

A life-year approach for measuring the human cost of disaster displacement

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Introduction

Internal displacement can have a destabilising effect on the lives of those forced to flee their homes, disrupting housing, livelihoods, access to services and overall stability. For many people, these impacts extend beyond the moment of movement and shape their ability to recover and rebuild their lives over time.

Quantifying them is challenging. Displacement is multidimensional, and its effects are rarely captured in a single dataset. Yet quantification is important, not only to generate an estimate of the scale of impacts, but also to raise awareness of the magnitude of the problem and strengthen accountability among governments, partners and decision makers. A transparent method for estimating the human costs of displacement has the potential to support more coherent planning, prioritisation and resource allocation.

This concept note presents an approach to estimating the human costs of disaster displacement.¹ It focuses on the temporary reduction in people's ability to live healthy, secure and productive lives once displaced. Emerging research shows that disaster displacement has measurable short-term health and social impacts, and that their magnitude and persistence varies substantially with the duration of displacement and recovery conditions (Cuadrado et al, 2023).

These impacts can be measured using a life-year approach in which reductions in people's ability to live healthy, secure and productive lives are expressed as life-years lost (Noy, 2016). These can then be translated into monetary terms, providing a comparable estimate of the human costs of displacement to support policy and investment decisions.

The approach builds on established public health and disaster economics methods (Salgado-Gálvez, 2018a, 2018b, 2019), adapting them to reflect the characteristics of displacement. It provides a practical and transparent framework to better understand how displacement affects people's lives over time and where interventions can most effectively reduce its impacts.

The disability adjusted life year framework

The disability adjusted life year (DALY) framework measures how much a condition affects people's overall health. It combines years of life lost as a result of premature mortality with years lived with disability (weighted by its severity),

¹ The approach has been developed for internal disaster displacement, but the underlying framework is in principle applicable to cross-border movements. Differences in legal status, access to services, labour market integration and protection frameworks may shape recovery trajectories in distinct ways, however, and would need to be accounted for.



offering a single metric to capture reductions in health and human functioning across populations and over time (Bickenbach et al, 2023).

The Global Burden of Disease (GBD) study is the largest and most comprehensive effort to measure health loss from disease, injuries and risk factors worldwide. Produced since 1990, it is widely used to inform health policy and planning. The framework also provides a useful basis for understanding the human costs of displacement in a comparable and transparent way (GBD, 2015, 2023).

DALYs incorporate disability weights that reflect the severity of a temporary or permanent reduction in function. These weights indicate how much a given condition reduces a person’s ability to live a healthy, fully functioning life (see table 1).

Table 1: Global Burden of Disease weights

Health state (example)	Disability weight	Interpretation
Full health	0.000	No loss
Mild anxiety disorder	0.042	Slight impairment
Mild depression	0.145	Noticeable impairment
Moderate depression	0.396	Significant daily impact
Severe depression	0.658	Major functional loss
Severe COPD	~0.408	Serious physical limitation
Blindness	~0.187	Moderate-long term impairment
Death	1.000	Complete loss

Source: Adapted from Salomon et al. (2012) and subsequent Global Burden of Disease updates by the Institute for Health Metrics and Evaluation. Values are illustrative and selected for relevance to displacement-related impacts. Disability weights represent population-based valuations of health states derived from large-scale survey evidence across various countries.

They range from 0 (full health) to 1 (death) and quantify the severity of different conditions. Severe chronic obstructive pulmonary disease, for example, a serious physical limitation, is assigned a weight of around 0.408, corresponding to a 40.8 per cent reduction in full health (Salomon et al, 2012). In the GBD framework, DALYs quantify total health loss as the sum of years of life lost as a result of premature mortality *and* years lived with disability. For example, an individual who dies 20 years prematurely and another who lives for five years with a condition weighted at 0.408 ($5 \times 0.408 = 2.04 \approx 2$) together account for around 22 life-years lost (for further reference, see Murray and Lopez, 1996; Vos et al, 2020).

Noy’s (2015, 2016) economic model of disaster costs draws inspiration from the DALY concept. But rather than estimating disease burdens, Noy measures disaster costs in terms of life-years, capturing reductions in function and disruptions to people’s lives over time. This provides a way to express the human costs of disasters without directly assigning a monetary value to human life.

IDMC has further adapted the concept to reflect the costs of displacement. Life-years lost capture periods during which displaced people experience reduced levels of human functioning. These arise from disruptions to housing, livelihoods, access to services and social networks, and the time required for recovery.

One life-year lost can be understood as one person experiencing the equivalent of a full year of reduced wellbeing relative to normal conditions. This includes impediments to their ability to generate income, maintain social relationships, access basic services and participate in community life.

Some individuals may adapt positively over time and even improve their situation, but the evidence suggests that disaster displacement is almost always associated with at least temporary declines in human functioning. Disaster-related shocks tend to lead to income losses, asset depletion, erosion of social capital and prolonged recovery, particularly among vulnerable households (Hallegatte et al, 2016).

In Bangladesh, household-level evidence further indicates that displacement is associated with income volatility, temporary declines and incomplete recovery, particularly among vulnerable groups (IDMC, 2026).

These dynamics are consistent with the interpretation of life-years lost as periods of reduced economic and social functioning, and provide a consistent and comparable metric of the human costs of disaster displacement at the macro level.

Methodological framework

Noy (2016) contrasts traditional economic valuation, where the total cost of a disaster is expressed as the sum of direct monetary damages and the monetised value of mortality, with an alternative life-year based approach.

His model breaks disaster costs down into three components:

$$Life - years = L(M, A^{death}, A^{exp}) + eTN + (1 - c) \frac{Y}{PCGDP}$$

1. A mortality term, expressed as life-years lost ($L(M, A^{death}, A^{exp})$), calculated as the difference between age at death and expected lifespan at time of death
2. A temporary reduction in functioning term (eTN), defined as the disability weight (e) multiplied by the duration of disruption (T) and the number of affected individuals (N)
3. A capital destruction term, expressed in life-year equivalents ($(1 - c) \frac{Y}{PCGDP}$), where Y is total economic damage, c is an adjustment factor and $PCGDP$ is income per capita.²

This provides a transparent way of interpreting human costs without relying solely on the monetisation of life. The capital destruction term translates economic losses into life-year equivalents, linking material damages to human impact, while the mortality and temporary functioning components ensure that fatal and non-fatal costs are captured in a unified framework.

Not all components can be directly applied in the case of displacement. Mortality specifically attributable to displacement is rarely estimated or recorded, and separating displacement-related asset losses from broader disaster damage is not feasible with available data.^{3 4}

For this reason, the model focuses on the component that most closely reflects the lived experience of displacement: the temporary reduction in functioning.

When adapted to displacement, life-years lost are defined as:

$$YLD_{Displ} = eTN$$

Where:

- e represents the reduction in people's ability to live healthy, secure and productive lives during displacement and its associated disruptions
- T represents the duration of disruption associated with displacement expressed in years
- N represents the number of internally displaced people

Together these components capture the total human cost of displacement in terms of life-years lost.

Noy's approach captures economic losses through the capital destruction term, but he deliberately avoids expressing them in monetary terms. For planning, budgeting and prioritisation purposes, we convert these life-year equivalents into dollar values using the value of a statistical life year (VSLY), enabling the human and economic dimensions of displacement to be presented in a single, interpretable metric that meets the practical needs of displacement analysis.

VSLY has for decades helped policymakers assess trade-offs in decisions involving lifesaving and risk-reducing measures. In our framework, it is used as a practical tool to express the human cost of displacement in comparable terms across events and over time. The approach also aligns with emerging "Beyond GDP" frameworks, which advocate for measures that better capture human wellbeing rather than relying solely on economic output as measured by GDP per capita (e.g. Stiglitz et al, 2009).

By expressing displacement costs in terms of welfare losses, the framework complements existing disaster risk monitoring approaches such as the Sendai Framework for Disaster Risk Reduction, whose global targets rely primarily on GDP-based metrics, and provides a more human-centred basis for assessing and comparing losses across settings.⁵

² In Noy's original formulation, c corresponds to the discount factor applied to income (or time not devoted to productive effort). This is denoted as d , where c ($\equiv d$) is the share of time not counted as productive (e.g. leisure/non-work time), and is typically set to 0.75, meaning only 25 per cent of time is treated as economically productive. $(1 - c)$ represents the effective share of time used for productive effort, and only that portion of income per capita is used to convert economic losses into life-year equivalents.

³ Mortality can occur during disasters and displacement, but attributing deaths specifically to displacement is challenging. Mortality is more commonly recorded at the level of the hazard event rather than the displacement episode, and distinguishing between deaths caused directly by the hazard, those occurring during evacuation and those linked to post-displacement conditions is often not possible in a consistent and comparable way. Including mortality in the model would introduce significant attribution uncertainty and reduce comparability across events and countries. For this reason, the framework focuses on non-fatal welfare impacts, which are more consistently observed and represent the dominant share of displacement-related human impacts.

⁴ Loss and damage estimates capture asset destruction at the event level, but they are not directly attributable to displacement and risk double counting when combined with displacement metrics. The framework therefore focuses on welfare losses specific to displacement and not captured in loss assessments.

⁵ The Sendai framework defines global targets and indicators that predominantly express disaster losses relative to GDP (UNDRR, 2015).

VSLY is derived from the value of statistical life (VSL), which governments and international organisations use widely for policy evaluations (OECD, 2025). VSLY converts VSL into an annual equivalent by spreading it over the expected remaining lifetime of an individual. Table 2 provides approximate ranges based on Organisation for Economic Co-operation and Development (OECD) guidance and global adaptations of this conversion.

When detailed demographic data is not available, this can be approximated by dividing VSL by the expected remaining life year of a median person. This can be expressed as:

$$VSLY = VSL / (LifeExp - MedianAge)$$

For comparability, the World Health Organization uses a standard reference life expectancy of approximately 92 years, based on projected frontier survival estimates. This provides a consistent benchmark across countries, even where national life expectancy differs (Devleeschauwer et al, 2014).

Table 2: VSL/VSLY proxy calculations based on OECD guidance and global adaptations

Income category	Example countries	VSL (\$)	VSLY (\$ per year)	Notes
High income	Germany, US, UK	3 – 10 million	100,000 – 300,000	OECD baseline values
Upper-middle income	China, Brazil	1 – 3 million	30,000 – 100,000	Adjusted via income elasticity
Lower-middle income	India, Vietnam	0.3 – 1 million	10,000 – 30,000	Lower willingness to pay
Low income	Sub-Saharan Africa	0.05 – 0.3 million	1,000 – 10,000	Highly income constrained

Source: Author calculations based on OECD (2012, 2025) guidance on VSL and standard income-adjustment approaches used in the literature (e.g. Cropper et al, 2011). The ranges presented are indicative and derived from standard VSL transfer methods using income-adjusted scaling. They are intended for illustrative purposes and do not represent country-specific estimates.

The resulting measure (HC_{Displ}) represents the human cost of displacement expressed in monetary terms:

$$HC_{Displ} = eTN \times VSLY$$

Parameter assumptions

1. Reduction in functioning parameter e

The parameter e reflects the severity of the temporary reduction in people's ability to function associated with displacement. Conditions commonly experienced during displacement, such as loss of housing, constrained mobility, reduced access to services and livelihoods, and heightened insecurity can significantly disrupt daily life. These impacts often affect practical functioning and emotional wellbeing.

In the case of disaster displacement, "heightened insecurity" encompasses protection risks, such as loss of safety, social ties and access to essential services; and economic risks, including loss of livelihoods that may persist long after displacement. Research shows that these social and economic vulnerabilities shape the severity and duration of displacement impacts across different types of events (Paul, 2025).

To represent this level of disruption in consistent and comparable way, the methodology draws on the disability weight framework used in public health. The effects of disaster displacement are proxied using the disability weight for mild anxiety disorder, which captures symptoms such as worry, tension and reduced ability to carry out usual activities without implying severe or long-term impairment (see table 1).

This choice reflects the typically temporary nature of disaster displacement, during which impacts on mental health and functioning, while significant, are generally less severe than those observed in conflict settings. More acute conditions, such as post-traumatic stress disorder (PTSD) or severe depression, are not explicitly modelled. These would require a much larger e value (see table 1). In the absence of comparable data across settings, applying a single, conservative e value of 0.042 provides a transparent and policy-relevant approximation of the average reduction in functioning associated with disaster displacement.⁶

2. Duration of disruption T

The duration of disruption T captures the length of time during which displaced people experience reduced functioning. Observable evacuation stays reflect only the acute phase of displacement and systematically underestimate the full period of reduced functioning. Households often continue to experience impediments long after returning home, including in the form of damaged housing, disrupted services, impaired mobility, delayed livelihood recovery and persistent psychosocial stress (Desai, 2025).

⁶ The use of a single weight reflects a simplifying assumption necessitated by the absence of harmonised data on the distribution of displacement-related wellbeing states. Impacts may vary in severity across individuals and events, but the application of a constant parameter is consistent with standard practice in aggregate welfare and burden-of-disease analyses, where average disability weights are used to approximate population-level outcomes (Salomon et al, 2012; Vos et al, 2016).

To capture this extended disruption, the model defines:

$$T = \left(\frac{D}{365}\right) \times F$$

In this equation, D is the observed number of days in evacuation centres or with host families and F is a recovery extension factor that scales observed displacement duration to reflect longer recovery trajectories. Dividing by 365 allows T to be expressed in years. This formulation follows established approaches in disaster and welfare economics, where observed exposure is adjusted to reflect unobserved recovery periods using scaling parameters, particularly when direct data is limited (Dercon and Hoddinott, 2004; Hallegatte et al, 2016; Noy, 2016).

The recovery extension factor F captures the intensity and persistence of disruption associated with different displacement events. It is derived from composite assessment of observable displacement characteristics rather than relying solely on hazard type. Specifically, it is informed by four dimensions known to shape recovery trajectories at the macro-level: the geographical scope of the event; the extent of damage; the scale of displacement; and the type of displacement, whether it was pre-emptive, short-term or long-term.⁷

Each dimension is classified on an ordinal scale reflecting increasing severity, and the resulting score is used to assign F within predefined ranges that represent low, moderate, high and very high recovery extension. The operational derivation of F and its mapping to recovery extension ranges is described in box 1.

This approach allows the model to distinguish between displacement events that are predominantly pre-emptive and short-lived, and those in which housing damage, livelihood loss or service disruption result in prolonged recovery. In events where most displacement is preventive but a subset of households experiences severe trajectories, F reflects the average recovery extension implied by these differing trajectories, rather than assuming uniformly long disruption for all those displaced.

In this sense, F functions as a recovery multiplier that translates short-term displacement into longer-term disruption of functioning. By grounding it in event-level severity characteristics, the model avoids systematic overestimation of disruption duration while remaining sensitive to protracted displacement and slow recovery. This ensures that losses in wellbeing reflect not only the duration of evacuation, but the broader trajectory of disruption and recovery.

Most assessments of internally displaced people (IDPs) occur immediately after a disaster. Seventy-one per cent of weather-related displacements are recorded only once and sudden-onset events such as floods and storms are tracked for under a week, while slow-onset events such as droughts are monitored for an average of nearly four months (Desai, 2025). Table 3 summarises these average durations. F can vary across events, allowing for comparable situations within and across hazards.

Table 3: Average number of days between first and last assessment of IDPs for weather-related events, 2023-2024

Hazard type	Average number of days between first and last assessment (D)
Drought	113
Erosion	14
Flood	6
Storm	5
Extreme temperature	4
Mass movement	3
Wildfires	2

Source: Desai (2025)

⁷ Recovery trajectories are also shaped by institutional capacity, including response effectiveness and humanitarian assistance, and household-level characteristics such as assets, social networks, access to credit and education (e.g. Barrett and Carter, 2013; Alkire, 2016; Dercon, 2005; Hallegatte et al, 2016). These factors are not explicitly modelled because of the limited availability of consistent cross-country data. However, stronger institutional capacity and more effective response systems are likely to support faster and more complete recovery and so reduce the overall human costs of displacement.

Box 1: Derivation of the recovery extension factor F

The recovery extension factor F scales observed displacement duration to reflect the longer period of impaired functioning experienced by displaced people after return. Because this period is not directly observed in displacement data, F is derived using a transparent, event-level severity score.

Each displacement event is characterised along four observable dimensions that are known to influence recovery trajectories:

Table 4: Dimensions that influence recovery trajectories

Dimension	Categories
Geographic scope	Localised/district-level/nationwide
Damage assessment	Minor/moderate/major
Scale of displacement	Small/medium/large
Type of displacement	Pre-emptive/short-term/long-term

Source: Authors' analysis based on Desai (2025)

Each category is ordered from lowest to highest severity, and each dimension is assigned an ordinal score from 1 (lowest severity) to 3 (highest severity). The total event severity score S is calculated as the sum across dimensions:

$$S = S_{geo} + S_{damage} + S_{scale} + S_{type}$$

with $S \in [4, 12]$.

S is then mapped to discrete F ranges to avoid false precision while preserving comparability across events:

Table 5: Severity score classification and assigned F -values

Severity score S	Categories	Assigned F
4 – 5	Very limited recovery disruption	2
6 – 7	Moderate recovery disruption	4
8 – 9	High recovery disruption	7
10 - 12	Very high/systemic disruption	8

Source: Authors' analysis

In events where displacement is primarily pre-emptive but a subset of households experience severe housing damage or prolonged disruption, F reflects the average recovery extension implied by these differentiated trajectories. This can be used to estimate welfare losses separately for short-lived and severe displacement profiles and aggregating results. This ensures that pre-emptive evacuations are not systematically treated as long-term welfare losses, while still capturing severe recovery outcomes where they occur. The application of the framework is illustrated by the examples below.

Example 1:

Moderate disruption

- Observed displacement: five days
- Recovery extension factor: $F = 4$

$$T = (5/365) \times 4 = 0.055 \text{ years}$$

Although displacement lasts only for five days, effective disruption is equivalent to around 20 days, reflecting continued recovery constraints.

Example 2: Comparing low and high-severity events

Severity scores are derived by combining four dimensions: geographic scope, level of damage, scale of displacement and type of displacement. Each dimension is scored from 1 (low) to 3 (very high). The total score determines F using predefined ranges.

Scenario	Scope	Damage	Scale	Type	<i>S</i>	<i>F</i>	<i>D</i> (days)	<i>T</i> (years)	Interpretation
Preventive evacuation	1	1	1	1	4	2	3	0.016	Minimal disruption, rapid recovery
Flood (moderate damage)	2	2	2	2	8	7	6	0.115	Temporary disruption with recovery needs
Cyclone (housing loss)	3	4	3	2	12	8	7	0.153	Prolonged disruption and slow recovery

Note: The table presents stylised figures for illustrative purposes only

Example 3: Why recovery extension matters even with the same displacement duration

Two events displace people for five days, but differ in severity:

Event	<i>S</i>	<i>F</i>	<i>D</i> (days)	<i>T</i> (years)	Interpretation
Event A (minimal impact)	4	2	5	0.027	Minimal disruption, rapid recovery
Event B (severe impact)	12	8	5	0.110	Temporary disruption with recovery needs

Note: The table presents stylised figures for illustrative purposes only

Observed displacement duration is the same, but differences in severity lead to substantially different recovery trajectories. *F* captures these differences, resulting in more than a fourfold increase in effective disruption for more severe events.

Conclusion and further research

The application of a DALY-based framework to internal displacement provides a structured way of quantifying the prolonged human costs that are otherwise difficult to capture through conventional disaster or economic assessments. By translating temporary declines in functioning into life-years lost, and into monetary terms through the value of statistical life, the model sheds light on a dimension of the human costs of displacement that is often overlooked in policy debates and resource allocation decisions. Its simplicity and transparency mean it can be applied even in settings where data is limited, and it is grounded in established methodologies.

Several limitations, however, warrant careful consideration. Parameter choices, particularly the reduction in functioning and the duration of disruption, are subject to uncertainty, and data gaps in many countries impedes the ability to represent displacement dynamics with precision. To address these sources of uncertainty, the methodology is empirically calibrated wherever data availability allows and complemented by systematic sensitivity analysis to assess the stability of results across plausible parameter ranges. This provides a structured assessment of robustness under alternative assumptions and helps reduce statistical uncertainty in the estimates.

Nor does the model, which in its current form estimates impacts on an event-by-event basis, fully capture the multidimensional nature of costs, the varying impacts across social groups or the effects of repeated or protracted displacement. Evidence from the literature suggests that recurrent shocks lead to cumulative costs over time by eroding assets, weakening coping capacity and prolonging recovery trajectories (e.g. Dercon and Hoddinott, 2004; Carter et al, 2007; Hallegatte et al, 2016).

Despite these constraints, the model provides a valuable foundation for bridging human cost analysis and displacement research.

Future extensions could address some of the above issues by introducing an individual-level accumulation mechanism to allow for path-dependent recovery trajectories, capturing how successive displacement events alter baseline functioning and recovery speed over time. This is feasible where longitudinal or repeated exposure data are available, or where exposure histories can be reconstructed in enough detail, but not in typical event-level or cross-sectional applications where such temporal linkages cannot be directly identified.

Future work could also extend the model's use to national level assessments, integrate longitudinal or household-level data, and refine parameter estimation through empirical studies of recovery duration and coping behaviour. This approach could then be used to quantify the overall impact of displacement globally, regionally and for specific events, and to compare outcomes spatially and temporally.

There is also potential to adapt the framework to settings of conflict and violence, where displacement often entails longer, more complex and less reversible welfare losses and extreme human costs. Advancing these lines of inquiry would help to develop a more comprehensive understanding of the human consequences of displacement and support evidence-based policies for prevention, preparedness and recovery.

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