Brain-be 2.0
Belgian Research Action through Interdisciplinary Networks
POLICY BRIEF

Policy Brief n° 3

BE-FORINTEL - BUILDING THE FOUNDATIONS OF A FORENSIC INTELLIGENCE TOOL IN BELGIUM - How Forensic DNA Transforms Criminal Networks

This study links Belgian police case records (2016–2021) with national DNA intelligence to build three case-based networks: a police-only network, a DNA-only network, and a combined network. Integrating forensic intelligence (FI) adds 412 previously invisible cases (+14.3%) and 352 new links (+6.6%) to the police network; 6.5% of all connections in the combined graph exist only because of forensic data. Ego-network and crime-type analyses show that these new links are not random: FI mainly extends serious and complex crime areas (family & public morality, organized crime, violent theft) and creates forensic "bridges" between otherwise unconnected investigations. In organized-crime related cases, FI expands the visible subgraph by +434.5% in nodes and +140% in edges without disturbing existing core clusters. These patterns demonstrate that FI is a strategic intelligence layer that can reveal serial offending, cross-jurisdictional links, and hidden serious-crime structures that police data alone cannot see.

Context and question of research

The sources of criminal network data are shaped by information silos, fragmented across jurisdictions, and biased toward individuals already known to authorities (Pickering & Fox, 2022; Ribaux & Wright, 2014). As a result, police-derived networks often miss the wider landscape of criminal activity, including unconnected case series, cross-jurisdictional offending, and long-standing cold cases that lack identifiable suspects. Forensic science produces a parallel stream of intelligence that can help fill these gaps. DNA clusters, fingerprints, and other traces link crime scenes regardless of whether a suspect is known, and prior research shows that aggregated forensic data can uncover serial offending, repeat victimization, and geographically dispersed case series that traditional investigations fail to recognize (Moor et al., 2020; Jeuniaux et al., 2015; Raymond & Julian, 2015). Despite this potential, FI is still typically used reactively rather than as a data source capable of revealing connections previously unseen across investigations.

This study addresses that gap by integrating police and forensic DNA data into a single case-based network for the Bruges region and examining how FI uncovers previously unconnected cases and hidden investigative relationships. We ask three questions: (1) Which ego networks and case groupings emerge only through FI, and how do they differ from police-derived structures.

Main findings

To understand where FI creates new investigative opportunities, we first compared the police-only network with the combined police–DNA network and flagged every case whose connections increased after forensic data was added. This process allowed us to isolate specific "ego networks" where DNA links introduced new investigative relationships. **Ego A** includes cases that were completely isolated in police records but became connected once a DNA match linked them to other files. These cases matter because they turn what appears to be a single, unrelated incident into part of a small series, offering investigators an immediate lead on potential repeat behavior or shared suspects. **Ego B** captures cases already embedded in an existing police cluster that gained one additional forensic-only neighbor. This type of extension is operationally important: it often points to a new location, victim, or modus operandi that branches off an established group, helping investigators spot early signs of spill-over or escalation. **Ego C** consists of cases that become small hubs when two or more forensic-only cases attach to them, effectively joining investigative files that previously seemed to have nothing in common. These hubs highlight cases positioned at the intersection of multiple crime events and may represent key offenders, shared environments, or cross-jurisdictional activity. Across all three patterns, the ego networks show that FI does far more than add extra nodes—it exposes hidden relationships, uncovers additional cases worth reviewing, and provides new pathways for connecting incidents that police intelligence alone leaves invisible.

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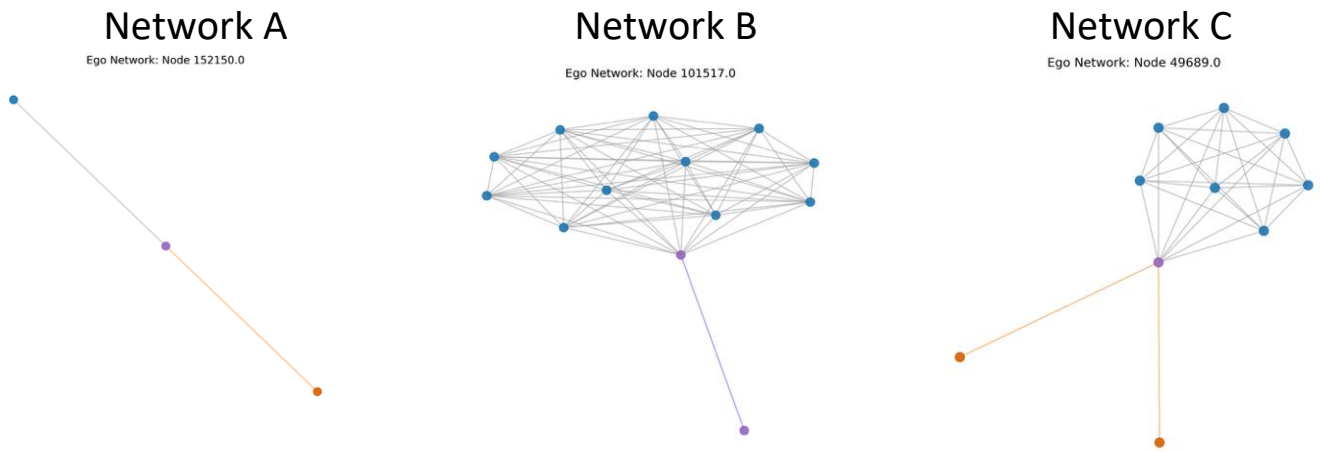

Conclusion and recommendations

This study shows that FI adds a strategically important layer of visibility that police data alone cannot provide. Even though the number of forensic-only links is relatively small, their value is high: they highlight hidden relationships, suggest repeat or cross-jurisdictional offending, and identify cases positioned at key intersections within the broader crime landscape.

The ego-network patterns (Ego A, B, and C) demonstrate that FI can transform stand-alone incidents into series, extend known groups into new crime spaces, and create hubs that join previously separate investigations. Combined with the dramatic expansion of the serious-crime subgraph, these findings confirm that FI can uncover cases that are cold, siloed, or invisible to traditional intelligence workflows. To harness this value, FI should be treated as a routine, built-in component of intelligence-led policing. Police and forensic databases must be integrated so that new DNA-based connections automatically appear in analytical tools, with alerts for cases that move from isolated to connected or become forensic hubs. FI integration should be prioritized in high-harm offence categories such as sexual offences, organized crime, violent theft, and arson, where the added visibility is greatest. Breaking justice silos is essential: shared identifiers, coordinated data standards, and joint analytical teams will ensure that forensic-derived connections are not lost between systems. Agencies should also adopt practical tools such as network visualization dashboards and automated monitoring of serious-crime subnetworks to make forensic-linked structures are usable in daily operations. Future work should link these forensic-enhanced indicators to outcomes like case clearance and time-to-arrest, strengthening the evidence base for embedding FI at the core of policing practice.

Read more

- Harvey, D. L., Madjlessi, J., Kumar, K., & Vandeviver, C. (2026). Enhancing criminal network disruption through forensic intelligence: A scoping review [Preprint].
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- Harvey, D. L., Geeraert, J., & Vandeviver, C. (2026). Observability and disruption in criminal networks: A simulation study of forensic intelligence [Preprint].
- Harvey, D. L., & Vandeviver, C. (2026). Examining observability in forensic-enhanced criminal networks: Evidence from empirical network reconstruction [Preprint].
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- Klymentiev, R., Harvey, D. L., Rocha, L. E. C., & Vandeviver, C. (2025). A systematic review and Bayesian meta-analysis of co-offending characteristics. Nature Human Behaviour, 9(10), 2135–2152. https://doi.org/10.1038/s41562-025-02244-z
- Vandeviver, C. (2023). The future of big data policing for law enforcement agencies [Lecture].

Information

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