for simultaneous
**ACTION ON DIABETES
AND HYPERTENSION** for more
resilient health systems



ACKNOWLEDGEMENTS

This policy brief has been developed by the NCD Alliance, International Diabetes Federation and World Heart Federation and has received input from the American College of Cardiology, American Heart Association, FDI World Dental Federation, International Federation of Psoriasis Associations, George Institute for Global Health, Resolve to Save Lives, Union for International Cancer Control and World Obesity Federation as well as from members of NCD Alliance's Peer Learning Advocacy Network on an Inclusive NCD Agenda.

Table of contents

Policy background	6
Common co-morbidities for people living with diabetes or hypertension	8
The current situation: Challenges for people living with diabetes and hypertension and the costs of inaction	10
The case for action: Opportunities and benefits of timely diagnosis and treatment of co-morbidities	14
Call to preventative action on diabetes, hypertension and their co-morbidities	16

© 2021 NCD Alliance

Published by the NCD Alliance

Editorial coordination: Jimena Márquez and Jennifer Bajdan

Design, layout and infographics: Mar Nieto



NCD Alliance
31-33 Avenue Giuseppe Motta,
1202 Geneva, Switzerland

www.ncdalliance.org





Call for simultaneous action on diabetes and hypertension for more resilient health systems

Noncommunicable diseases (NCDs) are on the rise and now constitute seven of the world's top 10 causes of death.⁽¹⁾ This group of diseases kills around 41 million people every year, and causes half of all global disability. Almost one quarter of all people worldwide live with at least one NCD, including 463 million people who live with diabetes and 1.13 billion people living with hypertension (commonly known as high blood pressure, a chronic condition and risk factor for NCDs).⁽²⁾⁽³⁾⁽⁴⁾ Many of these people live with both conditions, as they commonly occur together. Diabetes is now among the top 10 causes of death worldwide – deaths from diabetes have increased by 70% since 2000.⁽¹⁾ The major cause of morbidity and mortality in people living with diabetes is heart disease, which is exacerbated by hypertension.

Co-morbidity, where a person lives with one or more disease or condition at the same time, is increasingly becoming the norm globally, and the number of people living with more than one NCD has steadily increased over the past 20 years. Diabetes and hypertension for example commonly occur together, and both are linked to a wide range of other NCDs, due to complications or being triggered by the same risk factors. This policy brief therefore makes the case for simultaneous action for both conditions as an opportunity for decision-makers to achieve an exponential positive impact on wellbeing, health systems strengthening and sustainable development.

The urgency and opportunity for action on NCDs has never been greater. The majority of people who have died from COVID-19 were living with underlying NCD conditions, most commonly hypertension, cardiovascular disease or diabetes. People living with multiple chronic conditions have been found to be at significantly higher risk. The global COVID-19 pandemic disproportionately impacted people living with NCDs, due both to the links between COVID-19 and many NCDs and severe disruptions in almost all countries to timely diagnosis, treatment, care and support services. The pandemic has demonstrated the interconnections between NCDs and communicable diseases, and a need for integrated responses and solutions for health security and health systems resilience, both in terms of recovery and future preparedness.

2021 marks the centenary of the discovery of insulin – yet 100 years on and despite great strides in treatment, half of adults living with diabetes are undiagnosed and access to essential and affordable care for people living with diabetes remains a distant reality for many in low- and middle-income countries (LMICs). As for hypertension, even in high-income countries (HICs) the condition is only under medical control for one in five people.⁽⁵⁾



2021
100 YEARS
since the
DISCOVERY OF
INSULIN

◀ Health worker checking an elderly patient's blood pressure at her home during the COVID-19 outbreak

Policy background

Governments have made numerous political commitments to act on NCDs at United Nations (UN) High-Level Meetings on NCDs and via adoption of the WHO global NCD targets and the Sustainable Development Goals (SDGs).⁽⁶⁾⁽⁷⁾⁽⁸⁾⁽⁹⁾⁽¹⁰⁾⁽¹¹⁾⁽¹⁰⁾ However, progress at the national and regional levels remains far too slow and uneven: Fewer than twenty countries worldwide are on course to meet SDG target 3.4 to reduce premature mortality from NCDs. The rising tide of NCDs and co-morbidity has received insufficient investment, research and policy commitment, resulting in fragmented health systems, rising healthcare costs and poorer health outcomes.

If progress towards the SDGs and the goal of Universal Health Coverage (UHC) are to be achieved, sustained action on NCDs – including diabetes, hypertension and their co-morbidities – is essential.

“Personally, I have had challenges in managing two conditions at once, my diabetes and hypertension. Taking medication for both has resulted in a pill burden that has been particularly problematic for me, leading to anxiety, depression, low motivation and worse treatment outcomes.”

NCD advocate, Zimbabwe.

What is a co-morbidity?

Diseases or conditions that occur at the same time, in the same person. NCD co-morbidities can occur because diseases share the same risk factors, or because some diseases predispose individuals to developing others.⁽¹²⁾

People living with multiple NCDs – a growing, but underserved group

Co-morbidity is reported to affect between 13-95% of people accessing healthcare globally – such a wide range reveals just how little is known about the burden.⁽¹³⁾ Causes of co-morbidity are still insufficiently understood and research on the topic, particularly in LMICs, is scant. However, it is known that people living with one NCD are more likely to develop other NCDs, chiefly because of common risk factors and/or due to complications.⁽¹⁴⁾

89% of people living with diabetes and 68% of people living with hypertension also live with at least one additional NCD co-morbidity, commonly including heart disease, stroke, depression, dementia, oral disease and/or chronic renal disease.⁽¹⁵⁾⁽¹⁶⁾⁽¹⁷⁾ Many, but not all, of these comorbidities are due to a direct causal link (see page 8).

- The prevalence of people living with more than one NCD has steadily increased over the past 20 years to the extent that it is now common in HICs and increasingly recognised as a challenge in LMICs.⁽¹⁸⁾
- There is a strong link between people living with multiple NCDs and advanced age. The global population aged 65 years and older is expected to grow to 1.5 billion people by 2050, so can no longer be overlooked in global health and development discussions.⁽¹⁹⁾⁽²⁰⁾

Despite this, co-morbidity has not received sufficient attention in current global policies or commitments on NCDs, which has limited the recognition of the specific needs of people living with multiple NCDs in healthcare, NCD policies, research agendas and investment cases.⁽²¹⁾⁽²²⁾⁽²³⁾⁽¹⁹⁾



A Red Cross volunteer checks blood pressure in Mongolia.

Diabetes and hypertension, two sides of the same coin

- Diabetes and hypertension are closely interlinked, due to shared risk factors including obesity, vascular inflammation, and high cholesterol. This means that people living with diabetes are also likely to have hypertension and vice versa.
- Heart disease complications are also common for people living with diabetes and/or hypertension, and are related to microvascular disease* (such as chronic kidney, nerve and eye disease) and macrovascular disease† (such as stroke and diseases of vessels in the heart and lower limbs).⁽²⁴⁾
- People living with diabetes and/or hypertension are more likely to have an additional disease. For example, studies have shown that 75% of people had at least one additional co-morbidity at the time of their type 2 diabetes diagnosis and 44% had at least two other conditions.⁽²⁵⁾

Co-morbidities reveal underlying inequalities

Co-morbidities highlight inequalities at global and national levels, as they are more common in communities with fewer resources.⁽²⁶⁾

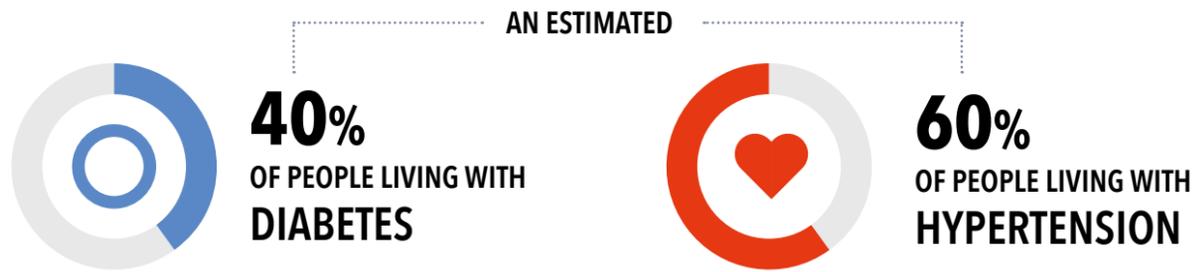
For example:

- Since its discovery 100 years ago, insulin has saved the lives of countless people living with diabetes; however, today only half of the 65 million people living with type 2 diabetes who need insulin are able to access it. Beyond this life-sustaining medication, a substantial number of people living with diabetes cannot access or afford the items needed to measure their blood glucose (e.g. glucometers, test strips, lancets) or the needles and syringes needed to safely administer insulin. This issue dramatically increases an individual's risk of diabetic complications, disability and premature death and is particularly noticeable in LMICs - home to 79% of people living with diabetes.⁽²⁷⁾
- Children and adolescents living with diabetes from families of lower socioeconomic status have a greater risk of chronic kidney disease and early death than those from better off families.⁽⁴⁾
- Lower socioeconomic status is also associated with increased risk of developing hypertension, and those who have received lower levels of education are twice as likely to have hypertension than people with higher educational levels.⁽²⁸⁾

* Microvascular disease is a disease of the finer blood vessels in the body, for example those found in the eyes, kidneys and feet.

† Macrovascular disease is a disease of the large blood vessels in the body, for example large arteries of the heart, brain and limbs.

Common co-morbidities for people living with diabetes or hypertension

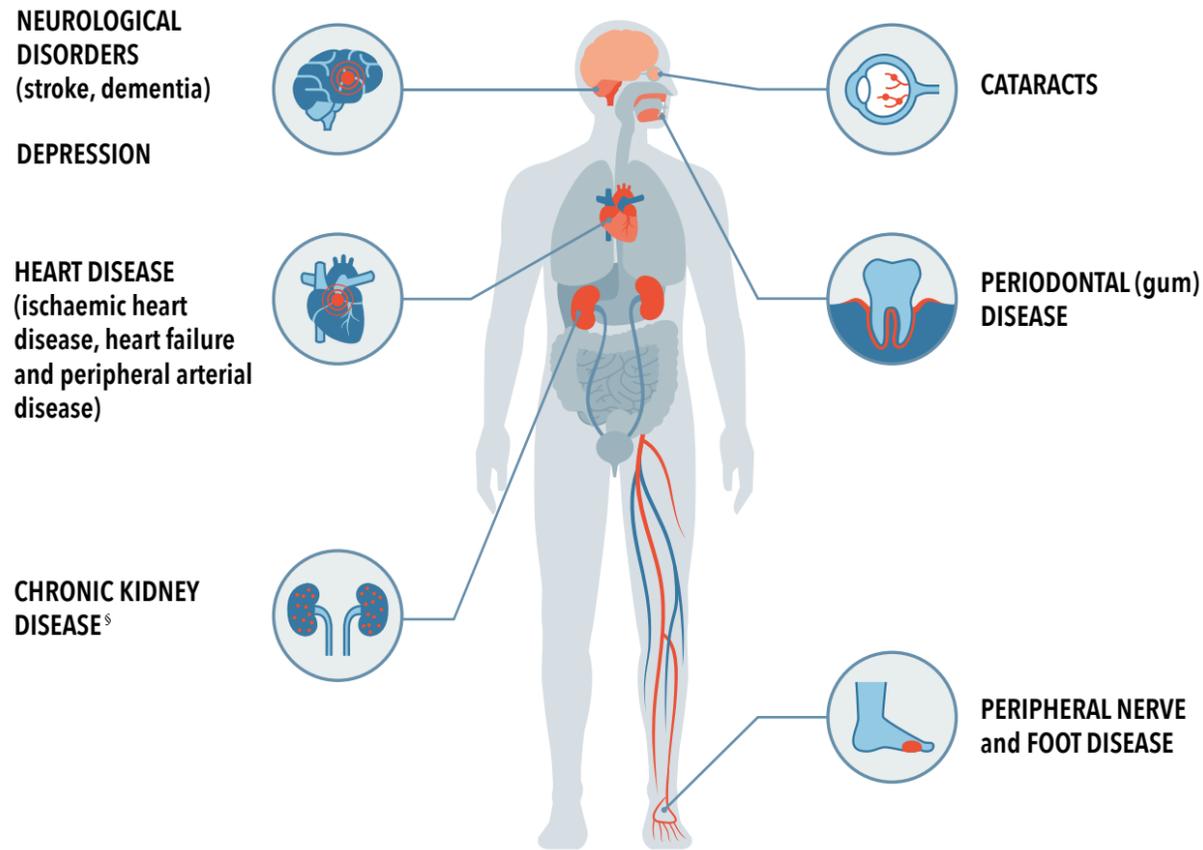


have co-morbidities that occur because of a direct causal link between the diseases or their risk factors

For example, obesity accounts for 80-85% of the overall risk of developing type 2 diabetes and high cholesterol.(12)(29)(15)(30)(18)‡

FREQUENT CO-MORBIDITIES OF DIABETES AND HYPERTENSION INCLUDE

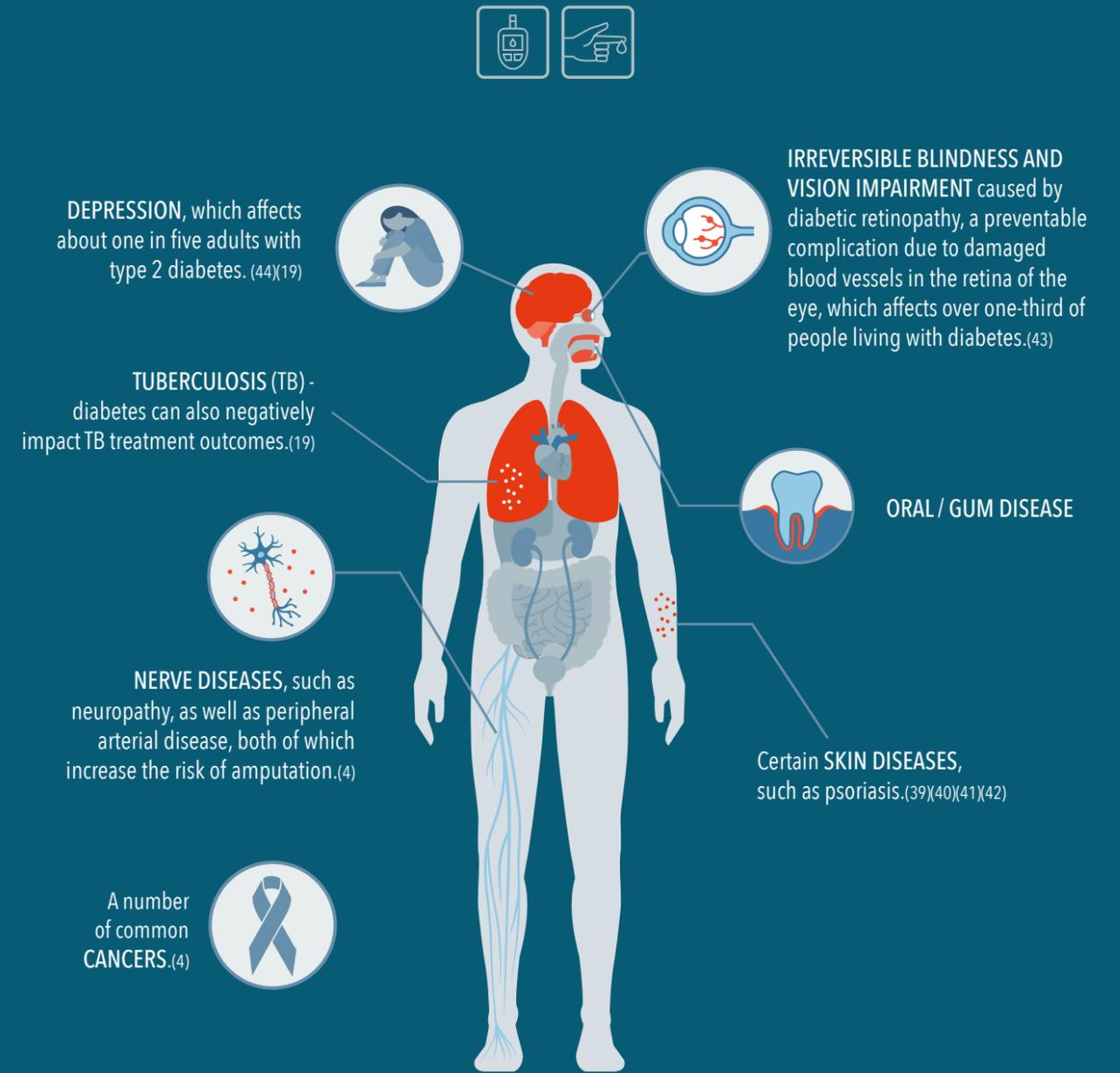
(15)(31)(32)(33)(34)(35)(36)(37)(38)(39)(40)



‡ In addition, some people living with diabetes and/or hypertension have co-morbidities that occur by chance or do not share similar risk factors. Sometimes, treatments for these diseases can negatively affect management of diabetes and/or hypertension.(23)(29)(15)(30)(18) This includes diseases and conditions such as hypothyroidism, osteoporosis or chronic obstructive pulmonary disease (COPD).(25)

§ Diabetes, hypertension, or a combination of both, cause 80% of end-stage kidney disease globally.(4)

PEOPLE LIVING WITH DIABETES are more likely to develop:



Complications and co-morbidities are highly preventable, if people living with diabetes and/or hypertension have access to timely, well-coordinated prevention, screening, diagnosis and care.

The current situation:

Challenges for people living with diabetes and hypertension and the costs of inaction

Co-morbidities necessitate navigating fragmented health systems that remain focused on treating single diseases

People living with multiple NCDs often have to navigate fragmented health systems, designed and structured around single disease management and parallel medical specialities. People living with multiple chronic conditions have different needs than those with a single chronic condition, requiring coordination of their medical management and support. This can be associated with contradictory medical advice; poor referral systems, causing some individuals to be lost during the follow-up; inefficient allocation of resources, such as over-prescribing and over-hospitalisation; and poorer patient outcomes, anxiety and frustration.

- On occasion, disease management plans can even act in opposition to each other. For example, some treatment options used for hypertension (Thiazide diuretics) can increase the risk of developing diabetes – although if well managed the benefits outweigh the risk, and some antipsychotics used to treat psychiatric diseases have been associated with increased risk of developing diabetes as well as cardiovascular diseases.⁽⁴⁾⁽¹⁹⁾ This puts people living with multiple NCDs at risk of errors of both omission (i.e. not providing people with the medical care required) and commission (i.e. prescribing a medication that adversely interacts with another medication).
- The situation is exacerbated by lack of guidance and training for medical staff on how to manage people living with multiple NCDs, which in part is due to the fact that people living with multiple NCDs are often excluded from randomised trials. ⁽¹⁹⁾ As a result, people living with multiple NCDs tend to experience a lower quality of care and lower quality of life outcomes.⁽¹⁵⁾⁽³¹⁾

“The focus of each of my days varies, as challenges flow from medical, pharmaceutical, social, emotional, physical, mental, and nutritional aspects, to self-love and hope.”

Advocate living with obesity, diabetes, autoimmune disorders and osteoporosis, Kuwait

Living with co-morbidities can negatively impact the ability to manage diabetes and/or hypertension

Co-morbidities can reduce management options available to treat individual diseases. They can also create barriers to self-care because of competing disease management priorities as well as logistical and time constraints. This can lead to a triggering or worsening of other conditions, creating limitations and lowering the quality of life. In turn, this can cause a more rapid decline in health and a greater likelihood of disability.⁽¹⁹⁾⁽¹⁸⁾



Rohan Arora lives with Type 1 Diabetes in India. He faces challenges each day, especially since the start of the COVID-19 pandemic.



PEOPLE LIVING WITH DIABETES are more likely to develop



ORAL DISEASES, SUCH AS GUM DISEASE, which leads to worse diabetes outcomes



and further increased risk of developing **HEART DISEASE** if left untreated ⁽³³⁾⁽⁴⁵⁾

Depression is common in people living with diabetes, causing them to be twice as likely to have poor adherence to medication, be at increased risk for work absenteeism, and have poorer health outcomes than those living with diabetes alone.⁽⁴⁴⁾⁽¹⁹⁾

Co-morbidities increase the costs of health and social care

“From hospitalization to regular purchase of medicines, it is always cash. This of course has been catastrophic for the family income. The medicines alone cost almost \$100 each month,” [relative to gross national income per capita of \$754 per year, 2017]

Advocate living with diabetes and CVD, Burundi

People living with co-morbidities often experience higher out-of-pocket (OOP) expenditures, which can commonly exceed the combined treatment costs of the individual diseases.⁽²⁶⁾ OOP expenditures are often catastrophic, pushing families into poverty in the absence of strong social protection systems, and particularly affect younger adults. As insurance schemes often do not stretch to manage co-morbidities, quality can be jeopardised through seeking cheaper options. In addition, people living with co-morbidities are more likely to be faced with impossible choices between paying for necessary treatment for their conditions or paying for family essentials such as food, heating or education.⁽⁴⁶⁾⁽¹⁹⁾⁽¹²⁾

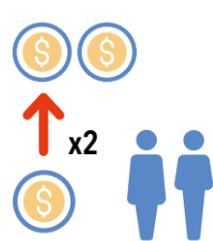
THE COST OF CARE for HYPERTENSION in the USA ranges from

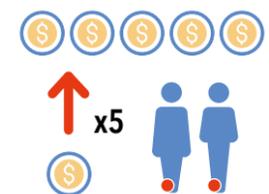
 **US\$ 3,914** mean per year for those with no co-morbidities

 to **US\$ 13,920** per year for those with three or more co-morbidities.⁽²⁸⁾

People living with **DIABETES** face higher OOP medication costs than people with almost any other chronic disease.

On top of this:

 **x2** The **HEALTH COSTS** of treating the **COMPLICATIONS OF DIABETES** is **DOUBLE** the direct health costs of treating diabetes itself.⁽³¹⁾⁽⁴⁾⁽⁴⁷⁾

 **x5** People with **DIABETIC FOOT ULCERS** bear five times higher health expenditures.⁽⁴⁾

For people living with diabetes and four or more co-morbidities, **THE COST OF CARE CAN BE 30 TIMES MORE THAN FOR PEOPLE WITH DIABETES** without co-morbidities.⁽³¹⁾⁽⁴⁾⁽⁴⁷⁾

Woman receiving eye care for diabetic retinopathy. ▶



Co-morbidities increase the risk of acute medical events and disability

Combinations of co-morbidities such as hypertension and diabetes greatly increase the likelihood of acute emergencies such as strokes, heart attacks, and acute heart or kidney failure. Such acute events alongside chronic complications, such as chronic kidney failure, retinopathy or peripheral neuropathy, increase the risk of disability, reduced quality of life, and increased need for medical care and societal support.

Diabetic retinopathy is the leading cause of irreversible blindness and vision impairment among working-age adults, despite being treatable through early detection and treatment.⁽⁴⁸⁾⁽⁴³⁾ Although other causes of blindness decreased between 1990 and 2020, diabetic retinopathy-related blindness increased by 68%, mainly in LMICs.⁽⁴⁹⁾

Diabetic complications are among the most common causes of amputations worldwide. Worldwide on average, one person living with diabetes loses a lower limb to amputation every 30 seconds.⁽⁴⁾

The case for action:

Opportunities and benefits of timely diagnosis and treatment of co-morbidities

The increasing number of people living with more than one NCD is a rising public health challenge, which must be met with comprehensive policies for the timely prevention and management of diabetes and hypertension. Action at the national level provides an opportunity for governments and policy makers to simultaneously tackle co-morbidity, strengthen existing diabetes and hypertension programmes, and in turn reform health systems to better respond to NCDs and provide integrated services.

Policymakers have the opportunity to:

Ensure timely diagnosis and treatment of diabetes and hypertension before costly co-morbidities cause further suffering, loss of productivity and negative economic impact.

Improvements in care for people with diabetes and hypertension, prevention of complications before they develop (primary prevention), as well as screening for, early detection and prompt treatment of complications when they arise (secondary prevention), promise to improve quality of life and to be highly cost effective.⁽⁴⁾⁽⁵⁰⁾ It is important to routinely include preventable co-morbidities in cost-benefit and return-on-investment calculations for diabetes and hypertension interventions to make a clearer case for investment.

Adequate **CONTROL OF SUGARS** can **REDUCE RISK OF AMPUTATION** by over a third.⁽⁴⁾



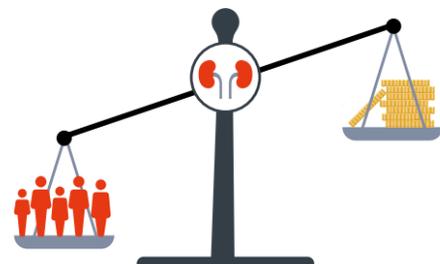
Adequate **CONTROL OF BLOOD SUGAR** and **BLOOD PRESSURE**

REDUCES THE RISK of developing

HEART DISEASE and **CHRONIC KIDNEY DISEASE**, and their associated high costs health systems.⁽⁴⁾⁽³⁸⁾



DIALYSIS and **KIDNEY TRANSPLANTATION** alone range between **US \$35,000** and **US \$100,000 per PATIENT**, which is unaffordable for governments and individuals in many parts of the world.⁽⁵¹⁾⁽⁴⁾



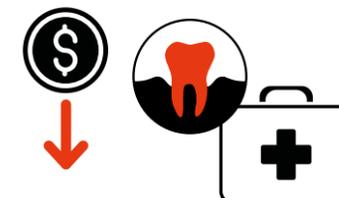
Adequate **CONTROL** combined with **EARLY DETECTION** and timely **TREATMENT** of vision-threatening **DIABETIC RETINOPATHY** can **PREVENT**



In people living with diabetes, screening, **PREVENTION** and **TREATMENT** of **DEPRESSION** results in better self-management and improved quality of life.⁽⁴⁴⁾



TREATING GUM DISEASE has a **POSITIVE IMPACT** on blood glucose control, reduces the likelihood of hospitalisation, and lowers the cost of treating diabetes.⁽³³⁾



Tackle socio-economic inequalities.

Simultaneous action on diabetes and hypertension will serve to reduce health inequalities for people in poorer and marginalised groups:

Co-morbidities are associated with adverse health outcomes and are more likely in women, older people and lower socioeconomic groups.^{(16,25) (18)}

In high-income countries (HICs), people living in more deprived areas have a higher likelihood of co-morbidities at the time of a diabetes diagnosis (72% of females; 64% of males) compared to those in higher-income settings (67% of females; 59% of males).⁽¹⁶⁾⁽²⁵⁾

LIKELIHOOD OF CO-MORBIDITIES IN HICs



Call to preventative action on diabetes, hypertension and their co-morbidities

COVID-19 has been a wake-up call for the imperative for integrated health systems. Governments and policy makers must not ignore the rights and needs of the increasing number of people living with diabetes and hypertension and their associated co-morbidities.

We call on policymakers to:

1. Pivot to prevention

- In light of the costs of inaction and enormous benefits of cost-effective prevention of the onset of both hypertension and type 2 diabetes, governments are called on to dramatically step up implementation of proven policy responses for primary prevention and health promotion. These measures include those recommended by WHO as part of the Global Action Plan on NCDs, particularly in relation to diet, and those included in WHO technical packages, such as MPOWER (tobacco control), HEARTS and HEARTS-D (cardiovascular disease and diabetes diagnosis and management), SHAKE (sodium reduction), ACTIVE (physical activity) and REPLACE (transfats elimination).
- Tackle the commercial, social and environmental determinants of diabetes, hypertension and their co-morbidities by integration of national health and NCD strategic plans and budgets across other sectors such as education, employment, trade and social services.

2. Strengthen national screening, diagnosis, surveillance and monitoring of co-morbidities

- Improvements in monitoring and surveillance of NCDs and co-morbidities at the national level is essential for planning and implementing health policy in all countries. Monitoring and surveillance are fundamental tools for public health, providing health information in a timely manner so that countries have the information they need to respond to NCDs and shape health systems and services accordingly.

3. Further global research on co-morbidities

- At the global level, there is a need to support and promote research into the true scale, trajectory and patterns of co-morbidity of NCDs, particularly in LMICs. In addition, further research on implementation and health systems research on sustainable delivery of care for people living with multiple NCDs is needed.⁽¹⁹⁾⁽¹⁸⁾⁽¹²⁾

4. Ensure quality, affordable care for people living with diabetes, hypertension and other co-morbidities, by integrating NCD prevention and care into national UHC benefit packages

- Governments need to ensure quality, affordable care for people living with diabetes, hypertension and other co-morbidities. Given that women, older people and those from lower socioeconomic groups are more likely to live with multiple NCDs, essential NCD prevention and care services – including those for diabetes, hypertension and their co-morbidities – must be integrated into all national UHC benefit packages.
- Efforts should be made towards collecting and reporting information on both met and unmet needs, including effective coverage of services, improving access and financial risk protection for priority interventions, and defining quality assurance measures.

- Governments, other purchasers, donors, and suppliers all can work to ensure access to quality-assured and affordable medications and diagnostics is critical to increasing coverage and improving disease control.
- Every US \$1 invested in NCD prevention and control in LMICs will yield a return of US \$7 by 2030, while the costs of inaction are far higher ⁽⁹⁾ – and must in future reflect the learnings from the COVID-19 pandemic, and the costs of inaction on NCDs in terms of population and health system vulnerability to future health threats.
- Catalytic development assistance funding will be vital to support governments in LMICs to provide these essential services and strengthen integrated health systems.

5. Reform health systems to ensure person-centred care

Health systems reform is required to shift away from the current siloed, disease-centered approach health care and move towards a person-centred and integrated model that ensures safe, appropriate and effective care for all, including those living with co-morbidities.⁽¹⁵⁾

Reforms should include:

- An increasing focus on overall quality of life goals, guided by people's overall needs – rather than disease management goals for single conditions, reflected through changes to health system governance and planning (including engagement of people living with NCDs in decision-making processes, health financing, health information systems) and across the continuum of services for health promotion, prevention, treatment, rehabilitation and palliation.⁽¹⁸⁾

- Reorientation of the health workforce, moving from the current focus on medical specialists to a strengthened primary healthcare workforce trained to support people whose health care needs span multiple diseases. Health workers should be supported by the development of evidence-based clinical guidance for people living with diabetes, hypertension and associated co-morbidities. This guidance should include how to integrate care (e.g. rationalisation and streamlining of clinical appointments and medications) and how to provide education on risk factors and bi-directional screening opportunities (e.g. screening for TB amongst people living with diabetes).⁽⁵²⁾
- A focus on patient education for people living with diabetes and hypertension to enable self-management.

6. Include prevention of co-morbidities within a cost-benefit analysis of diabetes and hypertension programmes to strengthen their investment cases

At present the economic costs of co-morbidities are not systematically considered in the allocation of resources. For example, they are not included in cost effectiveness analyses for WHO's recommended NCD interventions.⁽⁵³⁾ Instead, policy makers should ensure that diabetes and hypertension as well as their shared, preventable co-morbidities are recognised and included within cost-benefit calculations for primary[†] and secondary^{**} prevention strategies. This will enable identification of cost-effective interventions for the integrated management of diabetes and hypertension and their co-morbidities. These interventions should address mental health conditions and be focused on primary health care to ensure that services are widely accessible, affordable and of high quality to meet the needs of those living with diabetes and hypertension.

† Primary prevention: interventions or activities aimed at preventing a disease before it occurs.

** Secondary prevention: interventions or activities aimed at reducing the impact of a disease that has already occurred.

References

1. WHO. 2019 Glob Heal Estim “The top 10 causes death” [Internet]. Available from: <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>
2. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. *Diabetes Res Clin Pract* [Internet]. 2019 Nov 1;157. Available from: <https://doi.org/10.1016/j.diabres.2019.107843>
3. Zhou B, Bentham J, Di Cesare M, Bixby H, Danaei G, Cowan MJ, et al. Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1479 population-based measurement studies with 191 million participants. *Lancet* [Internet]. 2017 Jan 7;389(10064):37–55. Available from: [https://doi.org/10.1016/S0140-6736\(16\)31919-5](https://doi.org/10.1016/S0140-6736(16)31919-5)
4. IDF. Diabetes atlas. Ninth edition. [Internet]. 2019. Available from: <https://www.diabetesatlas.org/en/resources/>
5. Zhou B, Danaei G, Stevens GA, Bixby H, Taddei C, Carrillo-Larco RM, et al. Long-term and recent trends in hypertension awareness, treatment, and control in 12 high-income countries: an analysis of 123 nationally representative surveys. *Lancet* [Internet]. 2019 Aug 24;394(10199):639–51. Available from: [https://doi.org/10.1016/S0140-6736\(19\)31145-6](https://doi.org/10.1016/S0140-6736(19)31145-6)
6. Endocrinology TLD & COVID-19 and diabetes: a co-conspiracy? *Lancet Diabetes Endocrinol* [Internet]. 2020 Oct 1;8(10):801. Available from: [https://doi.org/10.1016/S2213-8587\(20\)30315-6](https://doi.org/10.1016/S2213-8587(20)30315-6)
7. Clark CE, Martin U, Clark CE. COVID-19 and hypertension : risks and management . A scientific statement on behalf of the British and Irish Hypertension Society. *J Hum Hypertens* [Internet]. 2021;20–3. Available from: <http://dx.doi.org/10.1038/s41371-020-00451-x>
8. Yang J, Hu J, Zhu C. Obesity aggravates COVID-19: A systematic review and meta-analysis. *J Med Virol* [Internet]. 2021 Jan 1;93(1):257–61. Available from: <https://doi.org/10.1002/jmv.26237>
9. Foresight Global Health. Building Back Better: Investing in healthy populations and resilient health systems for NCDs and Mental Health to be better prepared for future crises. An open letter to Heads of State and Government. 2020.
10. Clark A, Jit M, Warren-gash C, Guthrie B, Wang HHX, Mercer SW, et al. Articles Global , regional , and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020 : a modelling study. 2020;8(August).
11. Giulia F. Istituto Superiore Di Sanita. Characteristics of COVID-19 patients dying in Italy Report based on available data on March 20, 2020. 2020;4–8. Available from: https://www.epicentro.iss.it/coronavirus/bollettino/Report-COVID-2019_20_marzo_eng.pdf
12. Valderas JM, Sibbald B, Salisbury C. Defining Comorbidity: Implications for Understanding Health and Health Services. *Ann Fam Med*. 2009;7(4):357–63.
13. Newcastle University. Global burden of multiple serious illnesses must be urgently addressed. 2018.
14. Schellevis, FG; Van Der Velden, J; Van de Lisdonk, E; Van Eijk, JTM; Van Weel C. Comorbidity of chronic diseases in General Practice. *J Clin Epidemiol*. 1993;46(5):469–73.
15. An J, Le QA, Dang T. Association between different types of comorbidity and disease burden in patients with diabetes *. 2019;11:65–74. Available from: <https://pubmed.ncbi.nlm.nih.gov/29956479/>
16. Wolff JL, Starfield B, Anderson G. Prevalence, Expenditures, and Complications of Multiple Chronic Conditions in the Elderly. *ARCH INTERN MED*. 2002;162.
17. Brilleman SL, Purdy S, Salisbury C, Windmeijer F. Implications of comorbidity for primary care costs in the UK : a retrospective observational study. *Br J Gen Pr*. 2013;274–82.
18. Arokiasamy P, Uttamacharya U, Jain K, Biritwum RB, Yawson AE, Wu F, et al. The impact of multimorbidity on adult physical and mental health in low- and middle-income countries: what does the study on global ageing and adult health (SAGE) reveal? *BMC Med* [Internet]. 2015;13(1):178. Available from: <https://doi.org/10.1186/s12916-015-0402-8>
19. Multimorbidity: a priority for global health research. *Acad Med Sci* [Internet]. 2018;(April). Available from: <https://acmedsci.ac.uk/file-download/82222577>
20. Vollset SE, Goren E, Yuan CW, Cao J, Smith AE, Hsiao T, et al. Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: a forecasting analysis for the Global Burden of Disease Study. *Lancet*. 2020;1–22.
21. UN. Political declaration of the High-Level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Disease (66th sess.:2011–2012). 2011.
22. UN. Outcome document of the High-Level Meeting of the General Assembly on the Comprehensive Review and Assessment of the Progress Achieved in the Prevention and Control of Non-communicable Diseases (68th sess.:2013–2014). 2014.
23. UN. Political declaration of the 3rd High-Level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Disease (73rd sess.:2018–2019). 2018.
24. Petrie JR, Guzik TJ, Touyz RM. Diabetes, Hypertension, and Cardiovascular Disease: Clinical Insights and Vascular Mechanisms. *Can J Cardiol*. 2018 May;34(5):575–84.
25. Nowakowska M, Zghebi SS, Ashcroft DM, Buchan I, Chew-graham C, Holt T, et al. The comorbidity burden of type 2 diabetes mellitus : patterns , clusters and predictions from a large English primary care cohort. *BMC Med*. 2019;17(145).
26. Lee JT, Hamid F, Pati S, Atun R, Millett C. Impact of noncommunicable disease multimorbidity on healthcare utilisation and out-of-pocket expenditures in middle-income countries: Cross sectional analysis. *PLoS One*. 2015;10(7):1–18.
27. Beran D, Mirza Z, Dong J. Access to insulin: applying the concept of security of supply to medicines. 2019; Available from: <https://www.who.int/bulletin/volumes/97/5/18-217612/en/>
28. Aparicio HJ, Benjamin EJ, Callaway CW, Carson AP, Cheng S, Elkind MS V, et al. Heart Disease and Stroke Statistics — 2021 Update A Report From the American Heart Association. 2021.
29. Noh J, Kim HC, Shin A, Yeom H, Jang S, Lee JH, et al. Prevalence of Comorbidity among People with Hypertension : The Korea National Health and Nutrition Examination Survey 2007–2013. 2016;672–80.
30. Hauner H (2010). Obesity and diabetes, in Holt RIG, Cockram CS, Flyvbjerg A et al (ed.) Textbook of diabetes, 4th edition. Oxford: Wiley-Blackwell.
31. Piette, JD; Kerr E. The Impact of Comorbid Chronic Conditions on Diabetes Care. *Diabetes Care*. 2006;29(3).
32. Seitz MW, Listl S, Bartols A, Schubert I, Blaschke K, Haux C, et al. Current Knowledge on Correlations Between Highly Prevalent Dental Conditions and Chronic Diseases: An Umbrella Review. *Prev Chronic Dis*. 2019 Sep;16:E132.
33. Persson GR. Diabetes and Periodontal Disease: An Update for Health Care Providers. *Diabetes Spectr* [Internet]. 2011 Nov 1;24(4):195 LP – 198. Available from: <http://spectrum.diabetesjournals.org/content/24/4/195.abstract>
34. Muñoz Aguilera E, Suvan J, Buti J, Czesnikiewicz-Guzik M, Barbosa Ribeiro A, Orlandi M, et al. Periodontitis is associated with hypertension: a systematic review and meta-analysis. *Cardiovasc Res* [Internet]. 2020 Jan 1;116(1):28–39. Available from: <https://doi.org/10.1093/cvr/cvz201>
35. Nemet AY, Vinker S, Levartovsky S, Kaiserman I. Is cataract associated with cardiovascular morbidity? *Eye (Lond)*. 2010 Aug;24(8):1352–8.
36. Varsano D, Friedman M, Goldstein M, Bar-Sela S, Sella T, Shalev V, et al. Association between Cataract and Keratinocytic Skin Cancers or Melanoma: Speculating on the Common Role of Sun and Ultraviolet Radiation Exposures. *Ophthalmic Epidemiol*. 2017 Oct;24(5):336–40.
37. Phaswana-Mafuya N, Peltzer K, Crampin A, Ahame E, Sokhela Z. Prevalence of Self-Reported Diagnosed Cataract and Associated Risk Factors among Elderly South Africans. *Int J Environ Res Public Health*. 2017 Dec;14(12).
38. Benetos A, Davis AM, Michos ED, Muntner P, Rossing P, Zoungas S, et al. Diabetes and Hypertension : A Position Statement by the American Diabetes Association. *Diabetes Care*. 2017;40(September):2–3.
39. Mehta NN, Azfar RS, Shin DB, Neimann AL, Troxel AB, Gelfand JM. Patients with severe psoriasis are at increased risk of cardiovascular mortality: cohort study using the General Practice Research Database. *Eur Heart J*. 2010 Apr;31(8):1000–6.
40. Al-Mutairi N, Al-Farag S, Al-Mutairi A, Al-Shiltawy M. Comorbidities associated with psoriasis: an experience from the Middle East. *J Dermatol*. 2010 Feb;37(2):146–55.
41. Elmetts CA, Leonardi CL, Davis DMR, Gelfand JM, Lichten J, Mehta NN, et al. Joint AAD-NPF guidelines of care for the management and treatment of psoriasis with awareness and attention to comorbidities. *J Am Acad Dermatol*. 2019 Apr;80(4):1073–113.
42. Jensen P, Skov L. Psoriasis and Obesity. *Dermatology* [Internet]. 2016;232(6):633–9. Available from: <https://www.karger.com/DOI/10.1159/000455840>
43. Yau JWY et al. Global Prevalence and Major Risk Factors of Diabetic Retinopathy. *Diabetes Care* [Internet]. 2012;35(3):556–64. Available from: <https://doi.org/10.2337/dc11-1909>
44. Owens-gary MD, Zhang X, Jawanda S, Bullard KM, Allweiss P, Smith BD. The Importance of Addressing Depression and Diabetes Distress in Adults with Type 2 Diabetes. *J Gen Intern Med*. 2018;34(2):320–4.
45. Sanz M, Ceriello A, Buysschaert M, Chapple I, Demmer RT, Graziani F, et al. Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. *J Clin Periodontol*. 2018 Feb;45(2):138–49.
46. Cortaredona S. The extra cost of comorbidity : multiple illnesses and the economic burden of non- communicable diseases. 2017;1–11.
47. Stegbauer, C., Falivena, C., Moreno, A. et al. Costs and its drivers for diabetes mellitus type 2 patients in France and Germany: a systematic review of economic studies. *BMC Health Serv Res* 20, 1043 (2020). <https://doi.org/10.1186/s12913-020-05897-w>.
48. Leasher JL, Bourne RRA, Flaxman SR, Jonas JB, Keeffe J, Naidoo K, et al. Global Estimates on the Number of People Blind or Visually Impaired by Diabetic Retinopathy: A Meta-analysis From 1990 to 2010. *Diabetes Care* [Internet]. 2016 Sep 1;39(9):1643 LP – 1649. Available from: <http://care.diabetesjournals.org/content/39/9/1643.abstract>
49. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. *Lancet Glob Heal* [Internet]. 2021 Feb 22; Available from: [https://doi.org/10.1016/S2214-109X\(20\)30488-5](https://doi.org/10.1016/S2214-109X(20)30488-5)
50. Zhou X, Ng BP, Jawanda S, Proia K, Zhang X, Gregg EW. Cost-effectiveness of Interventions to Manage Diabetes : Has the Evidence Changed Since 2008 ? *Diabetes Care*. 2020;43(July):1557–92.
51. Levin A, Tonelli M, Bonventre J, Coresh J, Donner J-A, Fogo AB, et al. Global kidney health 2017 and beyond: a roadmap for closing gaps in care, research, and policy. *Lancet* [Internet]. 2017 Oct 21;390(10105):1888–917. Available from: [https://doi.org/10.1016/S0140-6736\(17\)30788-2](https://doi.org/10.1016/S0140-6736(17)30788-2)
52. Jajat, C; Stein, E; Yach D. Multiple Chronic Conditions: The Global State. Available from: https://www.tevapharm.com/globalassets/tevapharm-vision-files/teva_mcc_report.pdf
53. WHO. Global Action Plan for the Prevention and Control of Noncommunicable Diseases (2013–2020). 2013.



Website: www.ncdalliance.org Twitter: [@ncdalliance](https://twitter.com/ncdalliance) E-mail: info@ncdalliance.org