POLICY BRIEF · HEALTH · PREDICTIVE MEDICINE

From medical drift to predictive medicine

Systemic diagnosis of the French healthcare system and architectural properties of a sustainable vigilance regime confronted with chronicity

THESIS

Medical drift is not principally the failure of insufficiently attentive actors; it is the structurally expected effect of an intermittent vigilance regime confronted with pathological trajectories that have become longitudinal, multifactorial, and dynamic.

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Executive summary

The French healthcare system is entering a zone of durable structural tension. As of January 1, 2024, 13.8 million patients held ALD status (long-term condition registry, *affection de longue durée*). Chronic trajectories already concentrate close to two-thirds of reimbursed expenditure, with a projection approaching 75% by 2035. This evolution unfolds against a cumulative backdrop of medical demographic contraction, organizational fragmentation, professional cognitive saturation, and growing territorial heterogeneity.

This document defends a precise proposition. The phenomena of medical wandering and drift should not be interpreted principally as local malfunctions or individual follow-up failures. They result more fundamentally from a progressive inadequacy between the historical architecture of the healthcare system and the epidemiological nature of the trajectories it must now govern. The French system was historically optimized for the management of acute events: discrete episodes, short temporalities, relatively localizable causalities, punctual decisions. Chronicity introduces, in contrast, long, evolving, multifactorial, and partially silent trajectories whose degradations often become visible only late.

The central problem can be stated simply. The dominant surveillance regime remains principally intermittent, while chronic trajectories require a minimal capacity for longitudinal vigilance. This distinction designates neither a moral insufficiency of professionals nor an absence of commitment from care actors. It designates an informational property of the system itself: the bulk of the patient's physiological, behavioral, and contextual trajectory remains invisible between institutional points of observation. In this framing, drift no longer appears as an exceptional statistical anomaly. It becomes a predictable state of a system whose vigilance capacities remain principally organized around discrete contact points.

This document proposes neither a platform, nor a technological program, nor an automation of clinical judgment. It deduces, from the diagnosis posed, the minimal properties that a sustainable vigilance regime should satisfy: longitudinal visibility strictly bounded by an explicit doctrine of informational minimization, interpretive continuity of trajectories, explicit prioritization under resource constraints, cognitive sustainability for professionals, preserved centrality of human clinical reasoning, explicit governance of thresholds, uses, and limits of the system.

The central questions raised by a predictive vigilance regime are not principally technical. They are political. Who governs alert thresholds? Who bounds the legitimate uses of longitudinal trajectories? Who arbitrates prioritization under medical scarcity? What institutional form is capable of governing a vigilance infrastructure without drifting toward an actuarial surveillance infrastructure? This document does not claim to resolve these arbitrations. It establishes that no sustainable architecture can avoid making them explicit.

1. The problem: chronicity as structural transformation

Western healthcare systems face a long-running epidemiological transformation whose implications have not been fully absorbed by their organizational architectures. France does not escape this inadequacy; it presents, indeed, a particularly constrained combination of it.

13.8 M
patients holding ALD status as of January 1, 2024

62%
of reimbursed expenditure concentrated on chronic patients

87%
of the population in zones qualified as medical deserts

6.7 M
French residents without a registered GP

Four structural determinants converge

Taken individually, each of these four determinants is documented. Taken together, they produce a structurally reactive system, incapable of ensuring continuous vigilance over long trajectories.

Demographic constraints. Medical density standardized by care needs fell from 331 to 312 physicians per 100,000 inhabitants between 2012 and 2021; care needs grew faster than the physician count. In 2022, 65% of GPs reported refusing new patients as registered GPs, against 53% in 2019.

Economic incentives oriented toward acute care. Activity-based pricing (T2A, *tarification à l'activité*), designed for the management of punctual events, mechanically values the hospital episode and disadvantages prevention. The cost of potentially avoidable hospitalizations, estimated at 742,474 annual stays under the Weissman method, places the corresponding envelope between €2 and €3 billion for strictly avoidable stays alone.

Cognitive load exceeding human capacities. The growing complexity of clinical management, the multiplication of clinical guidelines, and the fragmentation of digital tools produce a cumulative cognitive debt among professionals. This debt is neither an individual psychological frailty nor a moral failing: it is a physical limit on longitudinal information processing.

Organizational fragmentation of care pathways. Chronic trajectories cross several institutional levels (health insurance, regional agencies, health authorities, care operators) whose perimeters and responsibilities partially overlap without coinciding. No single actor holds an integrated view of the trajectory.

Wandering and drift: two pathological regimes of one system

WANDERING

Disorganized over-utilization of the care system. Multiplication of clinical contacts without explicit longitudinal piloting. Phenomenon visible in activity indicators.

DRIFT

Structural under-utilization of the care system. Rupture of follow-up, progressive invisibility of the trajectory. A silent phenomenon, invisible in activity indicators.

Wandering and drift are not independent malfunctions: they designate two successive or alternative states of a structurally reactive system. A prolonged wandering trajectory tends to tip into drift; and drift, when it decompensates, produces a new phase of wandering in the emergency system. It is this cumulative dynamic that the analysis seeks to render legible.

2. The diagnosis: an intermittent vigilance regime

The inadequacy observed is not a question of resources, nor a question of tools, nor a question of professional commitment. It is a question of *vigilance regime*.

Intermittent surveillance vs continuous vigilance

The dominant mode of surveillance for chronic trajectories in France relies on scheduled consultations, annual examinations, and punctual hospitalizations. These observation points are precious, but they are by construction discrete. A type-2 diabetic patient followed by their registered GP is the subject, on average, of four to six annual consultations — that is, less than a single day of direct observation across the 365 days of the year. The bulk of the physiological trajectory unfolds outside any structured field of observation.

Increasing the number of contact points improves certain follow-up capacities but does not, by itself, modify the fundamental property of the dominant regime: a primarily discrete observation of trajectories that have now become continuous. The question is therefore not solely quantitative; it becomes architectural. It is not a matter of denying that additional consultations would produce real marginal benefits; it is a matter of recognizing that those benefits do not correct the structural property of the regime, which remains to observe by sampling trajectories whose degradation occurs predominantly between samples.

> *The question is not solely quantitative; it becomes architectural. No addition of consultations transforms a regime of discrete observation into a regime of continuous vigilance.*

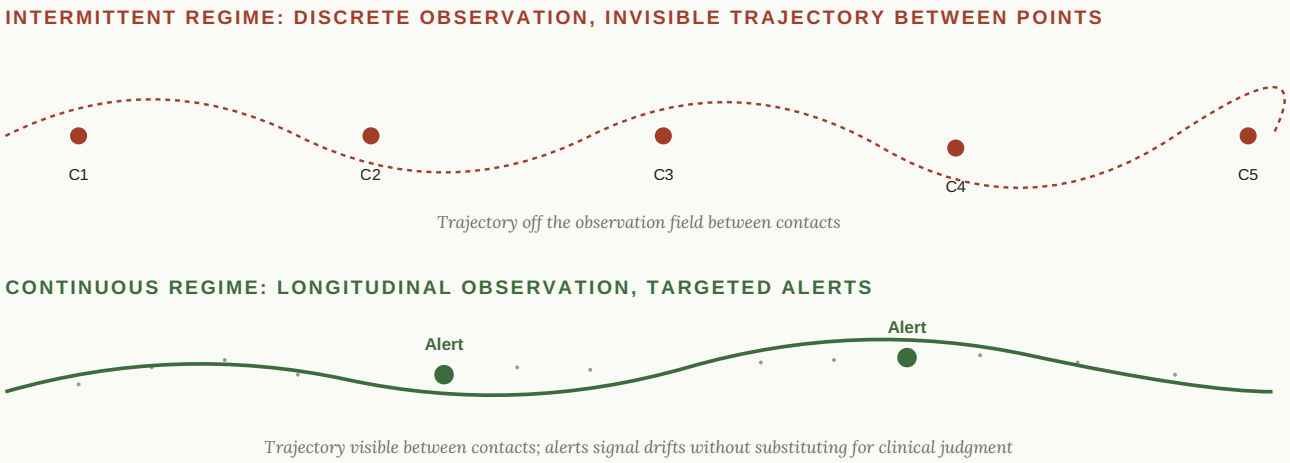

Figure 1. *Structuring distinction between intermittent vigilance regime and continuous vigilance regime. Observational continuity is an informational property of the device, distinct from the relational continuity exercised by clinicians.*

A necessary distinction: human continuity vs observational continuity

This analysis does not accuse care actors. There exists in France a *human continuity* of trajectories: registered GPs following their patients over decades, nurses building fine-grained knowledge over time, hospital teams mobilizing considerable relational competencies. This human continuity is neither absent nor disengaged.

The analytical distinction operates on another register: that of *observational continuity*. Whatever the professional's commitment, the consultation as a unit of observation remains punctual. Human continuity is not observational continuity. The first is a relational quality exercised under conditions of chronic overload; the second is an informational property of the surveillance device.

The problem identified is therefore not the absence of medical attention. It is the radical discretization of chronic trajectories by the dominant mode of observation, independently of the quality of the caregiver-patient relationship.

DOCTRINAL HEURISTIC · CONCEPTUAL TOOL

Clinical vigilance density

To make the transformation envisaged comparable and discussable, it is useful to introduce a conceptual operator that this document proposes as a doctrinal heuristic.

> *Clinical vigilance density designates the effective proportion of a pathological trajectory that is the object of an interpretable observation by the care system.*

This concept makes explicit what traditional formulations leave implicit. It provides a comparison operator across national regimes (the clinical vigilance density of a system with mandatory patient registration differs from that of an open system), across pathologies (the observation of chronic heart failure has a different vigilance density than that of a cancer in remission), and across temporalities (density varies along the trajectory according to disease phases).

Cautions of use. This concept is not, at this stage, a calibrated operational metric. It constitutes a heuristic tool intended to structure the political discussion on sustainable observation regimes. Its translation into a quantifiable indicator presupposes a precise definition of what constitutes an "interpretable observation" and of the weighting to apply to different signal types. That translation belongs to subsequent methodological work, not to the present note.

3. No foreign system provides a directly transposable model

The comparative examination of four contrasted configurations (the British NHS, the Netherlands, Nordic models, the integrated American models Kaiser Permanente and Veterans Health Administration) makes it possible to situate the French diagnosis without yielding to the illusion that some foreign model would resolve the problem.

Configuration	Structural strength	Structural limit	Transposability
British NHS	Regulated universalism, mandatory patient registration with a practice, GP gatekeeping.	Unresolved tension between rapid access and personal continuity; vigilance regime remains intermittent.	Low
Netherlands	Bundled payments since 2010; territorialized care groups; integrated nurse practitioners.	Mono-pathology architecture ill-suited to multimorbidity; expenditure increase on those patients.	Partial
Nordic countries	Strong longitudinal continuity; reduced chronic mortality associated with this continuity.	Persistent informational fragmentation despite 98% electronic records (Norwegian case).	Low
Kaiser Permanente / VHA	Vertical payer-provider integration; unified information system; hypertension control > 85%.	Inaccessible to a single-payer system without major concession to mutualization principles.	Near-zero

Cross-reading. The systemic production of wandering and drift is not specific to France. But none of the configurations compared constitutes, properly speaking, a solution. Each reduces certain vulnerabilities at the cost of residual tensions. France presents a particular combination of difficulties: absence of mandatory registration with a referent, absence of territorialized payments, fragmentation at least equivalent to that of the Nordic countries. This combination renders the phenomena of wandering and drift structurally less buffered by existing organizational devices.

The conclusion is precise: the transformation required is not a question of adopting a foreign architecture, but a question of changing the surveillance regime — a change that the foreign configurations, to varying degrees, have not themselves fully effected.

4. A minimal architectural framework, not a program

This document proposes neither a particular device, nor a reform program, nor operational recommendations. It deduces from the analysis the minimal properties that an alternative surveillance regime should satisfy in order to address the structural limits identified.

Six minimal architectural properties

01 **Strictly bounded longitudinal visibility.**
The patient trajectory must be observable between scheduled consultations, drawing on heterogeneous signals (clinical, biological, behavioral, contextual). This visibility must, however, be strictly bounded by an explicit doctrine of informational minimization, of limited retention temporality, and of technical impossibility of unauthorized extra-clinical use. The quantity of information observed does not depend on what technique permits; it depends on what political doctrine authorizes.

02 **Interpretive continuity of trajectories over time.**
Longitudinal aggregation must produce a dynamic representation of each trajectory, capable of rendering visible departures from expected evolution.

03 **Explicit prioritization under resource constraints.**
Any architecture must assume the scarcity of clinical time by proposing a hierarchization of situations requiring heightened attention, without substituting for allocation decisions, which remain political.

04 **Cognitive and organizational sustainability.**
The architecture must not increase professionals' cognitive load but absorb it, by hierarchizing information rather than multiplying it.

05 **Preserved centrality of human clinical reasoning.**
The function of the architecture is to support medical judgment, not to replace it. Responsibility does not bear on the correctness of a prediction, but on the way information is taken into account in a human decision.

06 **Compatibility with a fragmented institutional system.**
The architecture must be deployable without prior suppression of the plurality of actors; it must traverse the silos, not replace them.

Five non-negotiable legitimacy constraints

These properties are defensible only under five legitimacy constraints, which are not secondary safeguards but structural conditions. Longitudinal visibility produces an informational asymmetry between public actors and patients that must be bounded. The social function of health data is transformed by its placement into architecture. The architecture is structurally incompatible with an individualizing actuarial logic. Longitudinal data constitute an object of systemic vulnerability. Individual patient consent is necessary but does not suffice to ground the collective legitimacy of the device.

Predictive prevention is neither a technology, nor a promise of accuracy, nor a program. It is an architectural property.

A limited hypothesis, not a promise of accuracy

The proposed regime does not rest on the hypothesis of perfect predictive capacity, nor on an automation of clinical decision. It rests on a more limited hypothesis: *certain degradations become statistically detectable earlier when a partial longitudinal trajectory is rendered interpretable in time*. This hypothesis is neither a promise of exhaustiveness nor a guarantee of universal effectiveness. It is a scientifically defensible bound, sufficient to justify an architectural examination without requiring the impossible demonstration of absolute predictivity.

This precision has a direct doctrinal consequence: a sustainable predictive system is not a system that eliminates error; it is a system that renders its conditions of validity, its zones of uncertainty, and its operational limits explicitly governable. The performance of the device becomes a secondary property; the governability of uncertainty becomes the central property. This inversion is what distinguishes the framework proposed here from narratives on artificial intelligence in health that overrate algorithmic accuracy without making explicit the conditions under which it remains valid.

5. Credible alternative architectures and zones of irreducibility

The proposed framework must be situated among other credible architectures. This contextualization does not aim to relativize the analysis; it aims to avoid a teleological reading according to which the diagnosis posed would necessarily lead to the deduced architecture. Four alternatives merit examination.

Architecture	Structural strength	Structural limit
Reinforcement of proximity medicine (multiprofessional teams around the referring GP)	Documented reduction of fragmentation and improvement of longitudinal continuity; reduced chronic mortality.	Relies on the availability of a stable referring physician, which clashes with demographic decline. Does not address longitudinal visibility between two contacts.
Vertical integration of operators (Kaiser, VHA model)	Economic coincidence between payer and provider; suppression of cost-externalization incentives.	Inaccessible to a single-payer system without prior transformation of system structure. Does not address sustainability outside the self-selected perimeter.
Precision medicine and genomic stratification	Fine identification of at-risk subpopulations through biomarkers; effective targeted interventions.	Relevant for pathologies with strong biological determinism, marginal for multifactorial chronicity. Cost-effectiveness limited to a restricted number of indications.
Patient platforms and digital empowerment	Direct patient involvement in follow-up; connected measurement tools.	Burden transfer to the patient, producing usage drift among populations with lower digital literacy — precisely those at higher clinical risk.

The architecture proposed by this document: architected longitudinal surveillance. The regime defended here does not substitute for any of the four alternatives; it proposes a foundation of longitudinal observation that can be combined with them. Its distinguishing property is to render the trajectory visible between clinical contacts, independently of the availability of a referring physician or the patient's digital capability. It resolves neither medical scarcity nor literacy issues; it specifically addresses the problem of longitudinal invisibility, which none of the alternatives addresses.

Three zones of irreducibility common to all architectures

None of the five architectures examined fully resolves the problem. Three zones of irreducibility must be acknowledged and assumed by public debate.

The absolute scarcity of medical resources. No architecture creates physicians or increases total available clinical time. Each architecture redistributes, prioritizes, or buffers; none transforms the addition.

The multifactorial complexity of chronic trajectories. Biological noise and behavioral, social, and organizational determinants exceed what any infrastructure can predict. Perfect prediction is excluded by the very nature of the living.

The political dimension of arbitrations between solidarity, individualization, surveillance, and autonomy. No architectural choice settles this dimension; it falls within the scope of an explicit public framing.

6. Epistemic limits specific to predictive systems in health

Predictive systems deployed in health carry consubstantial limits that must be addressed head-on. Ignoring them would amount to conceiving predictive artificial intelligence as a stable functional layer, when the stability of a predictive system over time is never acquired. Five limits must be named.

Distribution drift

Every predictive model is trained on a past distribution of data. But clinical distributions evolve: therapeutic practices, diagnostic codings, demographics of monitored patients. A model calibrated on 2020 has no guarantee of equivalent operational validity on 2026. No credible architecture can dispense with an explicit device for monitoring this drift and with controlled retraining mechanisms.

Calibration and probabilistic quality of outputs

A model can produce correct classifications (good discrimination) while being poorly calibrated — that is, while associating systematically biased probabilities to its predictions. In the clinical context, a degradation

probability of 0.3 must signify an empirical frequency of 30% in the relevant population; otherwise the signal is uninterpretable. Calibration must be continuously monitored and reported explicitly.

Domain of applicability

Every model has a validity domain bounded by its training population. A prediction on a patient situated outside this domain is not equivalent to a prediction on a typical patient. A defensible architecture must refuse to produce a signal when the patient lies outside the recognized applicability domain, rather than silently producing a degraded-quality signal. This property conditions the medico-legal responsibility of the device.

Causal non-localizability

A predictive model identifies associations between variables; it does not establish causal relationships. A patient flagged as high-risk is not, by virtue of the signal alone, causally intervenable on the variable that produces the signal. Governance must explicitly articulate what the model says (this patient presents an elevated risk) and what it does not say (this patient should receive such-and-such intervention).

Probabilistic auditability

A probabilistic signal is, by construction, fallible. The auditability of a predictive device consists in verifying that the empirical frequency of error corresponds to the predicted frequency, that errors are not concentrated on identifiable subpopulations, and that the production conditions are reproducible. This auditability requires specific statistical competencies and institutional devices that European health authorities have not yet fully constituted.

> A *predictive system is never deployed once and for all; it is maintained or it drifts.*

7. Political conditions of sustainability

Any architectural analysis that ignored the real entropy of public arbitrations would, rightly, be perceived as institutionally naïve. Five structural forces contribute to the stability of the existing lock-in and to the difficulty of any transition. Identifying these forces is not a matter of proposing a program to overcome them; it is a matter of rendering them visible in the reasoning.

Asymmetry of temporalities

The clinical benefit of effective predictive prevention is measured on a horizon of five to fifteen years. The political horizon of health decision-makers oscillates between two and five years. A device whose benefits materialize beyond the career horizon of those bearing the decision is structurally disadvantaged in budgetary arbitrations, independently of its quality.

Institutional capture of measurement devices

Current performance indicators (hospital occupancy rates, T2A, ROSP indicators) were built within the acute-care paradigm. They measure what that paradigm values. A transition to a predictive vigilance regime would presuppose either the creation of new indicators or coexistence with existing ones. Actors whose performance is measured by current indicators have a structural reason to defend their continuity.

Territorial asymmetries and distribution conflicts

A territorialized vigilance infrastructure mechanically displaces visibility — and therefore public responsibility — toward the territories in which patient trajectories are made visible. Less-endowed territories may see in this an exposure of their lag. Better-endowed territories may perceive the device as an additional obligation in a saturated context.

Logics of administrative silos

Any territorial longitudinal surveillance device crosses several institutional perimeters. This transversality, which is precisely what the analysis defends conceptually, is also what renders its administrative

implementation most difficult. Transversal devices ordinarily die from the silent resistance of the silos they cross.

Contradictory indicators between internal actors

Within each organization, internal indicators may diverge between directorates. Without explicit arbitration borne at a higher level, organizational inertia favors the status quo, which is the only configuration compatible with the entirety of existing indicators.

> *Sustainable architectural transformations are those borne by a stable coalition beyond political cycles; transformations that lack such a coalition tend to become territorial pilot projects whose outcome is oblivion.*

8. Four arbitration points not delegable to the technical level

The very nature of the questions raised by the prospect of a predictive vigilance regime entails that they cannot receive a purely technical answer. Four arbitrations must be assumed at the political level, failing which they will be settled by default at the technical level, without mandate or transparency.

Arbitration 1 · Who governs alert thresholds?

Every predictive device operates on the basis of explicit or implicit thresholds. The choice of these thresholds is not a technical decision: a low threshold multiplies signals and the investigation load; a high threshold preserves the capacity for action but accepts a higher false-negative rate. The question is not whether thresholds exist (they always do), but who bears public responsibility for them. A defensible architecture must name the decision body, make the arbitrations explicit, and organize their periodic review.

Arbitration 2 · Who bounds the uses of longitudinal data?

The longitudinal trajectories produced by a vigilance infrastructure constitute, by their granularity and historical depth, objects of considerable economic value to private and public actors (insurers, employers, platforms, financial operators). Current legal prohibitions are necessary but not sufficient conditions: legally bounded use perimeters tend to expand over the course of legislative revisions. A defensible architecture must include deliberately limited capacities: bounded retention durations, granularity degraded at export, technical impossibility of profile constitution outside strict clinical use.

Arbitration 3 · Who decides on prioritization under insufficient resources?

The architecture can rank ten thousand patients by risk; it cannot decide which will actually receive care. That decision belongs to care operators and, more broadly, to territorial conferences and supervisory authorities. The structural risk: that algorithmic prioritization be perceived as a legitimate political decision, when it has neither the mandate nor the responsibility for one. A defensible architecture must make explicit that its output is a hierarchization proposal, not an allocation decision.

Arbitration 4 · What form of State?

The analysis converges toward a philosophical question that no technical analysis can settle: what form of State is capable of governing a predictive vigilance infrastructure without tipping into actuarial surveillance? This document does not claim to answer it. It establishes, however, that the position defended presupposes, by construction, a certain implicit doctrine of the role of the State, which it is appropriate to make explicit so as not to appear surreptitious. Four elements compose it.

First element: certain vigilance infrastructures fall within the public good. The territorial device described cannot be conceived as an ordinary market service. The very nature of what it observes (longitudinal individual trajectories, signals of silent degradation, population indicators) implies that it may be used to orient public decisions on allocation, regulation, and protection. This property disqualifies simple privatization as a sustainable option. It does not, however, disqualify contractual arrangements in which the State delegates certain technical functions to specialized operators, provided that the governance of the device and the use of the information produced remain non-delegable public functions.

Second element: certain data cannot be abandoned to market logics. Longitudinal trajectories constitute, by their granularity and historical depth, objects of considerable economic value to private and public actors. A partial inalienability of these trajectories constitutes a condition of historical sustainability of the regime, distinct from current French and European legal provisions, which remain calibrated for a less extensive data economy than the one taking shape.

Third element: certain architectures must be governed collectively. The governance of interpretive frames, thresholds, prioritization criteria, and periodic revisions cannot be left to technical designers without drift. It presupposes a public body of appropriate level, capable of mobilizing scientific expertise, citizen representation, and political arbitration capacity. The precise institutional form (independent authority, territorial conference, attached ethics committee) remains to be arbitrated; its existence is itself a condition of sustainability.

Fourth element: certain forms of health visibility must be politically bounded. The extension of longitudinal visibility is not, in itself, a progress. It modifies the status of the asymptomatic patient, the social function of health data, the informational asymmetry between public actors and patients. This transformation must be the subject of an explicit political bounding — that is, of a public decision that defines the maximum acceptable observation perimeter, independently of what technique renders possible. The gap between what is technically feasible and what is politically authorized is the proper locus of the political in matters of predictive surveillance.

These four elements do not constitute a program. They describe the implicit doctrine on which the cumulative argumentation rests. The philosophical question it opens remains unanswered at this stage: it interrogates the capacity of a State, under contemporary political conditions, to exercise an arbitration function over technical devices whose complexity exceeds that of prior devices without comparable precedent. This document does not resolve that question. It establishes that it cannot be circumvented.

A predictive vigilance infrastructure that is technically defensible but politically left to itself transforms, in the more or less long term, into an actuarial surveillance infrastructure. Its sustainability depends neither on its algorithmic performance, nor on the intentions of its designers, but on the explicit capacity of a public body to govern its thresholds, its uses, and its limits.

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