## An ML-Driven Platform for Criticality-Based Organ Matching and Transparent Transplant Allocation

## Organ-Specific Mortality – Global

Chronic noncommunicable diseases (NCDs) are the leading cause of death worldwide. According to the World Health Organization (WHO), in 2021, seven out of the top ten causes of mortality were NCDs, accounting for 38% of all deaths **(1).** Approximately 68% of the top ten causes fall into this category, with the remainder being infections or injuries. Most of these deaths are due to disorders affecting the heart, lungs, liver, and kidneys, making these organs the most significant sources of organ-related mortality globally.

1. **Heart (Cardiovascular)**:  
   Ischaemic heart disease is the world’s leading cause of death, responsible for around 9.1 million deaths annually (≈13% of all deaths) **(2)**. When combined with stroke (~10% of deaths) and other circulatory conditions, cardiovascular diseases are the chief cause globally. In India, they similarly top the list, causing about 28.9% of all deaths **(3).**
2. **Lungs (Respiratory)**:  
   Chronic respiratory diseases (such as COPD and asthma) account for about 5% of global deaths **(2).** Infectious lung conditions, including pneumonia and other lower respiratory tract infections, lead to another 3.7% of deaths **(4),** and lung cancer contributes approximately 2.8% **(5).** In total, lung diseases are responsible for about 10–15% of deaths worldwide. In India, respiratory illnesses (chronic and infectious) make up about 7.3% of deaths.
3. **Liver (Hepatic)**:  
   Liver disease—including cirrhosis, hepatitis, and liver cancers—causes roughly 2 million deaths per year worldwide, or about 4% of all deaths**(7).** India faces a significant burden, accounting for 18.3% of global liver-related deaths in 2015 **(8).** Major risk factors in India include viral hepatitis, alcohol consumption, and fatty liver disease.
4. **Kidneys (Renal)**:  
   Chronic kidney disease (CKD) and renal failure have rapidly increased as leading causes of mortality. Globally, kidney diseases moved from the 19th to the 9th most common cause of death from 2000 to 2021 **(9).** In India, they rank among the top causes, accounting for around 2.9% of all deaths between 2010–13, up from 1.9% in 2000 **(10).**

## References

1,2,4,5,9:  [WHO: The top 10 causes of death](https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death#:~:text=The%20world%E2%80%99s%20biggest%20killer%20is,of%20total%20deaths%2C%20respectively)

3,6,11,7:   [Central Bureau of Health Intelligence, India](https://cbhidghs.mohfw.gov.in/WriteReadData/l892s/Final_Central%20Bureau%20of%20Health%20Intelligene%20July%202024.pdf)

8,10:  [The Lancet Global Health](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30299-6/fulltext#:~:text=sample%20of%201%C2%B71%20million%20households,in%202000)

## Conclusion

Global and Indian health data consistently highlight heart, lung, liver, and kidney failures as leading causes of mortality. The increasing rates of these diseases underscore a critical need for transparent and urgency-based organ allocation.

A machine learning-driven platform for organ matching and transparent transplant allocation is crucial to bridge the gap between demand and supply. Such a system can enhance fairness, transparency, and outcomes by prioritizing allocation based on clinical severity and urgency, as supported by both international and Indian survey data



