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Motorcycles Collisions in Italy
A Case Study on a Possible Risk Paradox

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Abstract

Over the past decades, road collisions have become one of the major causes of death, especially for youths. The European Union has set ambitious goals to halve road fatalities by 2030 compared to 2020 levels. Within this framework, over twenty years, the number of motorcycles in circulation in Italy has steadily increased, alongside technological and regulatory advances in road safety. Conversely, the number of fatal motorcycle collisions and related deaths has decreased, although in recent years there has been a leveling off and even a slight increase. An analysis of the Italian historical series of fatal motorcycle collisions from 1991 to 2024 confirms this trend and highlights a particularly interesting aspect as a possible risk paradox. Despite the rise in circulating vehicles, the number of fatalities may decrease if the possible risk per vehicle declines due to improved infrastructure, safety devices, training, and effective road policing.

Keywords: *Road Safety; Motorcycles; Risk Paradox; Fatal Road Collisions; Enforcement*

Introduction

During recent decades, the number of motorcycles in circulation in Italy has steadily increased, alongside technological and regulatory advancements in road safety (ISTAT/ACI, 2025).

In 2024, in Italy, occurred 173,364 accidents resulting in injuries, with 3,030 fatalities and 233,853 injuries. Motorcyclists were killed in 830 events, equal to approximately 27.4% of total road fatalities (Carson, Jost et Meiner, 2025).

The most frequent circumstances for fatalities remain distracted driving, failure to give way and/or observe traffic lights, and the over-speed, which overall represent 37.8% of the main causes detected, underlining a stable trend (ISTAT/ACI, 2025).

The collision risk percentage remains very high for two-wheelers. Police reports highlight a levelled number in motorcyclist fatalities in 2024 and a significant proportion of injuries on motorized two-wheelers.

Table 1 illustrates the historical trend for years from 1991 to 2024 related to road collisions involving two-wheelers in Italy, underlining the *"risk index"* per million of vehicles.

Year	Motorcycles in circulation	Deceased	Risk per million
1991	2,543,186	1452	570.9
1992	2,560,037	1430	558.6
1993	2,526,761	1311	518.8
1994	2,539,835	1330	523.7
1995	2,530,750	1178	465.5
1996	2,531,946	1198	473.2
1997	2,557,356	1215	475.1
1998	2,699,274	1213	449.4
1999	2,975,651	1259	423.1
2000	3,375,782	1513	448.2
2001	3,732,306	1581	423.6
2002	4,049,592	1529	377.6
2003	4,375,947	1663	380.0
2004	4,574,644	1687	368.8
2005	4,938,359	1592	322.4
2006	5,288,818	1559	294.8
2007	5,590,183	1630	291.6
2008	5,859,094	1458	248.8
2009	6,118,098	1321	215.9
2010	6,305,032	1214	192.5
2011	6,428,476	1142	177.6
2012	6,482,796	1028	158.6
2013	6,481,770	911	140.5
2014	6,505,620	875	134.5
2015	6,543,612	919	140.4
2016	6,606,844	820	124.1
2017	6,689,911	877	131.1
2018	6,780,733	844	124.5
2019	6,896,048	817	118.5
2020	7,003,618	673	96.1
2021	7,152,760	723	101.1
2022	7,302,597	822	112.6
2023	7,498,908	839	111.9
2024	7,721,022	858	111,1

Table 1. Historical series of two wheels road accidents resulting in injuries (source ISTAT/ACI).

Figure 1 illustrates the fleet of two-wheeled vehicles circulating in Italy over the period from year 1995 to year 2024. The data show a virtually constant and sustained growth trend, with only minor fluctuations over time. This long-term increase reflects structural changes in mobility patterns, including the growing use of motorcycles and mopeds for daily commuting, urban mobility, and leisure purposes (ISTAT/ACI, 2025).

The expansion of the two-wheel vehicle fleet is also associated with factors such as increased urban congestion, economic accessibility, and the search for more flexible and efficient transport solutions. Notably, no prolonged phases of decline are observed, indicating a strong and resilient demand for this mode of transport.

Overall, the figure confirms that two-wheeled vehicles have become an increasingly significant component of the Italian vehicle fleet over the last three decades (ISTAT/ACI, 2025).

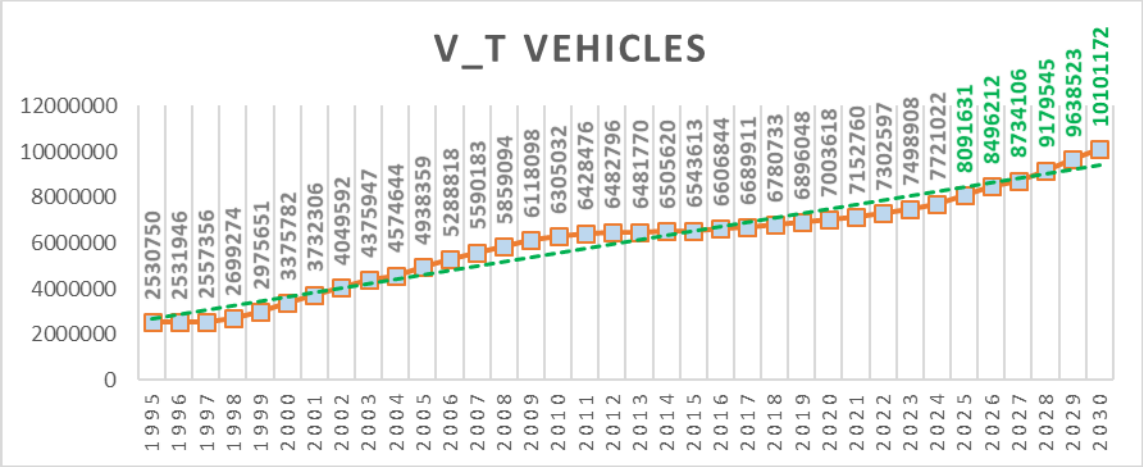

Figure 1. The fleet of two-wheeled vehicles circulating in Italy over the period 1995–2024 (Source: ISTAT).

Figure 2 illustrates the historical trend of fatal road collisions involving riders of two-wheeled vehicles over the observed period.

In the second half of the 1990s and the early 2000s, fatalities show a progressive increase, culminating in a pronounced peak in the mid-2000s.

This phase reflects a period of rapid growth in two-wheel vehicle circulation combined with less mature safety standards. From around year 2007–2008 onward, the trend reverses, with a sharp and persistent decline in the number of fatalities (Albalate et Fernández-Villadangos, 2010).

The downward trajectory is particularly evident throughout the 2010s and is confirmed by the negative slope of the fitted trend line (Amoros, Chiron et Martin, 2016).

Although short-term fluctuations are present, especially in the most recent years, the overall pattern remains clearly decreasing. This long-term reduction can be associated with improvements in vehicle safety technologies, infrastructure, protective equipment, enforcement, and rider awareness (Cestra, 2020). Overall, the graph demonstrates a substantial improvement in safety outcomes over time, despite the continued expansion of the two-wheel vehicle fleet.

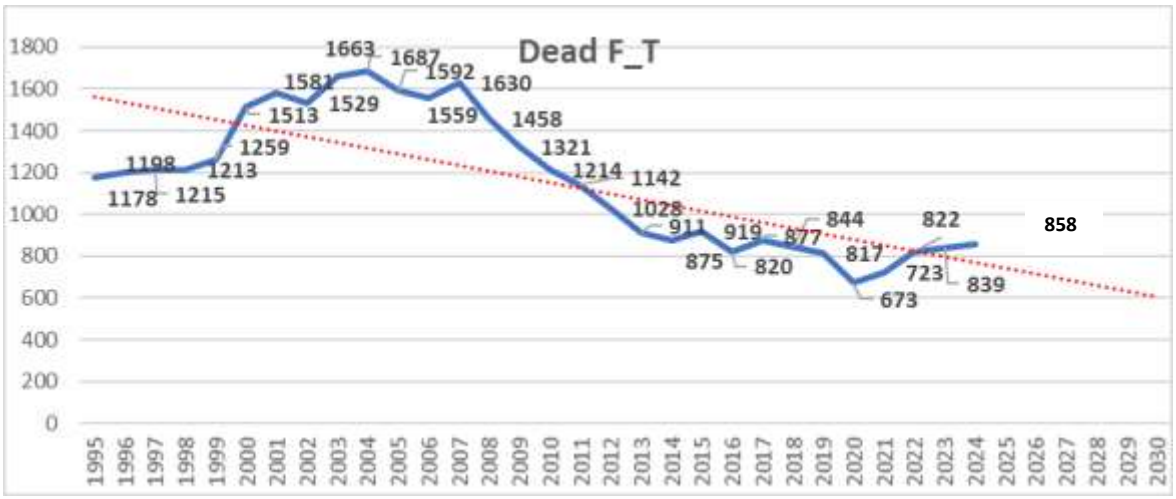

Figure 2. Historical trend of fatal road accidents involving riders of two-wheeled vehicles during years 1995-2024.

Discussion

Figure 3 illustrates the relationship between the number of two-wheeled vehicles in circulation and the number of road fatalities involving their riders over the period 1991–2024.

The bars represent the size of the motorcycle fleet, which shows a steady and almost uninterrupted increase throughout the entire timeframe (ISTAT/ACI, 2025).

This growth reflects the rising popularity of motorcycles and mopeds for both urban mobility and leisure, as well as structural changes in transport demand in Italy.

In contrast, the line representing fatalities follows a markedly different trajectory. During the 1990s and early 2000s, the number of deaths initially increases, reaching a peak in the mid-2000s. This phase corresponds to a period in which fleet expansion was not yet accompanied by sufficiently effective safety measures (Protospataro et al., 2025).

From around 2007–2008 onward, a clear and sustained decline in fatalities becomes evident, despite the continued growth of the two-wheel vehicle fleet (ISTAT/ACI, 2025).

The diverging trends highlighted by the graph point to a progressive decoupling between exposure and fatal outcomes.

While exposure, proxied by the number of circulating vehicles, increases steadily, the risk of death per vehicle decreases significantly over time. The downward trend line for fatalities further confirms a long-term structural reduction in mortality (AISCAT, 2024).

This pattern can be attributed to multiple factors, including improvements in vehicle safety technology, wider use of protective equipment, better infrastructure design, stronger enforcement, and enhanced rider training and awareness (Cestra, 2020).

Overall, the graph demonstrates that long-term safety policies and interventions have been effective in reducing fatalities, even in the context of a growing two-wheel vehicle fleet, highlighting a significant improvement in road safety performance (European Commission, 2018; Fouda Mbebou, Amoros et Martin, 2018; García-Quílez et al., 2012)

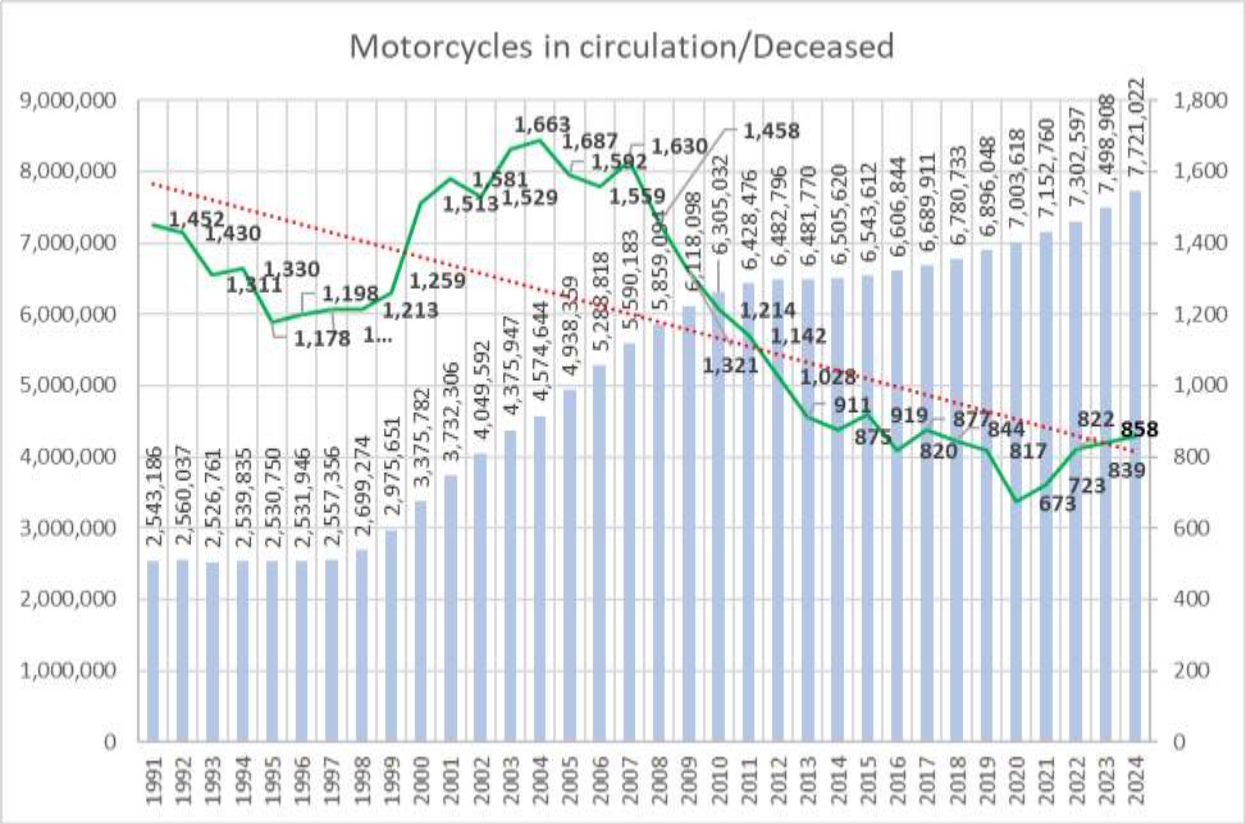

Figure 3. Relationship between the number of two-wheeled vehicles in circulation and the number of road fatalities involving their riders over the period 1991–2024.

Despite the substantial growth in the motorcycle fleet, the risk has decreased markedly, which explains the reduction in fatalities. The model highlights a critical phases between years from 199 to 2007, and a more recent post Covid19 pandemic stabilization phase within the period between years from 2021 to 2024), with a slight increase in the number of fatalities while maintaining a constant increase in motorcycles on the road.

In 2024, there were 830 motorcyclist fatalities (≈27.4% of total fatalities). The Italian Institute for National Statistics (ISTAT) document also highlights that the injury burden for two-wheelers remains high, approx. 32% of the total number.

The main causes of collisions involving two wheels vehicles can be detected in:

a) distraction/indecisive driving;
b) excessive speed, for the 37.8% of confirmed/presumed causes;
c) failure to respect right of way/traffic lights.

To obtain a stable reduction of this figures it is appropriate a specific enforcement activity focused on strengthening speed violations checks, alcohol and drug controls, with targeted services on highways and extra-urban roads (Elvik, 2013), as well as strengthening patrols during dedicated periods of time (see weekly ROADPOL Operations).

It is also appropriate a correct improvement of the use of speed cameras for more targeted detection on critical routes, and one of the most important role in possible reduction of collisions involving two wheels vehicles has the common participation in road safety ROADPOL campaigns

(Safety Days) and in other initiatives aimed at vulnerable users (motorcycles/scooters, bicycles, scooters), with specific and dedicated control and awareness-raising actions.

Focus on the correct use of helmets and combating the use of smartphones while driving motorcycles it is another impressive task for road policing and during year 2024, in Italy, it is reported an increase in violations for failure to wear helmets.

Some critical and attention-requiring moments can be identified as per the below Table 2:

1999	Turn of the century with acceleration of registration for two wheels vehicles. Cyclical increase in deaths rate on the roadways.
2003	Reorganizations and technological evolutions. Persistence of high mortality levels on the Italian roads.
2007	Diffusion of safety technologies and behavioral changes. After 2008, a structural reduction begins.
2010	Law 120/2010 – Art. 17 Road safety provisions per amendments to art. 116 Italian Traffic Code. Mandatory practical exam for moped certificate and stricter novice limits.
2011	Ministerial Decree 23 March 2011, nr.106 Reorganization of CIGC training/testing. Two-phase practical test and higher standards for moped riders. Legislative Decree 59/2011. Implementation of EU Directive 2006/126/EC Introducing AM, A1, A2, A driving licenses categories and provision of progressive access to moped and two wheels driving licenses.
2013	Ministerial Decree10 Dec 2012 + modification to art. 116 Italian Traffic Code. Transition to AM driving licenses AM license replaces CIGC and mandatory theory + practical tests.
2019	Ministerial Decree 4 June 2019, nr 229. Pilot program for electric micromobility Regulates e-scooters, hoverboards, power limits and speeds limits. Ministerial Decree 229/2019 (extensions). Operational rules for micromobility, with new speed limits, lights regulation and definition of dedicated circulation areas.
2021	Post Covid19 pandemic discontinuity with rebound in mobility. Mortality does not return to pre-2010 historical levels.
	Decree 9 June 2023 + Decree 9 Aug 2023, Progressive access to two wheels driving without exam and A1→A2 and A2→A driving licenses upgrade via 7-hour training course.
2024	Stability at significantly lower levels than in the years 1999–2007, with reduced risk index.
2024	Law 14 December 2024, nr. 177. Italian Traffic Code so called *"Salvini"* reform. Harsher penalties for two wheels drivers, with stricter novice rules and *e-scooter* regulations.

Table 2. Critical periods in the two wheels vehicles Road Safety Index.

Within this framework, a particularly interesting aspect is the so-called *risk paradox*. Despite the rise in circulating vehicles, the number of fatalities may decrease if the unit risk per vehicle declines due to improved infrastructure, safety devices, training, and effective road policing.

The risk paradox could be better explained illustrating a basic formula with an exposure risk model:

$F_t = V_t \cdot R_t$

where:

F_t = number of deaths over time

V_t = number of motorcycles on the road

R_t = unit risk of death per vehicle

Deriving in form logarithmic as per Figure 4:

$$\frac{d \ln F_t}{dt} = \frac{d \ln V_t}{dt} + \frac{d \ln R_t}{dt}$$

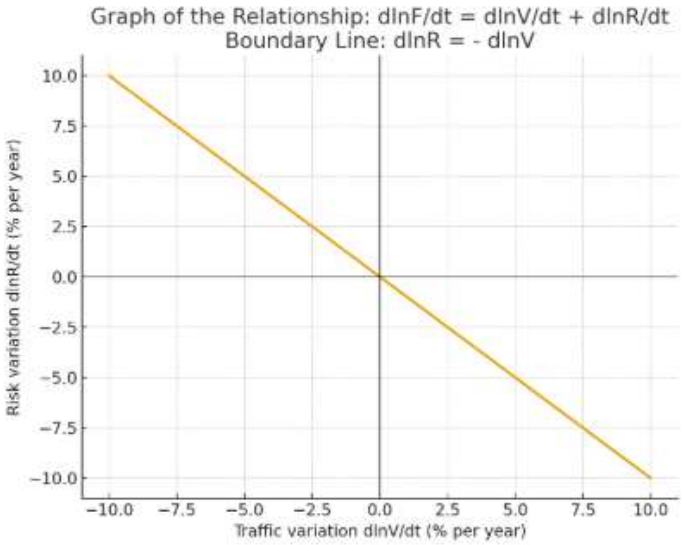

Figure 4. Graph of the relationship dlnF/dt = dlnV/dt + dlnR/dt

If the risk Rt decreases faster than the growth of vehicles Vt, then the number of deaths Ft will tend to decrease.

If $\frac{d \ln R_t}{dt} < -\frac{d \ln V_t}{dt}$ then F*t* goes down even though V*t* goes up,

The curve R*t* downing is the direct effect demonstration and confirmation.

We can use a logarithmic linear model for estimation and forecasting as follow:

$$\ln F_t = \alpha + \beta \ln V_t + \gamma t + \sum_{j=1}^{m} \theta_j H(t - \tau_j) + \varepsilon_t$$

Where:

α: is constant;

β: represent the elasticity of the number of deaths with respect to vehicles <1: more vehicles do not generate a proportional increase in deaths;

γ: is the time/ safety trends (technology, infrastructure, regulations) that reduce risk over time;

θj: is the effect of regulatory or technological interventions;

$H(t-\tau j)$: is the step function for structural changes. It is the *Heaviside function*, having 0 before the date (critical event/moment with increased mortality incidence) and 1 afterward. It measures the jump in level due to the critical moment (new law, economic crisis, pandemic, technological development, new speedometers, ADAS, etc.);

εt: is the error term- residual.

This results in the equivalent exponential formula:

$$\hat{F}_t = \exp\left(\alpha + \gamma t + \sum_j \theta_j H(t - \tau_j)\right) \cdot V_t^{\beta}$$

to demonstrate the decline in deaths compared to the increase in vehicles.

If $\gamma < 0$ (and/or $\theta j < 0$ in the case of effective reforms), the risk reduction effect is able to compensate for and exceed Vt^{β} even when V*t* increases.

Criticality is determined if it exceeds the absolute threshold value, while the sign $\theta j < 0$ indicates a positive jump/improvement, while $\theta j > 0$ indicates a negative break/deterioration.

Figure shows the projections obtained from a log-linear model.

Assuming a moderate growth of the motorcycle fleet (between 4% and 6% per year, based on the historical series of data from the Italian Automobile Club *ACI* sources), we can propose a forecast projection as shown in the table below, produced with a log-linear model:

$$\hat{F}_{t+h} = \exp\left(\hat{\alpha} + \hat{\gamma}(t+h) + \sum_j \hat{\theta}_j H(t+h-\tau_j)\right) \cdot V_{t+h}^{\hat{\beta}}$$

having confidence intervals that use the standard deviation of the residuals to estimate the uncertainty band of *lgF* , creating a general model (Figure 5).

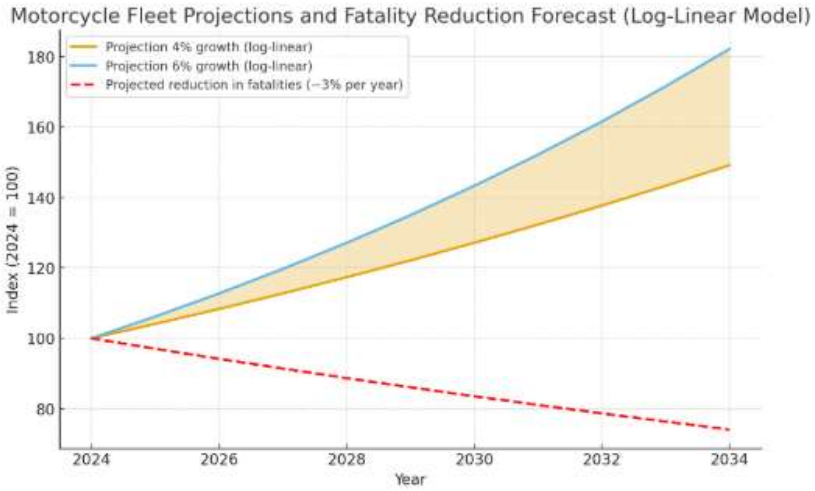

Figure 5. Motorcycle Fleet projections and Possible Fatalities Rate reduction. General model

Figure 6 presents a forecast specific model of the possible number of fatal accidents involving motorcyclists in the coming years, based on historical data and a fitted statistical model. The solid line with markers represents the observed fatalities, showing an initial increase during the late 1990s and early 2000s, followed by a clear and sustained decline from around 2007 onward. This downward trend reflects long-term improvements in road safety, enforcement, vehicle technology, and rider protection (OECD/ITF, 2023; Khan et Das, 2024).

The dashed blue line illustrates the estimated model, which smooth short-term fluctuations and captures the underlying structural trend of the series. The model confirms a pronounced decrease over time, despite temporary deviations linked to economic cycles, mobility changes, or extraordinary events. Vertical reference lines highlight key phases in the historical evolution of motorcycle fatalities, separating periods of growth, transition, and consolidation (Vandenberghe, 2020).

The green dashed segment shows the projection for the period 2025–2030, indicating a continued reduction in fatalities, although at a more gradual pace compared to earlier years (W.H.O., 2017). This suggests a potential stabilization phase, where further improvements become progressively harder to achieve without additional targeted interventions (W.H.O., 2023). Overall, the graph supports the hypothesis that motorcycle safety outcomes have improved substantially over the long term and are expected to continue improving, provided that current policies, enforcement levels, and safety innovations are maintained or strengthened.

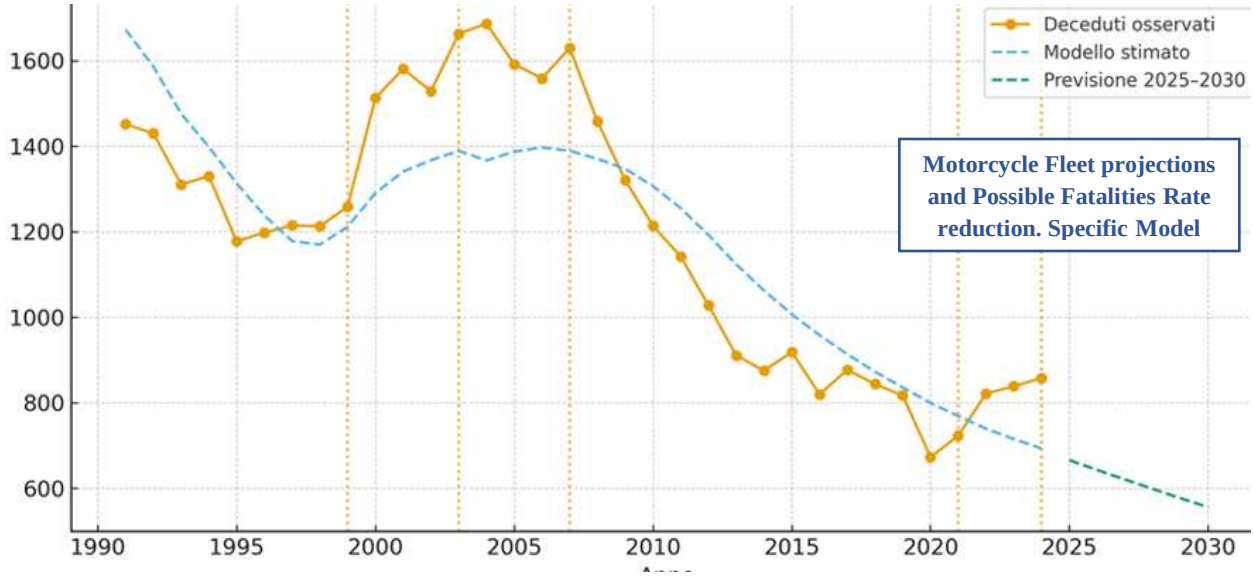

Figure 5. Motorcycle Fleet projections and Possible Fatalities Rate reduction. Specific model.

The expected reduction of fatalities involving two wheels vehicles drivers could be summarized as per following Table 3:

Year	Motorcycles expected to be in circulation	Expected deaths
2025	7,875,442	736
2026	8,076,189	683
2027	8,276,935	651
2028	8,477,682	619
2029	8,678,428	598
2030	8,879,175	576

Table 3. Expected reduction of deaths.

Conclusions

Despite the substantial growth in the motorcycle fleet, the unit risk has decreased markedly; this explains the reduction in deaths. The model highlights critical phases, from year 1999 to year 2007, and a more recent post-pandemic stabilization phase, from year 2021 to year 2024. The findings derived from the log-linear model reveal a central and counterintuitive dynamic in motorcycle safety: despite sustained and substantial growth in the motorcycle fleet, total fatalities have progressively declined.

This result challenges the common perception that an expanding fleet inevitably leads to more deaths, and instead confirms the presence of what can be termed the *motorcycle safety paradox*. The paradox emerges because the unit risk—the probability of death per motorcycle or per vehicle-kilometre—has declined when the fleet size has increased. In other words, exposure has grown, but risk per unit of exposure has decreased even more markedly, producing a net fall in fatalities.

The model clearly shows that the elasticity of fatalities with respect to fleet expansion has turned negative in the most recent decades. Whereas an increase in the number of motorcycles once directly translated into heightened mortality, the contemporary relationship is inverse. This structural shift can be traced to improvements in vehicle technology (notably ABS, traction control, and stability systems), higher compliance with helmet and protective gear standards, and stronger enforcement of critical behaviours such as speeding, alcohol impairment, and risky manoeuvres. All these factors combine to

reduce the lethality of crashes even in the presence of greater traffic volume (Cestra, 2020; NHTSA, 2020; OECD/ITF, 2015).

A historical analysis highlights two distinct periods. The first, extending roughly from year 1999 to year 2007, can be defined as a critical phase. During this interval, motorcycle ownership grew rapidly as part of broader mobility and lifestyle transformations, but the supporting safety ecosystem lagged behind. Enforcement levels were uneven, infrastructure was not yet adapted to higher two-wheel traffic, and protective equipment had not reached current standards. As a result, the decline in unit risk was insufficient to compensate for the surge in exposure. Fatalities fluctuated or increased, producing a period of heightened vulnerability (Berg, 2006; Elvik et Vaa, 2004).

By contrast, the post-Covid19 pandemic period 2021–2024 reveals a clear stabilisation of fatalities, despite motorcycle circulations remaining high and, in some cases, continuing to grow. This suggests that the safety system has become more resilient. Enforcement strategies have become increasingly targeted and data-driven; road users show higher levels of compliance; and motorcycles themselves incorporate advanced safety technologies as standard. Additionally, post-Covid19 modifications in mobility behaviour (e.g., more predictable peak times, a partial reduction in chaotic commuting flows, and a shift towards recreational rather than congested urban riding) may have contributed to a more favourable risk environment (International Transport Forum, 2023).

When interpreted through the lens of the log-linear dynamic model, these findings strongly reinforce the Safe System principle that safety can improve even when exposure increases, provided that interventions reduce risk at a faster rate than mobility expands. This principle demonstrates mathematically how the paradox unfolds:

$$\frac{d \ln F_t}{dt} = \frac{d \ln V_t}{dt} + \frac{d \ln R_t}{dt}$$

Fatalities decline if and only if the reduction in risk outweighs the growth in fleet (Cestra, 2020; Helvik, 2013; Vision Zero Network, 2021).

The data show precisely this pattern, especially in the 2010s and even more clearly in the period from year 2021 to year 2024.

Consequently, the observed decline in total motorcycle fatalities is not accidental, but the direct mathematical and operational result of sustained reductions in unit risk. This confirms that modern road safety policies and enforcement strategies are effective and that the system is moving toward a more mature safety equilibrium. The paradox thus becomes a key indicator of progress: it demonstrates that societal capability to manage motorcycle risk now exceeds the pressures produced by fleet expansion. This provides a solid foundation for future policy design and a strong argument for maintaining long-term investments in enforcement, infrastructure, training, and protective technologies.

Contribution statement

The article is the result of a common research and reflection of the Authors. However, Discussion must be attributed to Scala N.M. and Alfalasi A.T.., Introduction to Rufa G., and Conclusions to Cestra P.

Declaration of competing interests

The Authors report no competeing interests.

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References

AISCAT (2024). AISCAT Informazioni – Edizione Mensile 5/2024 https://www.aiscat.it/2024/12/06/aiscat-informazioni-edizione-mensile-5-2024/

Albalate, D, Fernández-Villadangos L. (2010). *Motorcycles on urban roads: A structural model of accidents.* Accident Analysis & Prevention, *42*(1), 174–182. https://doi.org/10.1016/j.aap.2009.07.020

Amoros E., Chiron M., Martin J.L. (2016). *Risk of death for motorcyclists in France: A cohort study applying extrinsic and intrinsic risk factors.* Accident Analysis & Prevention, 87, 1–7. https://doi.org/10.1016/j.aap.2015.10.012

Berg H.Y. (2006). *Reducing crashes and injuries among young motorcyclists.* Accident Analysis & Prevention, 38(5), 1005–1015. https://doi.org/10.1016/j.aap.2006.04.017

Carson J., Jost G., Meiner M. (2025). *Ranking EU progress on Road Safety – 19th Road Safety Performance Index Report.* ETSC European Road Safety Council. 24 June 2025 – Bruxelles – BE https://etsc.eu/19th-annual-road-safety-performance-index-pin-report/

Cestra P. (2020). *Road Policing. A new concept*. Editore Pacini Giuridica. 2020 ISBN 978-88-3379-258-3

Elvik R. (2013). *Accident risk and the problem of exposure data*. Accident Analysis & Prevention, 60, 404–410. https://doi.org/10.1016/j.aap.2013.03.011

Elvik R., Vaa T. (Eds.). (2004). *The handbook of road safety measures*. Emerald Group 2004

European Commission. (2018). *EU Road Safety Policy Framework 2021–2030: Next steps towards Vision Zero*. Publications Office of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021IP0407

Fouda Mbebou P., Amoros E., Martin J.L. (2018). *Trends in motorcyclist fatality risk in France: A long-term analysis.* Journal of Transport & Health, 9, 102–112. https://doi.org/10.1016/j.jth.2018.02.003

García-Quílez M., Lardelli-Claret P., Jiménez-Moleón J.J., Luna-Del-Castill, J. de D. (2012). *Motorcycle fleet size and motorcycle accident mortality rates: Temporal trends in Spain, 1993–2010*. Public Health, 126(3), 192–198. https://doi.org/10.1016/j.puhe.2011.11.002 https://doi.org/10.1016/j.aap.2009.07.020

International Transport Forum (2023). *Road Safety Annual Report*. OECD Publishing, 2023. https://www.itf-oecd.org/road-safety-annual-report-2023

ISTAT/ACI (2025) Incidenti Stradali Anno 2024. Rome, 24 July 2025 https://www.istat.it/comunicato-stampa/incidenti-stradali-in-italia-2024/

Khan M. N., Das, S. (2024). *Advancing traffic safety through the Safe System Approach: A systematic review*. Accident Analysis & Prevention, 196, 107126. https://doi.org/10.1016/j.aap.2023.107126

NHTSA (2020). *Motorcycle Safety Facts*. U.S. Department of Transportation. https://www.nhtsa.gov/road-safety/motorcycles

OECD/ITF (2015). *Improving Safety for Motorcycle, Scooter and Moped Riders*. OECD Publishing. https://www.oecd.org/en/publications/improving-safety-for-motorcycle-scooter-and-moped-riders_9789282107942-en.html

Protospataro , G., Mazziotta F., Serino, R., Biagetti, E, Goffredo, F., Franco G. (2025) *Codice della Strada e Regolamento di esecuzione (Italiano Codice della Strada e Norme Esecutive , 35ª Edizione, Egaf Forlì Cesena, 2025 ISBN 978-88-3521505-9*

Vandenberghe W. (2020). *The evolution of motorcycle fatalities in Europe: Exposure, risk, and policy dynamics.* Safety Science, 132, 104988. https://doi.org/10.1016/j.ssci.2020.104988

Vision Zero Network (2021). *Core Elements for Effective Road Safety Strategies*. Vision Zero Institute. https://visionzero.global/sites/default/files/2024-09/2-VZ%20Full%20A%2BA.pdf

W.H.O. - World Health Organisation (2017) – *Global Status Report on Road Safety 2016*. United Nations Office in Geneva, 2017. https://unece.org/DAM/trans/doc/2017/wp29/WP29-171-10e__WHO_.pdf

W.H.O.-World Health Organization. (2023). *Global status report on road safety*. WHO. https://www.transport-community.org/wp-content/uploads/2024/06/Global-status-report-on-road-safety-2023.pdf