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

Policy Brief n° 2

BE-FORINTEL - BUILDING THE FOUNDATIONS OF A FORENSIC INTELLIGENCE TOOL IN BELGIUM - Comparing Police, DNA, and Combined Case Networks: Understanding the Added Value of Forensic Intelligence

This study compares three criminal-intelligence network layers, police-only network, DNA-based forensic network, and merged police–forensic network to understand how forensic intelligence (FI) expands investigative visibility. The results show that police data produces dense clusters shaped by known suspects, while DNA data creates selective, high-specificity connections invisible to police systems. When integrated, there are 412 previously unseen cases and 352 non-redundant links in the FI network, expanding the investigative landscape without reshaping existing operational clusters.

Context and question(s) of research

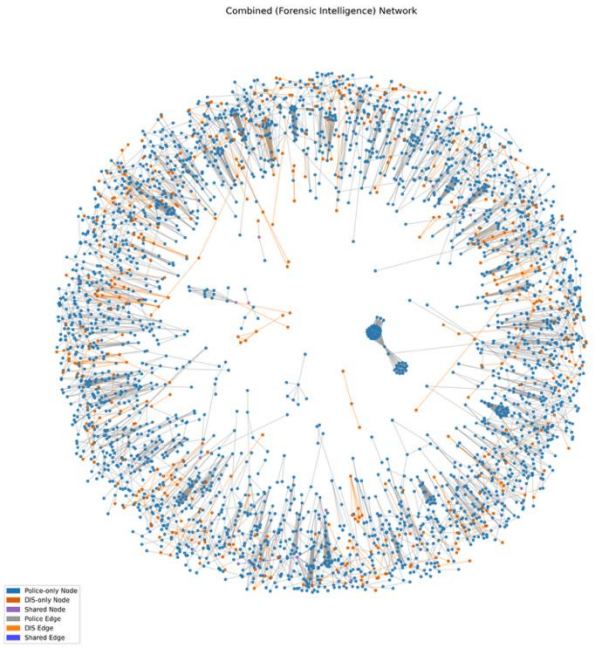
Criminal networks are complex, adaptive, and often only partially visible to law enforcement. Police intelligence (based on suspects, arrests, and co-offending) is fragmented across jurisdictions (Pickering & Fox, 2022), shaped by information silos (Ribaux & Wright, 2014), and limited to known offenders. Therefore, police networks capture only one relational layer and routinely miss hidden links, cold-case connections, and cross-regional offending patterns. FI offers a parallel source of relational information. DNA clusters, trace patterns, and forensic signatures link cases even when no suspect is known and can uncover cross-case patterns that traditional intelligence cannot detect (Ribaux et al., 2003; Jeuniaux et al., 2015). Aggregated FI has been shown to identify serial offending, reveal regional linkages, and help overcome linkage blindness caused by fractured information systems (Moor et al., 2020; Raymond & Julian, 2015). However, FI remains underused as a network data source, and its structural contribution is not well understood. In concrete terms, this research asks: to what extent does integrating DNA-based forensic intelligence into police case networks create new connections between cases, change the overall pattern of linkages, and thereby improve the visibility of criminal activity and the potential for intelligence-led policing in a multi-layer framework?

Main findings

The police network is moderately dense and highly clustered, reflecting known co-offending partnerships, repeated offender behavior, and geographically local crime groups. By contrast, the DIS (DNA) network is extremely sparse: forensic links appear only when the same biological trace recurs across cases. These are high-specificity, low-frequency connections that do not mirror social structures but instead expose hidden case-to-case relationships independent of suspect identity. When both intelligence sources are merged, the overall structure remains anchored in police data—but forensic intelligence adds a strategically significant layer of new information. Specifically, DNA analysis contributes 412 previously unseen cases and 352 new edges, representing approximately 6.5% of all connections in the combined network. These forensic-only links were entirely invisible in police records and therefore constitute genuine new investigative knowledge.

Rather than merging existing police clusters, forensic intelligence expands the network outward, attaching new cases at the periphery, forming small new micro-components, and creating bridges between separate investigative domains. These additional links are operationally meaningful: even though they represent a small share of the total network, they reveal repeat behavior, cross-jurisdictional movement, and serial offending patterns that police-only

intelligence cannot detect (Moor et al., 2020; Prego-Meleiro et al., 2022). The Jaccard Similarity Index (0.935) confirms this pattern: police data accounts for most of the network, but the 6% forensic contribution consists entirely of non-duplicated, previously hidden case linkages. These are precisely the types of connections that help overcome linkage blindness (Kamau et al., 2021) and broaden investigative visibility without reshaping the core social clusters that police already know.



Conclusion and recommendations

This study shows that forensic intelligence adds a strategically important layer of visibility that police data alone cannot provide. Even though forensic-derived edges represent a small proportion of all network ties, they consistently highlight connections that matter most for investigations: previously unconnected cases, potential serial patterns, and cross-regional offending that do not appear in suspect-based systems. FI, therefore, should be understood as a precision intelligence layer—one that reveals hidden pathways and strengthens case linkage in ways social or operational data cannot achieve on its own.

To realize this value, forensic intelligence must become a routine component of intelligence-led policing. Police and forensic databases should be automatically integrated so that DNA-based connections appear in analytical tools without manual intervention. Cases that shift from isolate to connected or that become forensic-derived hubs should trigger alerts for analyst review, as they represent high-priority leads for serial offending, repeat crime scenes, or cross-unit coordination.

Integration should be prioritized for high-harm crime types, including sexual offences, organized crime, violent theft, and arson—domains where forensic traces are most informative and where traditional intelligence often lacks visibility. Breaking long-standing justice silos requires shared identifiers, improved IT interoperability, and coordinated analytical teams capable of interpreting cross-layer network patterns.

Finally, agencies should invest in practical analytical tools—dynamic network dashboards, automated subgraph monitoring, and forensic-link visualization to help investigators use forensic intelligence in day-to-day decision making. Future work should measure how forensic-enhanced visibility improves clearance rates, time-to-arrest, and investigative efficiency, building the evidence base for fully embedding FI within Belgium's intelligence-led policing framework.

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].
- Harvey, D. L., & Vandeviver, C. (2026). The added value of forensic intelligence in criminal network analysis: Evidence from empirical network reconstruction [Preprint].
- 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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