A Transaction-Graph Census of 1.53 Billion Bitcoin Address Records

Directed transaction-graph paths from 28,583 Patoshi-consistent coinbase outputs through Bitcoin block 960,000.

Frozen aggregate release. DOI pending · independent review invited · published 2026-08-10

RECORDS	1,530,808,114
ELIGIBLE PATH	89.16%
SNAPSHOT	Block 960,000
METHOD	Directed graph

CENTRAL RESULT

1,364,936,252 of 1,530,808,114 records had an eligible path.

Under the published directed-path and terminal-hub rules, **89.16%** of distinct normalized address records through block 960,000 had an eligible path from the early-mining anchor set.

> **Do not read this as "89% of wallets are connected to Satoshi."** Transaction-graph proximity does not establish ownership, identity, literal coin ancestry, wallet membership, or contact with Satoshi Nakamoto.

01 · ABSTRACT

Address-level proximity, measured with explicit stopping rules

Sentario Research computed shortest directed paths across Bitcoin's transaction graph through block 960,000. The unit is a distinct normalized address record—not a person, wallet, company, UTXO, or individual satoshi. Paths start at a frozen set of 28,583 coinbase-output addresses selected by a documented Patoshi-consistent nonce predicate.

High-connectivity and curated hub addresses are terminal: a path can reach them but cannot use them as a bridge. At the selected 50,000-endpoint threshold, 1,364,936,252 of 1,530,808,114 records had an eligible path. Exact counts, membership files, sensitivity runs, schemas and checksums accompany this report.

Three results that survive the available checks

89.16%

Eligible under the selected rule

165,871,862 records (10.84%) had no eligible path under these terminal rules. That is rule-dependent reachability, not unconditional disconnection.

262,704,782

Degree 6 was the mode

19.25% of eligible records landed at exact degree 6. The complete distribution contains one row for every degree from 0 through 25,349.

+9,962

Marginal anchor expansion

Holding direction and the 50,000-endpoint terminal rule fixed, expanding from the two declared early anchors to 28,583 Patoshi-consistent anchors changed eligibility by 0.000651 percentage points.

What the result measures—and what it cannot

It measures

- the shortest eligible directed address-to-address transaction path;
- one normalized address record at a fixed chain snapshot;
- reachability after terminal high-connectivity and curated hub records stop traversal;
- aggregate graph structure under a published anchor definition.

It cannot establish

- who owns or controls an address;
- that an address belongs to one wallet;
- literal ancestry of individual satoshis through mixed inputs;
- interaction with Satoshi Nakamoto or ownership by the early miner.

The center is compact; the observed tail is long

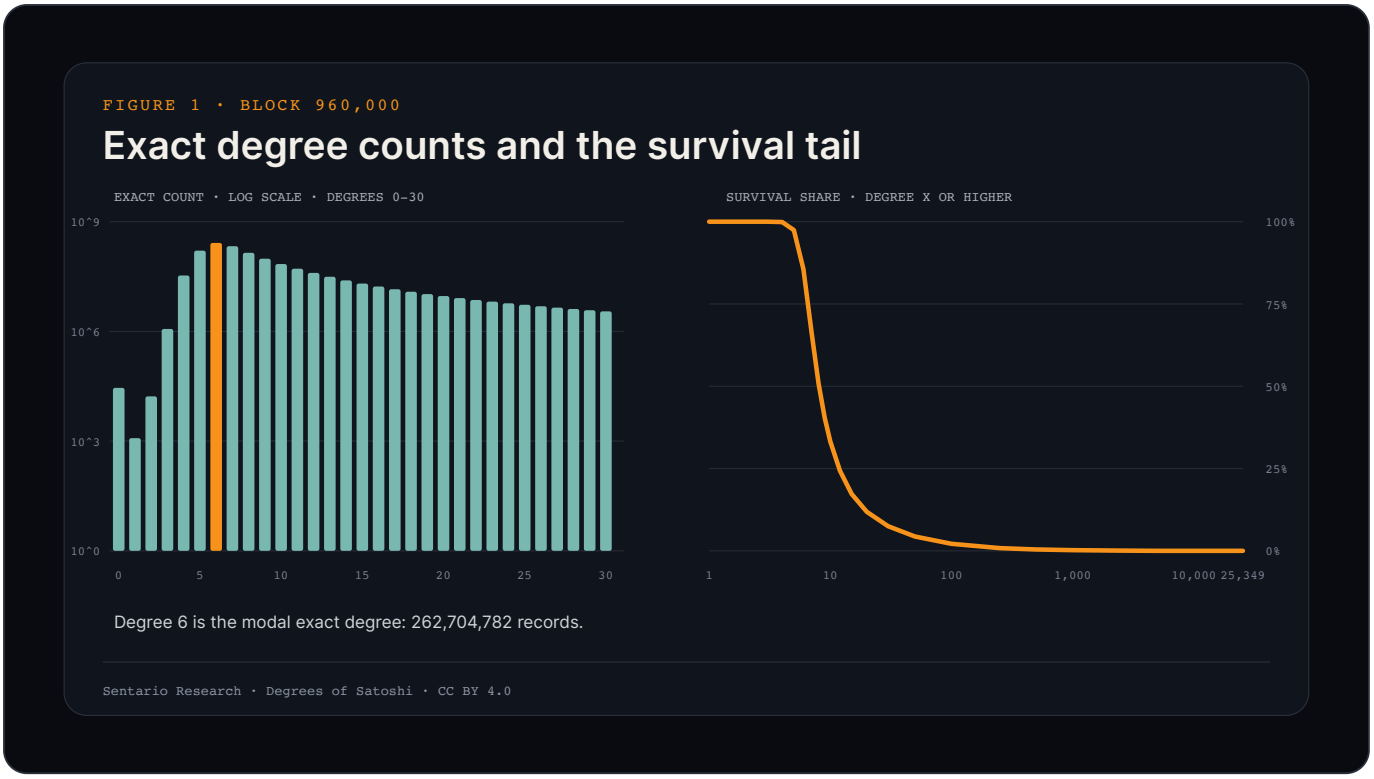


Figure 1. Exact-degree counts on a log scale and the share of eligible records at or beyond selected degrees.

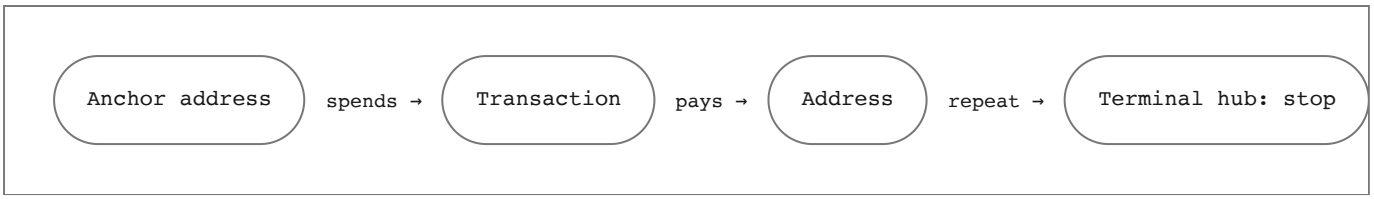
Exact degrees 0–12. Download the full 25,350-row distribution below.

DEGREE	RECORDS	SHARE OF ELIGIBLE	SHARE OF ALL
0	28,583	0.0021%	0.0019%
1	1,205	0.0001%	0.0001%
2	16,722	0.0012%	0.0011%
3	1,166,228	0.0854%	0.0762%
4	33,783,666	2.4751%	2.2069%
5	161,841,436	11.8571%	10.5723%
6	262,704,782	19.2467%	17.1612%
7	213,696,746	15.6562%	13.9597%
8	140,855,386	10.3196%	9.2014%
9	97,475,188	7.1414%	6.3676%
10	69,746,292	5.1099%	4.5562%
11	51,834,127	3.7975%	3.3861%
12	39,751,426	2.9123%	2.5968%

Corrected strict tail: degree >100 contains 28,681,130 records—2.10128% of eligible records and 1.87359% of all 1,530,808,114 records. This excludes exact degree 100 and therefore differs from the “degree 100 or higher” survival point in Figure 1.

> The source histogram’s maximum observed degree is 25,349. Its path has not been independently inspected, so this report does not interpret that extreme as an economic or behavioral finding.

A directional graph with terminal hubs



Direction is essential. An address reaches a transaction only as an input, and a transaction reaches an address only as an output. This prevents paths from moving backward through a recipient's unrelated input history.

The research-methodology wrapper `1.0.0` freezes the membership hashes and interpretation used here. It crosswalks to the deployed graph artifact `v1.0.0-draft.2` and standings enrichment `v1.0.0-draft.2-standings.1`; the live artifacts were not renamed.

Anchor membership

`28,583 records`

`sha256:e8b3b6979ef9d4777e7d352b6963b5c6067f4645eb2e42e013a5b01408d01546`

Curated terminals

`41 active + 13 retained`

`sha256:597ab88ae8a9333bc02722efd74a10f229bef3e3d1258da6c58f699ee5abb577`

The terminal rule is a material modeling choice

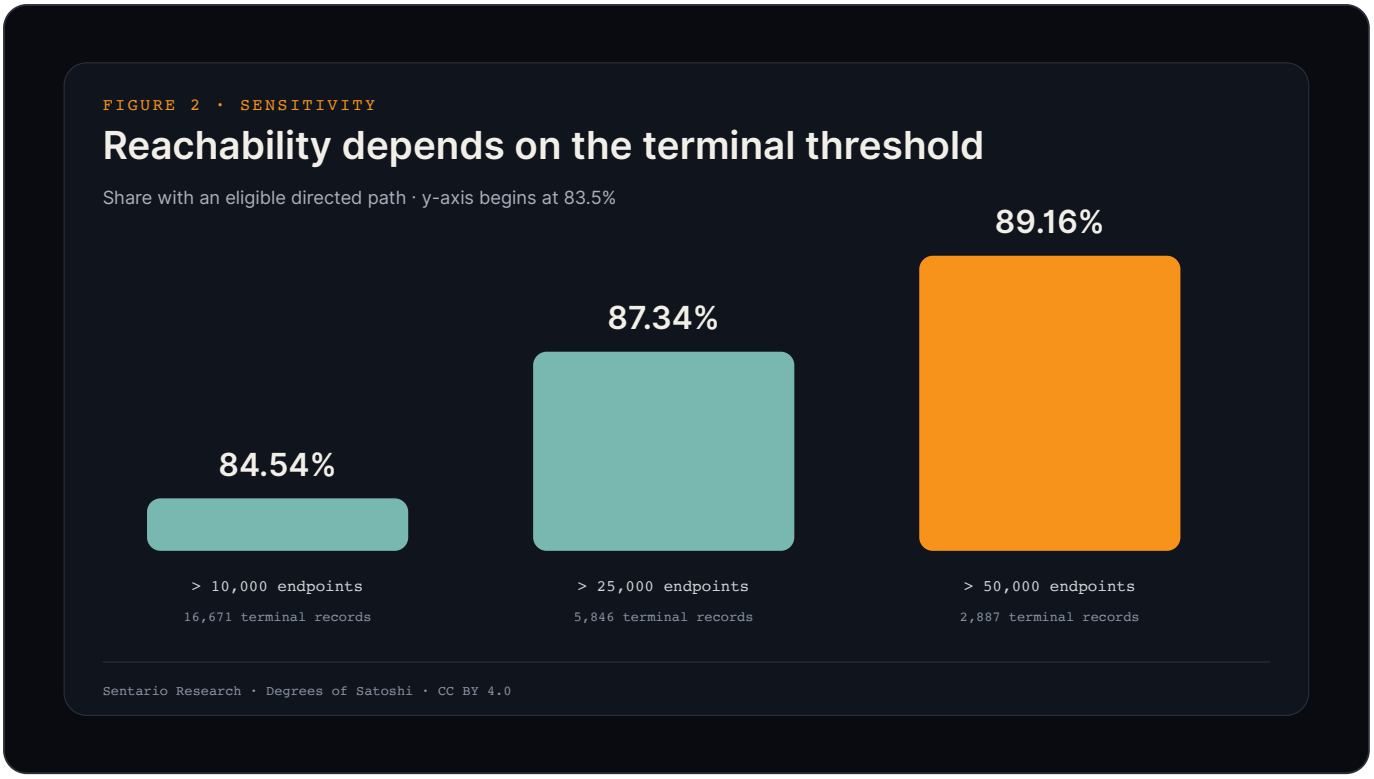


Figure 2. Eligible-path share across three terminal endpoint-count thresholds using the same 28,583-address anchor set.

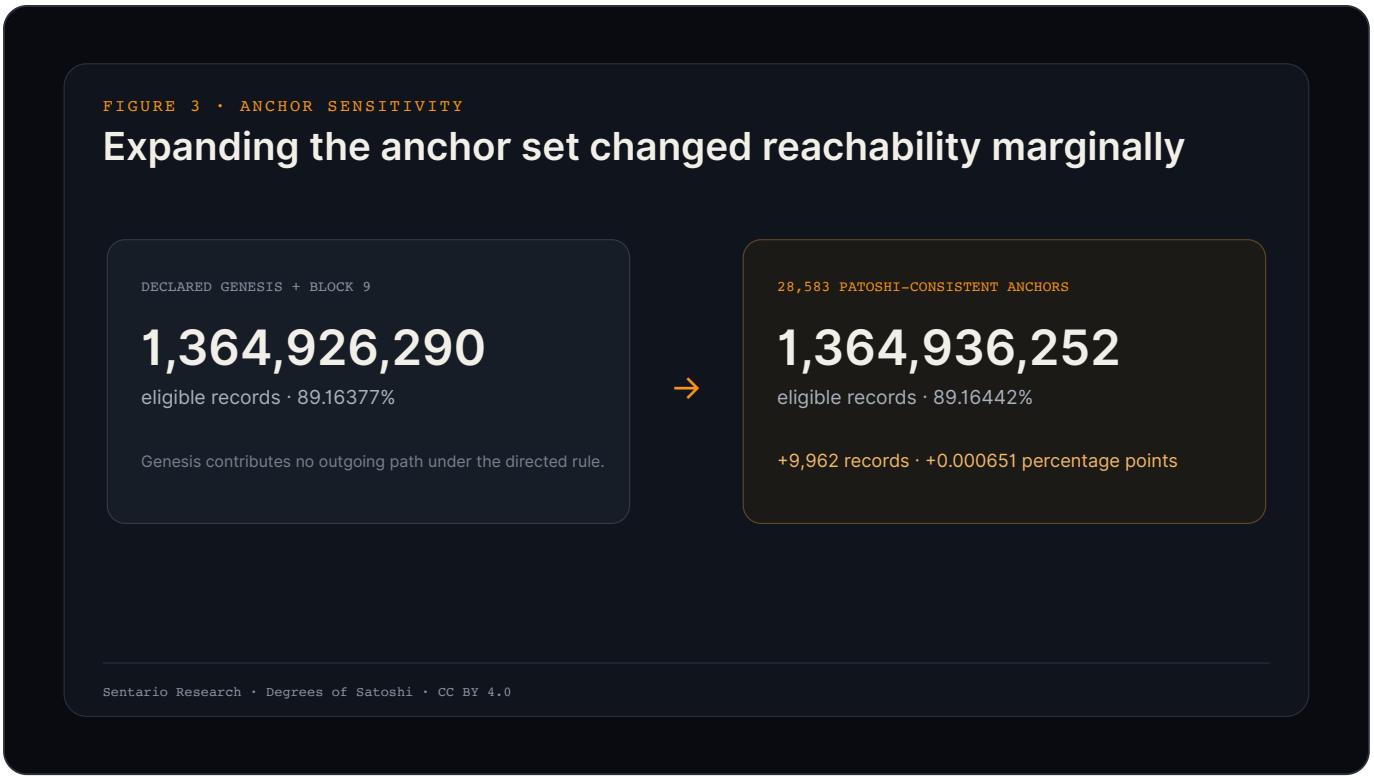


Figure 3. Reachability under the two declared early anchors and the 28,583-address Patoshi-consistent set, holding the directional and 50,000-endpoint terminal rules fixed.

With the same 28,583 anchors, tightening the endpoint threshold from 50,000 to 10,000 reduced eligible-path reachability from 89.16% to 84.54%. The post-Patoshi labelled-only run is not present in the checked-in evidence and is therefore not shown.

The anchor comparison is far smaller, but it does not prove the terminal-rule result is “structural” in every possible graph model. It shows only that this particular anchor expansion changed eligibility marginally while the other selected rules remained fixed.

Every persisted row was compared

Figure 4. Counts from the full persisted-artifact rebuild audit; degrees changed zero times while deterministic route dates and parents were corrected.

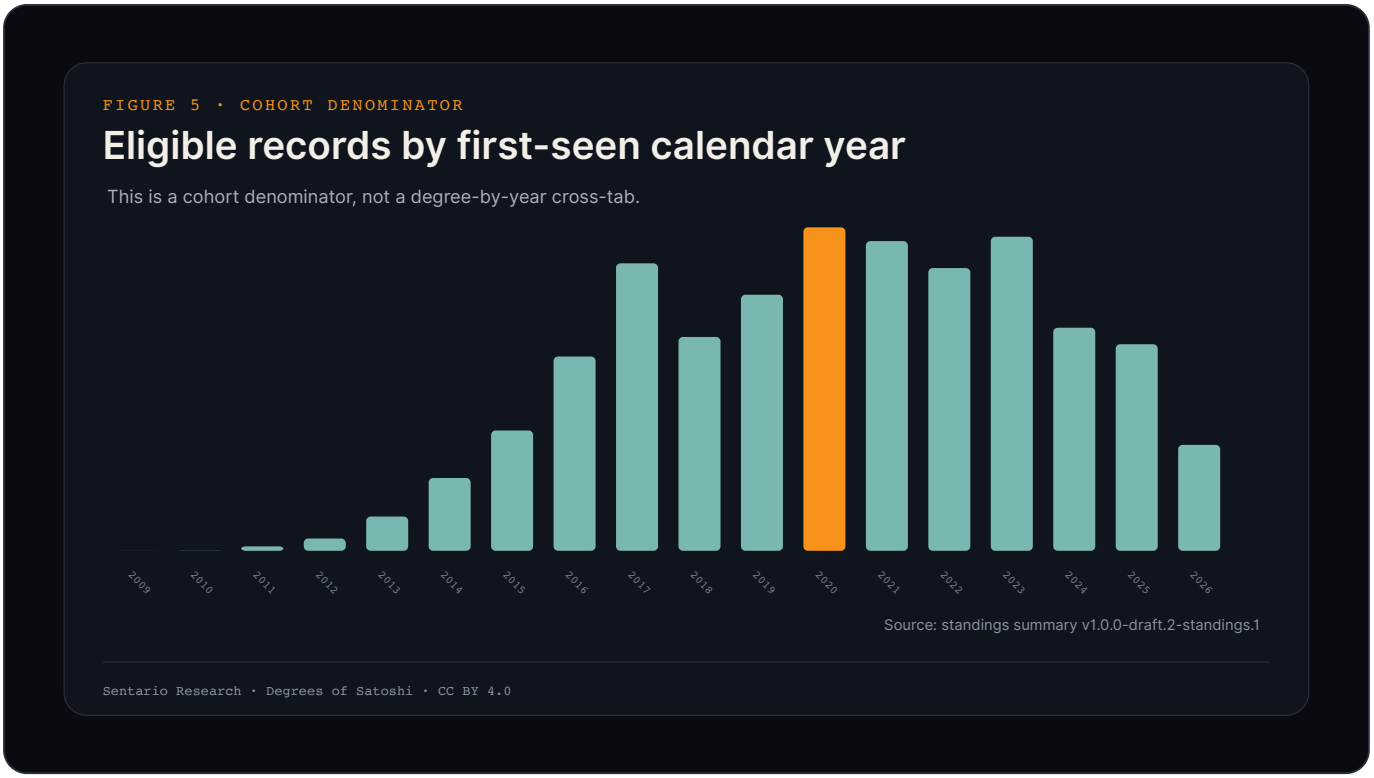


Figure 5. Eligible record counts by first-seen calendar year; this is not a degree-by-year cross-tab.

The deterministic path rebuild compared all 1,530,808,114 records. Degree changed zero times. Connected-since values changed for 506,285,603 records: 505,294,457 became earlier and 991,146 became later. All later dates replaced legacy paths that were invalid under the terminal rule.

The first-seen-year figure shows only cohort denominators from the standings artifact. The repository does not contain the degree-by-year cross-tab needed for a defensible heatmap.

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08 · LIMITATIONS

Graph paths are real; their interpretation is bounded

- **Batch payments:** one transaction can connect a sender to many outputs in a single hop.
- **CoinJoin and mixers:** deliberate input mixing can make graph proximity misleading as ancestry.
- **No wallet clustering:** addresses are not grouped by presumed common ownership.
- **Change and reuse:** change outputs are not distinguished from payments, and reused addresses can aggregate unrelated activity.

- **Terminal sensitivity:** the 10.84% without an eligible path is conditional on the selected stopping rules.
- **Snapshot:** the result stops at block 960,000 and does not describe later transactions.

> ### Analyses deliberately not claimed
>
> Connection-lag aggregates, a degree-by-first-seen-year cross-tab, a same-anchor directional-versus-undirected rerun, a post-Patoshi labelled-only run, and an inspected maximum-degree path are not available in the release evidence. The historic 50-path command was deterministic, not statistically random, and its output bytes are absent.

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09 · DATA AND CITATION

Download, verify, reuse

To the extent Sentario holds rights, the released data files—including aggregate tables and frozen anchor and terminal membership sets—are dedicated under CC0 1.0. Report text and figures are CC BY 4.0. The immutable data, citation, figure and PDF scope is recorded in the manifest; the mutable HTML, CSS and interaction layer are explicitly excluded there.

Research release 1.0.0

ASSET	COVERAGE	FILE
Printable research report (PDF)	Citable A4 report	bitcoin-address-graph-report-v1.0.0.pdf
Exact degree distribution (CSV)	25,350 exact-degree rows	degree-distribution.csv
Exact degree distribution (JSON)	Schema-described JSON	degree-distribution.json
Frozen anchor membership	28,583 addresses	anchors.csv
Curated terminal membership	41 active + 13 retained	terminal-hubs.csv
Terminal-threshold sensitivity	Three same-anchor runs	hub-threshold-sensitivity.csv
Anchor-set sensitivity	Fixed directional/t50k rule	anchor-set-sensitivity.csv
First-seen-year denominators	Not a degree cross-tab	first-seen-year-counts.csv
Full rebuild audit	Aggregate full-population audit	path-audit.json
Analysis availability ledger	Explicitly records unavailable analyses	availability.json
Release manifest	Versions, hashes and file manifest	research-release.json

SHA-256 CHECKSUMS | FROZEN METHODOLOGY | CODEBOOK | AVAILABILITY LEDGER

VERSION HISTORY | CORRECTIONS POLICY | LICENSES

RECOMMENDED CITATION

Sentario Research. “A Transaction-Graph Census of 1.53 Billion Bitcoin Address Records.” Degrees of Satoshi, version 1.0.0, 2026. https://degreesofsatoshi.com/research/bitcoin-address-graph/

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10 · DISCLOSURE

Publisher, incentives and corrections

Author: Sentario Research. **Publication:** Degrees of Satoshi. **Parent and copyright holder:** Sentario.

Sentario operates Degrees of Satoshi, which offers free address tracing and a paid address-publication product. The research CTA below leads to that product. Aggregate findings were generated from the same graph artifact that serves address lookups.

VERSION HISTORY

1.0.0 · 2026-08-10. Initial aggregate release candidate; no corrections recorded.

CORRECTIONS

The durable intake route will be the public repository issue tracker. That URL is not yet available, so public correction intake—and publication readiness—remain pending. Rule or result changes require a new version and checksum set.

FUNDING

No external funding is claimed.

CONFLICTS

Sentario’s operation of the checker and paid address-publication product is a direct commercial conflict.

REVIEW

No independent review is claimed. Technical review is invited before publication.