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Keeping Vaccination Simple: Building French Immunization Schedules, 1959–1999

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Keeping Vaccination Simple: Building French Immunization Schedules, 1959–1999

GAËTAN THOMAS

SUMMARY: This article explores the history of the immunization schedule—a table that orders mandatory and recommended vaccines and their boosters through time. My study focuses on France, from the late 1950s to the 1990s. A couple of conferences at the turn of the 1960s set the parameters for immunization schedules, providing insights into their expected disciplinary functions. In the wake of these conferences, a long series of clinical trials aimed to simplify and rationalize the schedules. These trials were carried out by the International Children’s Center (ICC), an institution whose aim transitioned in the mid-1960s from the standardization of the sole vaccine against tuberculosis to the simplification of the expanding immunization device for children. I draw from the ICC’s experimental work on schedules to define “simplification” with regard to the notion of standardization.

KEYWORDS: immunization, immunization schedule, simplification, International Children’s Center, standardization, public health, epidemiology, clinical trials

In the mid-2000s a new wave of criticism addressing vaccines emerged in several countries, including France and the United States.¹ In marked contrast to the arguments of previous decades, this criticism was not

This article builds on research toward a doctoral dissertation on the history of epidemiology and immunization in France, from the 1950s to the mid-1990s. For their insightful engagement with this material and incisive comments on previous drafts, I would like to thank Ronald Bayer, Luc Berlivet, Patrice Bourdelais, Dominique Cardon, James Colgrove, Amy Fairchild, Guillaume Lachenal, Anne Marie Moulin, Gerald Oppenheimer, David Rosner, Kavita Sivaramakrishnan, Thomas Tari, and the peer reviewers engaged by the *Bulletin of the History of Medicine*. I am also grateful to Rattanamol Singh Johal, who offered considerable help in improving the clarity and flow of the text.

1. Mark A. Largent, *Vaccine: The Debate in Modern America* (Baltimore: Johns Hopkins University Press, 2012); Pierre Bégué, “Alerte sur les difficultés du calendrier vaccinal du nourrisson en France,” *Bulletin de l’Académie Nationale de Médecine* 188 (2004): 861–64.

focused on an individual vaccine and its alleged side effects. It also wasn't centered on immunization's immunological rationale.² Instead, concern around "vaccine overload" expressed discomfort with the growing number of injections administered to newborns and was articulated by well-educated parents who recognized the value of immunization. Ironically, this conceivably balanced critique targeted the immunization schedule, a technology designed to keep immunization as simple and acceptable as possible.

This article examines the history of French immunization schedules between the late 1950s and the 1990s, a period in which schedules were the centerpiece of immunization's rather uncontroversial expansion. Immunization schedules are tables, often lacking remarkable design features, that order mandatory and recommended vaccines as well as their boosters through time. They began to be widely circulated among pediatricians and parents in the late 1950s, when public health experts, worrying that the multiplication of vaccines might compromise their actual use, sought to rationalize, bundle, and distribute most shots across the first month of a newborn's life. Simple in appearance, immunization schedules were integrated into a set of graphic technologies, alongside growth charts and feeding schedules, that were instrumental to the medicalization of childrearing. In the post-Second World War French context of unchallenged medical authority, the strategic redefinition of immunization as an intervention targeting newborns was expected to normalize the use of new vaccines and consolidate coverage rates.³

The French medical establishment of the late 1950s was not alone in considering that schedules might assuage the practical problems posed by the multiplication of vaccines. Several committees, partly tasked with establishing schedules, were set up in other countries during the same period—in 1963 in the United Kingdom and in 1964 in Canada and the United States.⁴ After the World Health Organization (WHO) launched

2. Jolanta Skomska-Godefroy, "La résistance contemporaine à la vaccination : le cas français," in *L'aventure de la vaccination*, ed. Anne Marie Moulin (Paris: Fayard, 1996), 423–37; Robert D. Johnston, "Contemporary Anti-Vaccination Movements in Historical Perspective," in *The Politics of Healing: Histories of Alternative Medicine in Twentieth-Century America*, ed. Robert D. Johnston (New York: Routledge, 2004), 244–71.

3. On the idea that newborns were a vector of medicalization in society, see Janet Golden, *Babies Made Us Modern: How Infants Brought America into the Twentieth Century* (Cambridge: Cambridge University Press, 2018).

4. The first session of the U.S. Advisory Committee on Immunization Practices explicitly addressed the simplification of immunization. The minutes read: "Dr. Joseph Bell discussed the desirability of an immunization schedule for public health practices simpler than that propounded by the Academy of Pediatrics "Red Book" Committee which presently

its Expanded Programme on Immunization in 1974—the first initiative to implement immunization globally and systematically beyond the short-term campaign for smallpox eradication—an effort was made to design schedules that fit developing countries' differing levels of health infrastructure. Albeit not unparalleled, post-Second World War France provides an illuminating case study as immunization schedules were both conceived at a distance from the state and the subject of decades of continuous clinical experiments.

In contrast to the widespread understanding of immunization as an archetypal state intervention, the history of French immunization schedules might be read as a long, somewhat delayed, path toward a state monopoly.⁵ In the wake of various scientific meetings, a government circular promulgated the first national immunization schedule in May 1960.⁶ It was updated five years later by another circular. Until the mid-1980s, though, the state was not the only maker of schedules. As an observer noted, stressing a profound contradiction, state schedules would remain “semi-official” for more than twenty years.⁷ Vaccine producers diffused their own schedules through a network of pharmacists, corporate publications, and advertisements, while prominent physicians defended their own opinions on this matter. Pediatric dispensaries adopted customized

recommends fourteen separate visits in sixteen years. It was agreed that simplification was of practical importance.” “Minutes, Meeting n° 1,” ACIP, May 25-26, 1964, National Archives at Atlanta, 68A1665. On national advisory committees worldwide, Maggie Bryson et al., “A Global Look at National Immunization Technical Advisory Groups,” *Vaccine* 28 (2010): A13–17.

5. Most recent historical literature revolves around the idea of immunization as the paradigmatic state intervention in matters of health: Jeffrey P. Baker, “Immunization and the American Way: 4 Childhood Vaccines,” *Amer. J. Public Health* 90 (2000): 199–207; Nadja Durbach, *Bodily Matters: The Anti-Vaccination Movement in England, 1853–1907* (Durham: Duke University Press, 2005); James K. Colgrove, *State of Immunity: The Politics of Vaccination in Twentieth-Century America* (Berkeley: University of California Press - Milbank Memorial Fund, 2006); Michael Willrich, *Pox: An American History* (New York: Penguin Press, 2011); Kendall Hoyt, *Long Shot: Vaccines for National Defense* (Cambridge: Harvard University Press, 2012); Elena Conis, *Vaccine Nation: America's Changing Relationship with Immunization* (Chicago: University of Chicago Press, 2015); Dóra Vargha, *Polio across the Iron Curtain: Hungary's Cold War with an Epidemic* (New York: Cambridge University Press, 2018). For different views, stressing a more ambiguous involvement of the state with regard to immunization, see: Warwick Anderson, “Immunization and Hygiene in the Colonial Philippines,” *J. Hist. Med. & Allied Sci.* 62 (2007): 1–20; Laurence Monnais, *Vaccinations: Le mythe du refus* (Montréal: Les Presses de l'Université de Montréal, 2019).

6. “Circulaire du 6 mai 1960 sur le calendrier des vaccinations,” French National Archives, 19810568-1.

7. “Conférence du professeur Lépine à l'Institut Mérieux,” October 30, 1959, Mérieux Foundation, D15.

schedules. Such pluralism—a source of tension between manufacturers and a range of legitimate health authorities—was put to an end in 1986, when the state seized control over the schedule with the creation of the Comité technique des vaccinations (CTV). The state's ambiguous involvement in matters of schedules was consistent with their normative status. Schedules listed mandatory vaccines, hence implying a legal obligation to comply, though no specific law enforced a comprehensive and orderly implementation of the entire recommended schedule. Their normative push was located at a different, arguably lower level. Schedules belonged to the realm of “implementation procedures” delegated to figures of the public health establishment. Since schedules were not fully reliant on legal coercion, nor fitted the category of health education—they did not engender a great deal of discourse directed toward the public—their existence blurs the fraught distinction between *obligation* and *education* that structures public and scholarly discourses on immunization.⁸ Reconsidering the power of norms in the context of immunization, this article pays particular attention to schedules' disciplinary mechanisms.

A process of rationalization developed alongside the diffusion of schedules, since physicians and epidemiologists supported their design with scientific evidence. In 1964, the International Children's Center (ICC, 1949–1999), an institution considered the main center for the epidemiological study of vaccination in France from the late 1940s to the early 1990s, started a randomized clinical trial testing different schedules. It quickly became ICC's flagship research and was renewed for almost thirty years, initially in the Paris suburbs, and then concomitantly in France and different countries of Francophone Africa. Through these trials, the ICC transitioned from the standardization of the sole vaccine against tuberculosis (BCG) to the simplification of childhood immunization. Even though the experimental work on the simplification of schedules emerged from a setting tackling the issue of vaccine standardization, the logics of simplification differed greatly from standardization, as I argue in this article.⁹ I aim to clearly distinguish these notions in order to unpack

8. Anne Marie Moulin, “Introduction: hasard et rationalité dans l'approche vaccinale,” *Hist. Philos. Life Sci.* 17 (1995): 5–29; Lion Murard and Patrick Zylberman, “Éducation ou contrainte: la vaccination antivariolique en France à la Belle Époque,” *Hist. Philos. Life Sci.* 17 (1995): 31–53; James K. Colgrove, “Between Persuasion and Compulsion: Smallpox Control in Brooklyn and New York, 1894–1902,” *Bull. Hist. Med.* 78 (2004): 349–78.

9. My arguments around simplification are built with regard to the notion of standardization as understood in the context of the history of pharmacy. For a broader approach to standardization, see Martha Lampland and Susan Leigh Star, eds., *Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life* (Ithaca: Cornell University Press, 2009); Lawrence Busch, *Standards: Recipes for Reality* (Cambridge: MIT Press, 2011).

their respective rationales. In doing so, the article underscores the importance of simplicity in public health, as a value warranting experiments.

A coherent group of actors, organized around the ICC, led the work on French schedules from the late 1950s to the dismantling of this institution in 1999. In this article, both the question of schedules' normativity and the processes of simplification are observed through the activities of these actors. I begin with a discussion of conferences that set the parameters for immunization schedules at the turn of the 1960s, providing insights into the expected disciplinary mechanisms of schedules. A long series of clinical trials intended at rationalizing schedules are then examined, laying the ground for a distinction between standardizing vaccines and simplifying immunization. I conclude with a short epilogue, examining how the design of schedules was appropriated by the state through the creation of an expert committee, the CTV, in 1986.

The Rule of Simplicity

As the rationalization embodied by schedules was considered an answer to the multiplication of vaccines, these tables illustrate the counterintuitive idea that the high level of pharmaceutical innovation in the postwar period has been framed as a practical problem by public health experts. To fully understand this idea, one can recall that the simplicity of vaccines had been constructed and communicated as their fundamental quality since the beginning of the twentieth century. This was considered crucial for their widespread adoption, especially since immunization was not the unique available intervention, either in human or veterinarian medicine. In the early 1910s, French bacteriologist Hyacinthe Vincent argued that vaccination against typhoid must present the least possible inconvenience.¹⁰ A decade later, the French creators of the vaccine against tuberculosis offered farmers the justification that vaccinating their cattle would cost less and be much simpler than slaughtering them if contaminated.¹¹ The simplicity argument gained traction after the diffusion of antibiotics in the 1940s: prevention is always *simpler* than cure. In the 1960s, G. S. Wilson, the head of the London School of Hygiene and Tropical Medicine, concluded that the “ease of administration” was

10. Hyacinthe Vincent, “Sur la Vaccination antityphique,” *Bulletin de l'Académie Nationale de Médecine* 65 (1911): 63–105, quotation on 66.

11. Delphine Berdah, “Innovation biologique, expertise et crise sanitaro-agricole: La lutte contre la tuberculose bovine et la fièvre aphteuse en France et en Grande-Bretagne du milieu du XIXe siècle aux années 1960” (Ph.D. diss., EHESS, 2010), 166–70.

one of the “five general principles for any vaccines.”¹² The ease of using vaccines generally referred to two things, namely, the techniques of injection and the number of shots.

The rapid pace of innovation initiated during the Second World War posed a major threat to vaccine simplicity.¹³ In the mid-1950s, health officials from Western countries with long-standing immunization policies started to worry that the multiplication of vaccines might overwhelm public health apparatuses. “The number of inoculations received by infants has reached formidable proportions,” noted a British pediatrician in 1954.¹⁴ The era was marked by the anticipated arrival of the polio vaccine, including which took the number of vaccine preventable diseases up to fifteen at the turn of the 1960s. The multiple primo-injections and boosters added by the new vaccines weakened this entrenched simplicity, as Pasteur Institute scientist and pioneer of combination vaccines Gaston Ramon stated in various instances.¹⁵ Two coordinated strategies were envisioned to maintain vaccination’s simplicity: accelerating the work on combining vaccines and ordering the shots into rationalized immunization schedules.¹⁶

In the second half of the 1950s, a series of international conferences tackled the multiplication of vaccines. The creation of the International Alliance for Biological Standards (IABS) in 1955 led to the organization of annual meetings where vaccine producers and regulators discussed the latest issues in the field, in conjunction with the WHO. The vaccine producer Charles Mérieux, an important participant in the first IABS meetings, held in Lyon, Opatija, Brussels, and Jerusalem, insisted on combination vaccines, taking this opportunity to bring up “simplified

12. Samuel L. Katz, “Immunization with Live Attenuated Measles Virus Vaccines: Five Years’ Experience,” *Archiv Für Die Gesamte Virusforschung* 16, no. 1–5 (1965): 222–30, quotation on 229.

13. Hoyt, *Long Shot* (n. 5).

14. Geoffrey V. Feldman, “Immunization of Infants with Triple Antigen,” *Arch. Dis. Childh.* 145 (1954): 175–77, quotation on 175.

15. Gaston Ramon, “Ive Mémoire : les vaccinations associées au moyen des vaccins combinés. Bases. Essor. Résultats,” *Revue d’immunologie* 13 (1949): 41–65; Gaston Ramon, “La prophylaxie individuelle et collective des maladies infectieuses par les vaccinations associées. Mise au point,” in *Calendrier des vaccinations*, ed. Centre international de l’enfance (Paris: Masson, 1960), 120–25.

16. The first combination vaccine can be traced back to the early twentieth century, when the Italian bacteriologist Aldo Castellani developed a typhoid-para-typhoid vaccine. Aldo Castellani, “Typhoid-Paratyphoid Vaccination with Mixed Vaccines,” *Brit. Med. J.* 2764 (1913): 1577–78.

immunization schedules.”¹⁷ These conferences anticipated events fully dedicated to the matter of schedules. In 1959, two international conferences on immunization schedules were organized, in May at the Wellcome Trust in London, and in October at the ICC headquarters in Paris.¹⁸ In both conferences, attended by physicians of diverse nationalities, including prominent figures of epidemiology and immunology (Austin Bradford Hill and Jonas Salk in London, Gaston Ramon in Paris), schedules were the umbrella under which most questions related to vaccine simplification were addressed. In the following years, sessions of the French Academy of Medicine, as well as meetings at the Conseil supérieur d’hygiène publique de France (CSHPF), a consulting body on public health in France, tackled the topic of immunization schedules.¹⁹

A solid consensus emerged on schedules’ fundamental principle: they had to be comprehensive but simple. As a participant remarked in London:

The object of any general immunization campaign should be to immunize as many people as possible against as many diseases as possible, as early in life as possible, and to maintain that immunity indefinitely. For the greatest chance of success, the programme should be kept as simple as possible, and should consist of the smallest number of necessary injections. The more complicated the programme and the greater the number of injections, the greater the possibility of immunization schedule not being completed.²⁰

The consolidation of principles informing immunization schedules at the turn of the 1960s is confirmed by the fact that simplicity was not mentioned in the context of the few immunization schedules that circulated in the early 1950s. In 1952, the ICC’s journal published an article on immunization schedules that did not consider the total number of shots for every vaccine.²¹

Another important feature that emerged in the late 1950s was the interrelation of vaccines. The 1959 conferences depicted schedules as

17. “Sur l’association des anatoxines au vaccin antipoliomyélique et la simplification du calendrier des vaccinations,” June 1959, Mérieux Foundation, D15.

18. David A. Cannon, ed., *Proceedings of a Symposium on Immunization in Childhood, Held in the Wellcome Building, London, 4th to 6th May 1959* (Edinburgh: E. & S. Livingstone, 1960); Centre international de l’enfance, *Calendrier des vaccinations, séminaire organisé par le CIE au château de Longchamp, 19-21 octobre 1959* (Paris: Masson et Cie, 1960).

19. Académie de Médecine, May 24, 1965; CSHPF, October 18, 1965, French National Archives, 19810568-1.

20. Cannon, *Proceedings of a Symposium* (n. 18), 112.

21. Julien Marie, “Problèmes d’organisation pratique des vaccinations (calendrier, technique, contre-indications, incidents),” *Le Courrier* 3 (1952): 123–29.

**PROBLÈMES D'ORGANISATION PRATIQUE
DES VACCINATIONS**
(CALENDRIER, TECHNIQUE, CONTRE-INDICATIONS, INCIDENTS)

par Julien MARIE,
Professeur Agrégé de Pédiatrie à la Faculté de Médecine de Paris,
Médecin de l'Hôpital des Enfants Malades.

L e but que nous nous proposons est essentiellement pratique : faire le point, pour les médecins praticiens, des dates, des techniques, des contre-indications et des incidents des diverses vaccinations.
Nous étudierons chaque vaccination suivant l'ordre chronologique de sa réalisation chez l'enfant, résumant dans le tableau ci-dessous le « calendrier » des vaccinations.

Calendrier des vaccinations

MALADIES A PRÉVENIR	ÂGE FAVORABLE
Variole	3 à 12 mois
Coqueluche	après 5 mois
Diphthérie et tétanos	au cours de la 2 ^e année
Fièvres typho-paratyphiques	à partir de la 6 ^e année
Tuberculose.	dès la naissance si nécessité. Electivement à partir de 6 ans.

I. — Vaccination contre la variole.

Cette vaccination, obligatoire en France et dans la majorité des pays, est facultative en Angleterre, en Hollande et dans certains cantons de Suisse.
D'après la loi française, elle doit être exécutée dans la première année. Nous conseillons de vacciner entre 3 et 12 mois et spécialement entre 4 et 6 mois, pour plusieurs raisons : la première est qu'après l'âge de 3 mois, le nourrisson a terminé sa période néo-natale ; il est moins immature, commence à mieux s'adapter aux agressions, apparaît plus résistant. La seconde raison est la persistance jusqu'au 3^e mois, d'une assez forte immunité maternelle passivement transmise qui habituellement s'atténue les 3 mois suivants pour disparaître

Figure 1. An early immunization schedule (1952). In contrast to schedules produced in the late 1950s and after, the total number of injections remains unspecified, there is no attempt to bundle vaccines, and the schedule is not restricted to infancy. Julien Marie, "Problèmes d'organisation pratique des vaccinations (calendrier, technique, contre-indications, incidents)," *Le Courrier* 3 (1952): 123–29, picture on 123.

an extension of combination vaccines. It was hoped that simultaneous injections, that is, the injection of different antigens administered during the same session, would eventually transform into a commercialized and standardized combination vaccine.²² Interrelation had an immunological dimension: experts wondered if an injection might enhance, or conversely damage, the protective action of another vaccine. The third major feature of late 1950s schedules, alongside simplicity and interrelation, was the targeted age of the vaccinated subject. Public health experts agreed on gathering most shots in the first year of a newborn's life. "The immunization schedule will be an immunization schedule for the newborn and the child, while boosters will be spread through adolescence and adulthood,"²³ summarized a French physician at the Paris conference.

Factors varying from one place to another—the epidemiological situation, the rhythms of child health consultations, the recommended vaccines—had to be considered for designing schedules, preventing the development of a universal schedule. It was largely acknowledged that schedules would be multiple and temporary. The lack of an ideal of uniformity distinguished immunization schedules from previous attempts to reform social rhythms, such as the debates on the introduction of a universal, unified, and permanent "world calendar" on the global stage from the late nineteenth century to the mid-1950s.²⁴ Illustrating this pluralism, experts attending the 1959 London conference established two different schedules for the United Kingdom—one comprising a combination vaccine, another free of it, as "mixed antigens" and their adjuvants were suspected of carrying a greater risk of accidents.²⁵

While immunization schedules were framed within national contexts since their introduction, discussions would later revolve around regional

22. Reflecting upon the complementarity of these bundling strategies, the members of the ICC's vaccine department wrote later, "Some vaccines can be combined. But not all of them. It is then necessary to envision various stages, a certain chronological order within this immunization policy for children. All over the world the need has been felt, for some years, to establish an "immunization schedule." " Raymond Mandé et al., "Données nouvelles sur les possibilités d'immunisation du nourrisson," *Archives Françaises de Pédiatrie* 26 (1969): 155–77, quotation on 155.

23. Centre international de l'enfance, *Calendrier des vaccinations* (n. 18), 279.

24. Vanessa Ogle, *The Global Transformation of Time, 1870–1950* (Cambridge: Harvard University Press, 2015).

25. The issue of adjuvants would become a trigger for vaccine controversies, as illustrated by the measles-mumps-rubella vaccine controversy of the late 1990s in Great Britain, and by denunciations of the alleged risk presented by the use of aluminum in combination vaccines, which erupted a couple of decades later in France. Largent, *Vaccine* (n. 1); Romain Gherardi, *Toxic story: Deux ou trois vérités embarrassantes sur les adjuvants des vaccins* (Arles: Actes Sud, 2016).

SCHEDULES ADOPTED BY THE SYMPOSIUM

SCHEDULE A

Age	Visit	Vaccine	Injection	Interval
5 weeks-6 months	1	Pertussis	1	4 weeks or more
	2	Pertussis	2	
	3	Pertussis	3	
7-10 months	4	Poliomyelitis	4	4 weeks or more
	5	Poliomyelitis	5	
10-12 months	6	Diphtheria and tetanus	6	4 weeks
	7	(Diphtheria and tetanus	7	
	8	Pertussis	8	
15-18 months	9	(Diphtheria and tetanus	9	
	10	(Poliomyelitis)*	10	
<i>Smallpox some time during the first 5 years</i>				
School entry	9	Diphtheria and tetanus	11	
8-9 years	10	(Diphtheria and tetanus	12	
10-15 years	11	(Smallpox (re-vaccination)	13	
* There is no doubt that a fourth dose of poliomyelitis vaccine will be necessary, but the exact timing of this dose has not yet been decided.				

SCHEDULE B

Age	Visit	Vaccine	Injection	Interval
2-6 months	1	Triple (diphtheria, and pertussis)	1	4 weeks or more
	2	tetanus		
	3	Triple (diphtheria, and pertussis)		
7-10 months	4	tetanus	2	4 weeks or more
	5	Triple (diphtheria, and pertussis)		
	6	tetanus		
15-18 months	7	Triple (diphtheria, and pertussis)	3	4 weeks or more
	8	tetanus		
	9	Poliomyelitis		
School entry	10	Poliomyelitis	4	4 weeks or more
	11	Poliomyelitis		
	12	Poliomyelitis		
<i>Smallpox some time during the first 5 years</i>				
8-9 years	7	Diphtheria and tetanus	8	
10-15 years	8	(Diphtheria and tetanus	9	
	9	(Smallpox (re-vaccination)	10	
	10	B.C.G.		
* There is no doubt that a fourth dose of poliomyelitis vaccine will be necessary, but the exact timing of this dose has not yet been decided.				

T.S. form page 128

Figure 2. Schedules adopted at the 1959 London conference. Only the simpler schedule (B), with a lower number of injections, was widely circulated. David A. Cannon, ed., *Proceedings of a Symposium on Immunization in Childhood, Held in the Wellcome Building, London, 4th to 6th May 1959* (Edinburgh: E. & S. Livingstone, 1960), 128.



Figure 3. A comparison of European schedules at the Mérieux Institute, Lyon, in April 1961. Mérieux Foundation, D24.

standardization. Foreign schedules circulated in national committees and conferences from the 1960s onward. They were compared and the project of making regional immunization schedules, though described as an ideal, was a well-worn subject of the increasingly international field of vaccine policies.

The 1959 Paris conference highlighted the primacy of immunological concerns in the design of schedules—a factor that was less subject to national variations. Robert Mande, a prominent pediatrician and ICC protagonist, explained:

The principle of immunization efficiency is now accepted, it seems obvious that children must benefit from it at the earliest stage. However, this axiom must be nuanced with the consideration of three sets of data. The first two sets relate to the subject: a) the age at which the child responds to vaccine preventable germs and viruses; b) the age at which he reacts to the introduction of vaccine antigens with the production of immunizing antibodies. The third set of data, unrelated to the subject, refers to the frequency, the gravity, the general epidemiological speed of vaccine preventable diseases.²⁶

This shift, from the object's qualities to the subject's evolving immunity, from the vaccine to the newborn, informed the entire Paris conference. It shaped numerous vaccine trials that did not intend to evaluate vaccines

26. Centre international de l'enfance, *Calendrier des vaccinations* (n. 18), 255.

CALENDRIER DES VACCINATIONS

ALLEMAGNE	BELGIQUE	MOIS	FRANCE	ITALIE
BCG	BCG	1	B.C.G.	
		2		
	DTC 1	3	DTC 1	DTCP 1
	DTC 2	4	DTC 2	DTCP 2
DTCP 1	DTC 3	5	DTC 3	DTCP 3
DTCP 2	POLIO 1	6	VARIOLE	
DTCP 3	POLIO 2	7	POLIO 1	
	VARIOLE	8	POLIO 2	VARIOLE
VARIOLE		9	POLIO 3	
		10		
		11		
		12		DTCP - R
	POLIO 3	13		
		14		
POLIO 4	DTC - R	15		
		16		
		17		
		18	DTC + P - R	
		19		
		20		
		21		
		22		
		23		
		24	TAB Folie	
DTP - R	BCG	3 ANS		DTCP - R
	POLIO - R	4 ANS	BCG	
		5	DTC + P - 2 ^{de} R	
	VARIOLE - R	6		DTP - 3 ^{de} R
	DT - R	8		VARIOLE
		9		DIPHTERIE
		10	DT P - 3 ^{de} R	
		12	VARIOLE	
VARIOLE - R	VARIOLE	15	DTP - 4 ^{de} R	
			TP	

Figure 4. A comparison of European schedules at the Mérieux Institute, Lyon, in April 1961. Mérieux Foundation, D24.

per se, but their interaction with newborns' rapidly changing immunological systems. The topic of newborns' immunity involved two different issues: would the antibodies provided by the mother block the effect of a vaccine (the temporary transmission of the mother's antibodies to the newborn was a phenomenon called "passive immunity")? When would a newborn be able to produce his/her own antibodies? Immunization schedules were taking their place in an immunological window, delimited at one end by the possible interference of the mother's remaining antibodies in the newborn's system and at the other end by the accepted chronology of a newborn's exposure to infectious diseases.

The insistence on the first months of a newborn's life was informed by considerations of consent. Medical authority was supposed to reach its apex in the weeks following the birth: "We do think that it is better to vaccinate against most diseases in the first months of life, when mothers listen carefully to the opinion of their doctor," argued a participant in the Paris conference.²⁷ "During the first months of their newborn life, mothers are very docile, they follow the recommendations of their physician," insisted Raymond Mande, elsewhere in the same year.²⁸ A Spanish doctor emphasized the role of "health education targeting mothers, the easiest part of the population to reach," explaining that schedules were distributed in Spanish pediatric consultations.²⁹ During the Paris conference, Mande also insisted upon the advantages of vaccinating subjects deprived of agency and lancet anxieties: "The adoption of this schedule gives a child the chance to be immunized as fast as possible, at an age when his psychological reactions to injections are almost non-existent."³⁰ This argument, reproduced in the 1960 government circular that disseminated the first national schedule, figured among the "three obvious rules" enumerated by a pertussis specialist: "The highest number of shots must be gathered in infancy, an age at which vaccine induced reaction are usually the weakest and the vaccine trauma is not a source of fears yet."³¹

These discussions reinforced the tendency, observed in other contexts, to place "significant health-citizenship responsibilities on the shoulders of the nation's youngest members," to quote historian Elena Conis.³² As Conis notes, this phenomenon was amplified by the polio vaccine campaign launched in the mid-1950s and the structuring of the pediatric field

27. *Ibid.*, 59.

28. CSHPF, December 16, 1959, French National Archives, 19810568-1.

29. Centre international de l'enfance, *Calendrier des vaccinations*, (n. 18), 324.

30. *Ibid.*, 263.

31. *Ibid.*, 278.

32. Conis, *Vaccine Nation* (n. 5), 201.

in the interwar period.³³ It must be emphasized that the Paris conference was organized by the ICC, an institution whose goal was to spread French pediatric knowledge and practices worldwide. In contrast with this global ambition, the infancy targeted by physicians at the Paris conference was certainly not universal. Concerns on class and race pervaded the discussions, as it was said that the highest degree of simplicity needed to be achieved in poor socioeconomic contexts, where medical authority was considered weaker.

The recent introduction of the poliomyelitis vaccine contributed to the proliferation of discussions on vaccine simplification. A participant in the Paris conference shared his concerns regarding “the rapid extension of poliomyelitis vaccination that, with its multiple injections, further burdens the immunization schedule.”³⁴ Perhaps more significantly than any single vaccine, the intense work on combination vaccines that took place in the second half of the 1950s amplified the impression of an injection overload. This discourse was largely fed by vaccine producers who commercialized combination vaccines. In the late 1950s, the most common combination was the diphtheria-tetanus vaccine, developed in the interwar period by Pasteur Institute scientist Gaston Ramon and made mandatory by law in 1940. The diphtheria-tetanus-pertussis vaccine was adopted by French parents and physicians in the mid-1950s. The Mérieux Institute launched a tetanus-polio vaccine in 1957 and presented, the same year, research on a diphtheria-tetanus-pertussis-poliomyelitis vaccine. Combination as a phenomenon extended beyond industrial practices. General practitioners used to mix, during their consultations, different antigens in the same lancet for the sake of simplicity (the result was termed a *mélange extemporané*). This practice raised concerns among public health experts as the dosing could have been hazardous and the mix potentially contaminated by multiple manipulations or by a lack of antisepsis. It was feared that homemade mixes would lead to grave accidents. In this situation, schedules were considered doctors’ guidelines, indicating which vaccines might be injected simultaneously while preventing the practice of homemade mixes.

While the turn of the 1960s signals the end of individual mixing practices with an emphasis, from the industry, on commercialized combination vaccines, one could read this period as an affirmation of a few powerful physicians over the state in matters of injections’ dates and order. The absence of legal considerations at the Paris conference is noteworthy,

33. Alexandra Stern and Howard Markel, eds., *Formative Years: Children’s Health in the United States, 1880–2000* (Ann Arbor: University of Michigan Press, 2002), 6.

34. Centre international de l’enfance, *Calendrier des vaccinations* (n. 18), 144.

given the fact that the late 1950s ended a period of “legislative fever” in matters of immunization, to borrow an attorney’s expression.³⁵ Injection dates were largely left unspecified in French laws, which favored big windows. For instance, the combination vaccine against diphtheria and tetanus had to be legally administered by the eighteenth month of life, and as for other mandatory vaccinations, failure to comply was subject to a small fine, considered “inoperant because scant.”³⁶ Reflecting upon a norm he was shaping, Robert Debré claimed at the French Academy of Medicine, “Immunization, either mandatory or recommended, is well accepted. It is now common that a mother, presenting her newborn to a physician, would inquire about the order of injections.”³⁷ Questions related to the appropriate age for vaccination age punctuated the “lecture” that Raymond Mandé gave on the national television in 1967.³⁸ “When to vaccinate?” asked a 1970 cover of *Médecine pour vous*, a weekly popular medical encyclopedia published by Hachette.³⁹

In the longer history of time regulation, states did not have an initial monopoly on schedules. Schedules, as Pierre Bourdieu reminds us in “On the state,” his lectures at the Collège de France, are a powerful technology that organize social life and ultimately create acceptance, hence becoming intertwined with the modern state apparatus. He writes, “We buy a calendar each year, we buy something that is a matter of course, we buy a completely fundamental principle of structuration that is one of the foundations of social existence, and makes it possible for example to make appointments.”⁴⁰ The differences between the general calendar and the immunization schedule are apparent. Immunization schedules are not the principle document that structure everyday life—they mostly structure the pace of medical consultations. Their strength is not related to their primacy but stems from the fact that immunization schedules have been added to a set of preexisting technologies that meticulously divide the time of infancy. This highly fractured period of life, oriented toward scheduling and dominated by the relationship between mothers

35. Franck Moderne, “Le régime juridique des vaccinations obligatoires,” *L’actualité juridique. Droit administratif* 4 (1965): 195–211, quotation on 198.

36. Jean-Simon Cayla, “Législation et administration,” *Revue trimestrielle de droit sanitaire et social* 36 (1973): 445–72, quotation on 452.

37. Robert Debré, “Sur le projet de calendrier des vaccinations,” *Bulletin de l’Académie Nationale de Médecine* 149 (1965): 372–76, quotation on 372.

38. “État actuel des vaccinations,” Fonds Fasquelle, French Academy of Medicine

39. Didier Fouret ed., *Médecine pour vous*, no. 81 (1970).

40. Pierre Bourdieu, *On the State: Lectures at the Collège de France, 1989–1992* (Cambridge: Polity Press, 2014), 8.

and their childrens' physicians, ultimately became a powerful vector for vaccine acceptance.

Well before the emergence of pediatrics, French physicians and mothers recorded the physical state of newborns on a regular basis. Initially limited to the upper classes, this practice extended to lower sections of society in the second half of the nineteenth century, with the rapid diffusion of child health booklets conceived and sold by independent physicians.⁴¹ These notebooks encouraged mothers to describe diverse aspects of their newborns' health. In the interwar period, processed food and pharmaceutical companies entered this booming market, emphasizing feeding schedules. In the United States, it is documented that the adoption of feeding schedules was driven by the prospect that rationalizing breastfeeding and feeding sessions would make a mother's regimen more suited to the rhythms of modern life.⁴² Incidentally, the popularity of feeding schedules led to a glorification of scheduling *per se*, strengthening the idea that the achievements of a future citizen lay on an adherence to strict schedules.⁴³

French booklets featured immunization prominently: mothers were asked to indicate the date of smallpox vaccine injections—sometimes BCG, too—next to a growth curve, breastfeeding, teeth, and other aspects of their child's development. The central place of immunization was confirmed in 1942 by the publication of the first official and mandatory booklet by the French government. Official booklets included several tear-off forms that informed public health statistics. Beyond this statistical function, the booklets were instrumental in developing what historian Rima D. Apple has called "scientific motherhood."⁴⁴ Through them, mothers agreed to execute daily observations that informed a physician's diagnosis. While this substitution of the gaze amounted to a form of control exercised by the medical community, it endowed mothers with health norms and a particular attention to the biological rhythms of infancy.

41. Golden, *Babies Made Us Modern* (n. 3); Catherine Rollet, *Les carnets de santé des enfants* (Paris: La Dispute, 2008).

42. Jacqueline H. Wolf, *Don't Kill Your Baby: Public Health and the Decline of Breastfeeding in the Nineteenth and Twentieth Centuries* (Columbus: Ohio State University Press, 2001), 31–28; Jessica L. Martucci, *Back to the Breast: Natural Motherhood and Breastfeeding in America* (Chicago: University of Chicago Press, 2015).

43. Wolf, *Don't Kill Your Baby* (n. 42), 34; Aimee L. Medeiros, *Heightened Expectations: The Rise of the Human Growth Hormone Industry in America* (Tuscaloosa: University of Alabama Press, 2016), 96.

44. Rima D. Apple, *Perfect Motherhood: Science and Childrearing in America* (New Brunswick: Rutgers University Press, 2006).

Unlike booklets, educational baby books did not necessarily involve writing practices. However, they also oriented mothering toward scheduling. This genre dates back to the early nineteenth century. It achieved national visibility in France with Laurence Pernoud's bestseller *J'élève mon enfant*, published in 1965. *J'élève mon enfant* enjoyed the blessings of ICC founder Robert Debré. In his preface, Debré stressed the importance of the mother-physician relationship mediated by educational baby books, noting, "A good observer mother is a rare chance for her child and of rare benefit to the physician called to the bedside of the healthy or sick little boy [*sic*]."45 Like most baby books and booklets, *J'élève mon enfant* emphasized the infant's diet, the main feature of which is to rapidly change over time. Time is the fundamental variable of baby books. When months do not structure the chapter organization, time divisions appear in countless tables. *J'élève mon enfant* includes a tear off feeding poster, that is twelve times the size of the book. The poster covers the first thirty-six months of a child's life and is divided into four vertical sections—for months, meal times, baby's posture, and food (from orange juice to ice cream). Among other significant tables, the book contains a schedule of the most common infectious diseases during childhood and an immunization schedule "recommended by the International Children's Center." In tune with recent discussions on immunization schedules, the caption says, "the current tendency is to start immunizing early, starting at three months."⁴⁶ This quick glance at booklets and baby books indicates that immunizations schedules blended into the already highly scheduled world of scientific motherhood.

Immunization schedules relied on a set of disciplinary mechanisms. First, they favored combination vaccines, products that presented parents with a reduced choice of aggregates. By bundling different antigens, combination vaccines were expected to favor the adoption of less popular vaccines by parents who may not have opted individually for all components. In 1960, a French public health expert noted that combination vaccines raised legal concerns, as they mixed mandatory antigens with recommended ones. But the anticipated benefits overcame the legal concerns, as he explained:

Taking the opportunity of families' fears of pertussis in newborns and concerns about poliomyelitis in children, and in making both vaccines free, we can hope that the diphtheria-tetanus vaccine—in extending its reach through combination with other antigens and thanks to the public's collaboration—will enjoy

45. Laurence Pernoud, *J'élève mon enfant* (Paris: Éditions Pierre Horay, 1965), 8.

46. *Ibid.*, 272.

a necessary success that it would not achieve without the contribution of new combinations.⁴⁷

Ten years later, Mande made the same argument about a different combination: “I think we will naturally have to consider the combination measles-rubella, because the vaccine against rubella will be highly popular. Unsolicited demand for vaccines against diphtheria and tetanus is lacking, but there will be demand for the vaccine against rubella and it will be very good to combine it with the vaccine against measles.”⁴⁸ Interestingly, combinations were expected to favor mandatory vaccines, a sign that vaccination laws were poorly enforced and that technical tools were seen by public health experts to be as crucial as legislation in implementing immunization. Discussions on schedules and combinations vaccines were often accompanied, in the 1960s, with statements acknowledging the ineffectiveness of French vaccine laws.

Second, immunization schedules are tables, and tables have their own logic. Historians and scholars interested in graphs have often remarked that tables are the simplest way to present data.⁴⁹ The visual representation of time in tables has become increasingly minimal in recent history, which makes them particularly suited as a graphic form to simplify immunization.⁵⁰ In his landmark book, *The Domestication of the Savage Mind*, anthropologist Jack Goody underscores another crucial, albeit less discussed, dimension of the rationale for tables: “Each space in the table has to be filled; the scheme allows no empty boxes.”⁵¹ In other words, immunization schedules did not only display the charm of simplicity, they presented immunization as a related set of injections that did not permit avoidance. Leaving an empty box by not getting a booster poses a threat to the entire schedule. In theory, missed injections had to be caught up with to pursue the rest of the schedule—no shot could remain missing, boxes had to be filled one after another.

The abundant documentation on schedules held in French archives does not include substantial discussions on their diffusion. As noted above, schedules were printed on various media from the 1960s onward: in baby

47. “Rapport sur les vaccinations associées,” October 1960, CSHPF, French National Archives, 19810568-1.

48. Raymond Mande, *Table ronde sur la rougeole* (Lyon: Fondation Mérieux, 1970), 82.

49. Charlotte Bigg, “Diagrams,” in *A Companion to the History of Science*, ed. Bernard Lightman (Chichester: Wiley Blackwell, 2016), 557–71; Edward R. Tufte, *Visual Explanations. Images and Quantities, Evidence and Narrative* (Cheshire: Graphic Press, 1997).

50. Anthony Grafton and Daniel Rosenberg, *Cartographies of Time: A History of the Timeline* (Princeton: Princeton Architectural Press, 2010), 19.

51. Jack Goody, *The Domestication of the Savage Mind* (Cambridge: Cambridge University Press, 1977), 153.



Cette photographie, due à l'amabilité de Bristol-Myers, nous permet d'illustrer le rythme des vaccinations à travers les âges.

**L'INSTITUT MÉRIEUX
ET LE CALENDRIER FAMILIAL DES VACCINATIONS DE RAPPEL**

2 ANS : Premier rappel Polio-D-T-Coqueluche



C'est la confirmation obligatoire de la vaccination quadruple (Tétracoq ou D.T.Coq + Sabin), effectuée au cours de la première année, entre le 3^e et le 7^e mois, après le B.C.G. (à la naissance) avant la bague-vaccin contre la Variole (8^e mois), et le nouveau vaccin contre la Rougeole (à partir du 9^e mois). Ce calendrier n'est pas impératif, l'essentiel étant de grouper ces vaccinations de base au cours de la première année.

5 - 6 ANS : A l'âge pré-scolaire, rappel D.T. Polio (et éventuellement Coqueluche)



C'est à l'âge pré-scolaire que doit s'effectuer une indispensable vaccination de rappel contre la Diphtérie, le Tétanos et la Poliomyélite : il est recommandé de pratiquer également la vaccination de rappel contre la Coqueluche, pour éviter les contagions familiales et il est possible d'effectuer le même jour la primo-vaccination contre la Rougeole (Rouvax Mérieux).

9 - 10 - 11 ANS : D.T. Polio + Variole - Rappels obligatoires



La législation préconise à ces âges la première vaccination de rappel contre la Variole, ainsi que celle contre la Diphtérie et le Tétanos : le nouveau D.T.bis de l'Institut Mérieux (dose faible d'anatoxine diphtérique pour éviter les réactions allergiques), est à conseiller, le vaccin Sabin étant utilisé comme "rappel Polio".

15 - 16 ANS : Tétanos, Polio - Rappel tous les 5 ans



Dès l'adolescence, il faut penser au rythme quinquennal des vaccinations de rappel contre la Poliomyélite (Sabin), et le Tétanos (seringue auto-injectable d'anatoxine). En ce qui concerne le B.C.G. chez l'enfant ou chez l'adolescent, c'est seulement si la réaction tuberculinique (bague) est devenue négative que des vaccinations de rappel doivent être pratiquées.

35 - 40 ANS : Les vaccinations de rappel chez l'adulte



La Poliomyélite frappe trop souvent les adultes et l'emploi du vaccin Sabin sur un morceau de sucre facilite la pratique de la vaccination. Le Tétanos est une menace permanente et seuls, les sujets recevant tous les 5 ans une dose d'anatoxine de rappel, peuvent éviter l'inopportune injection de sérum. La Variole n'a pas disparu dans le monde et pour de nombreux voyages à l'étranger un certificat de vaccination, datant de moins de 3 ans, est toujours exigé.

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Figure 5. An immunization schedule for boosters published by the Mérieux Institute, Lyon (Undated, circa 1975). Mérieux Foundation, D24.

books, official booklets, commercial brochures, government circulars, and medical journals.

One can understand the lack of concern over their diffusion in two related ways. First, these discussions were closely monitored by Robert Debré, a central figure of the French medical establishment since the early 1930s, and his disciple Raymond Mande.⁵² Debré chaired the 1959 Paris conference, presented an updated schedule at the French Academy of Medicine in 1965,⁵³ and published a summary of a landmark ICC publication on that topic in the *British Medical Journal* five years later.⁵⁴ Considered “the father of the French pediatric school,”⁵⁵ Debré defined the norms of the profession.⁵⁶ More efficiently than any professional body, Debré’s dominance over the field of French pediatrics was a vector of the schedules’ adoption. A second hypothesis relates to the perception of immunization’s widespread acceptance in the 1960s and 1970s. As a sociologist remarked in 1980, this intervention remained “indisputable” for decades: an overwhelming majority of parents followed their medical doctor’s recommendation without questioning immunization’s rationale.⁵⁷ In other words, the norms of the Mandarinate, the politics of personality, and an unchallenged medical authority might have prevented a larger discussion on the adoption of schedules.

52. Anne Simonin, “Le Comité médical de la Résistance: un succès différé,” *Le Mouvement Social* 180 (1997): 159–78; Luc Berlivet, “The Ubiquitous Mandarin: Notes on the Social Organization of Elite Medicine in the Twentieth Century,” *Medicina Nei Secoli* 20 (2008): 847–69.

53. Debré, “Sur le projet de calendrier des vaccinations” (n. 37).

54. Robert Debré and François Michel Lévy, “Immunization Schedules,” *Brit. Med. J.* 5738 (1970): 805.

55. Jean-François Picard and Suzy Mouchet, *La métamorphose de la médecine* (Paris: Presses Universitaires de France, 2009), 79.

56. Historians have emphasized the way Debré took up laboratory work in hospitals in order to modernize clinical practice: Jean-François Picard, “Poussée scientifique ou demande de médecins? La recherche médicale en France de l’Institut national d’hygiène à l’INSERM,” *Sciences sociales et santé* 10 (1992): 47–106; Jean-Paul Gaudillière, *Inventer la biomédecine. La France, l’Amérique et la production des savoirs du vivant (1945–1965)* (Paris: La Découverte, 2002). Another aspect of his contribution emerges from the history of the ICC: Debré pushed the boundaries of pediatrics, promoting a holistic, psychosocial approach toward children’s health that the ICC was supposed to embody. On this holistic approach, see Gaëtan Thomas, “La routine vaccinale. Enquête sur un programme français de rationalisation par les nombres, 1949-1999” (Ph.D. diss., EHESS, 2018). The emphasis on “psychosocial” aspects of children’s health parallels what historian Sydney Halpern has described for the United States. Sydney A. Halpern, “Medicalization as Professional Process: Postwar Trends in Pediatrics,” *J. Health Soc. Behav.* 31 (1990): 28–42.

57. Claudine Marenco and Sélimir Govedarica, “La vaccination des enfants en France, 1880-1980” (Paris: DGRST - CNRS, 1980).

Subject to constant modifications following the pace of vaccine innovation, immunization schedules displayed a level of apparent flexibility. “Should we be absolutely rigid regarding the interval between shots? If the mother brings her child on the nineteenth of the month, instead of the fifteenth, would it be a disaster? No,” reassured Raymond Mande on national television in May 1967, “this is a theoretical diagram.”⁵⁸ Nevertheless, the whole series of injections would have to be repeated if parents over delayed, he warned. Pediatricians and general practitioners were invited to adapt the schedule to the situation of a particular child: “An immunization schedule should be a living organism that might be pruned, fertilized, and cured. We think that the chief-gardener should be the pediatrician, who keeps frequent contact with immunologists and public health experts.”⁵⁹ In a book that addresses how modern states govern growing entities through simplification procedures, social theorist James Scott comments on the gardener metaphor, which captures the contradictions of “high modernist” social engineering: “Although the organic character of the flora limits what can be achieved, the gardener has enormous discretion in the overall arrangement and in training, pruning, planting, and weeding selected sample of what might be grown there. Similarly, social engineers consciously set out to design and maintain a more perfect social order.”⁶⁰

This is the contradiction in immunization schedules: they need to be flexible while producing a series of disciplinary effects on parents and physicians. Schedules belong to “implementation procedures,” a category of interventions subject to technological changes and human compliance, adopted by public health experts at the turn of the 1960s. As an ICC biologist wrote in 1966: “recommendations, even the most justified, only provide a path from which one shouldn’t stray.”⁶¹ The 1960 government circular that diffused the first national schedule insisted upon the absence of schedules’ “mandatory aspect.” How to enforce schedules without the contribution of law? In experts’ views, the best way to strengthen the normativity of schedules was to improve their rationality. The more rational, comprehensive, and simple a schedule, the more likely its broad adoption.

58. “État actuel des vaccinations,” Fonds Fasquelle, French Academy of Medicine.

59. Centre international de l’enfance, *Calendrier des vaccinations* (n. 18), 310.

60. James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 92.

61. “Les programmes de vaccinations chez l’enfant,” Fonds Fasquelle, French Academy of Medicine.

Simplification in Practice: The ICC's Project to Rationalize Immunization Schedules (1964–1980s)

Beyond a general agreement on the primacy of simplicity, almost every detail of a simplified immunization device needed to be settled upon at the turn of the 1960s: the age for the first injections, the interval between shots, the order of vaccines, the number of boosters, the choice of combinations. This section of the article deals with epidemiological work that aimed at building schedules scientifically in the wake of the 1959 conferences. While the most innovative parts of postwar epidemiology leaned toward cardiovascular diseases,⁶² favoring cohorts that would redefine the approach of causation in public health,⁶³ vaccine simplification became associated with a discreet, albeit demanding, clinical epidemiological practice. In 1955, Harvard epidemiologists Johannes Ipsen and Harry E. Bowen termed this practice “serologic epidemiology.” “The serologic data give a direct measure of the population’s potential resistance to a given disease,” they explained, adding, “It has hitherto been used to study the natural history of disease. Using it to measure public health programs is a new and promising application.”⁶⁴

Although not widely adopted by French epidemiologists working on immunization, this label accurately describes research that relied on serologic data to study the interactions between grouped injections and their effects on the changing immunity of infants and children.⁶⁵ Serological response to vaccines became the central variable for designing rational schedules, reducing *de facto* the long list of variables enumerated by experts in conferences and meetings, from the epidemiology of children’s diseases to health infrastructures. Although the questions related to serologic epidemiology have been dealt with by an interconnected scientific community that exceeds the French context, I focus here on the work

62. Gerald M. Oppenheimer, “Framingham Heart Study: The First 20 Years,” *Prog. Cardiovascular Dis.* 53 (2010): 55–61; Luc Berlivet, “Une santé à risques: L’action publique de lutte contre l’alcoolisme et le tabagisme en France (1954-1999)” (Ph.D. diss., Université de Rennes, 2000).

63. Luc Berlivet, “‘Association or Causation?’ The Debate on the Scientific Status of Risk Factor Epidemiology, 1947–c. 1965,” *Clio Medica* 75 (2005): 39–74.

64. Johannes Ipsen and Harry E. Bowen, “Effects of Routine Immunization of Children with Triple Vaccine (Diphtheria-Tetanus-Pertussis),” *Amer. J. Pub. Health Nat. Health* 45 (1955): 312–18, quotation on 318.

65. French epidemiologists were trained in the field and would present themselves with more established specialties, like pediatrics or pneumology.

carried out by the ICC during the 1960s.⁶⁶ Its vaccination department, “la Station Pilote,” fully embraced serologic epidemiology in the mid-1960s, shifting its focus from the questions and methods of vaccine standardization to the problems related to simplification.

The ICC was founded in 1949 by Robert Debré with the support of the Polish bacteriologist and UNICEF’s first president, Ludwik Rajchman.⁶⁷ The initial mission of the ICC was to disseminate Debré’s “social pediatrics”—a holistic approach toward children’s health and well-being emphasizing social determinants—through studies implemented in the French colonies, classes targeting foreign health professionals, and intense publishing activity. This was a highly diplomatic task as Debré explained, a matter of “French prestige” and “intellectual influence.”⁶⁸ Although a French institution by law, with headquarters located in a neoclassical mansion at the edge of Paris’s Bois de Boulogne, the ICC mimicked the rhetoric, symbols, and organizational structure of UN agencies.⁶⁹ To borrow Debré’s frank expression, the ICC was “a national deviation” that intended to integrate with an emerging international order unresponsive to the defense of national scientific interests.⁷⁰ Until its demise in 1999, the ICC was an influential institution on the international stage. This was accomplished with a limited staff that never exceeded about one hundred employees and continuous funding difficulties.

Medical research was organized into two departments at the ICC: the laboratory, which carried out bench work, and the Station Pilote, whose history precedes the ICC and relates to Debré, Rajchman, and UNICEF’s strong support for the BCG vaccine. In 1948, one year after UNICEF’s controversial and unexpected creation, the New York-based agency joined a northern-European initiative aimed at undertaking a mass BCG campaign on the continent.⁷¹ The campaign soon extended to non-European territories: Robert Debré’s protégé, Raymond Mande, was sent to France’s

66. Among the leaders of postwar vaccination, American Pearl Kendrick was an influential voice on that topic. On Kendrick, see Carolyn G. Shapiro-Shapin, “‘A Whole Community Working Together’: Pearl Kendrick, Grace Eldering, and the Grand Rapids Pertussis Trials, 1932–1939,” *Michigan Hist. Rev.* 33 (2007): 59–85.

67. Marta A. Balinska, *For the Good of Humanity: Ludwik Rajchman, Medical Statesman* (New York: Central European University Press, 1998).

68. Robert Debré, *L’Honneur de vivre: témoignage* (Paris: Stock Hermann, 1974), 335.

69. On the tension between internationalism and late French colonialism, see Jessica Lynne Pearson, *The Colonial Politics of Global Health: France and the United Nations in Postwar Africa* (Cambridge: Harvard University Press, 2018).

70. Robert Debré, *L’Honneur de vivre* (n. 68), 336.

71. John Farley, *Brock Chisholm, the World Health Organization, and the Cold War* (Vancouver: UBC Press, 2008).

North African colonies to monitor the campaign. The internationalization of BCG made the problems related to standardization more pressing.⁷² In the aftermath of the Second World War, BCG vaccines as a product, but also their use and assessments, were still not homogenized or unified. No BCG vial was similar—they contained varying number of living bacilli, originating from discrete vaccine strains, that lab technicians would count with methods differing from one place to another. The Station Pilote was set up in the wake of a UNICEF BCG campaign expansion, a few months before the formal creation of the ICC, and was tasked with assessing the different BCG vaccines in use.⁷³

The clinical assessment of BCG represented a major challenge. Because antibodies play no role in the protection against *Mycobacterium tuberculosis*, the causative agent of tuberculosis, serologic tests were useless. In an authoritative publication on BCG standardization, ICC members stated that acquired immunity against tuberculosis lacked a “base.”⁷⁴ Two solutions were left to assess the effects of BCG on someone’s immunological system: waiting years to notice tuberculosis cases among vaccinated people, which took considerable administrative machinery, or observing vaccinated subjects’ hypersensitive reactions. The Station Pilote opted for the second option. In 1949, it elaborated a protocol based on the use of tuberculin skin test for evaluating BCG vaccines. The relationship between an allergic reaction to tuberculin and proper immunization remained uncertain and controversial, a fact that did not prevent the Station Pilote from carrying on its work on BCG standardization for years.

In the 1950s, the legal context favored experiments on this vaccine. Through a law enacted in 1950, the BCG vaccine was made mandatory for the entire population. Local authorities were tasked with implementing this vaccination programme. Owing to the scarcity of means devoted to public health, elementary and secondary school principals in the Paris region welcomed the Station Pilote’s offers to provide free immunization in an experimentally controlled setting. Experiments were mixed with health propaganda: the Station Pilote took advantage of the trials

72. Christian Bonah, “The ‘Experimental Stable’ of the BCG Vaccine: Safety, Efficacy, Proof, and Standards, 1921-1933,” *Stud. Hist. Philos. Biol. Biomedical Sci.* 36 (2005): 696–721; Christian Bonah, “Packaging BCG: Standardizing an Anti-Tuberculosis Vaccine in Interwar Europe,” *Sci. Context* 21 (2008): 279–310.

73. Colette Fillastre and Nicole Guérin, eds., *Centre international de l'enfance: Le château de Longchamp. Mémoire* (Paris: l'Harmattan, 2000), 91.

74. François Michel Lévy, ed., *Recherches sur le BCG, Techniques d'étude et problèmes de standardisation* (Paris: CIE - Flammarion, 1966), 252.

to lecture teachers and parents about the benefits of BCG; in the 1960s, a movie titled “BCG will protect you” was even screened.⁷⁵

Dozens of vaccines were tested following the same repetitive protocol, based on the assessment of an allergic reaction to tuberculin before and after a BCG injection. The Station Pilote evaluated BCG vaccines on 40,404 children between 1948 and 1958, mostly in the Seine-et-Marne department. In the 1980s, when the ICC computerized its headquarters, the BCG records comprised more than 100,000 individual forms (against 10,000 individual forms for the research on immunization schedules that started in 1964).⁷⁶ A sense of fatigue was felt by the staff in the early 1960s: “the control of BCG became routine”;⁷⁷ “this program seemed exhausted. We thought we knew everything on BCG.”⁷⁸ In a book written immediately after the traumatic shutdown of the ICC in 1999, two former heads of the Station Pilote, Colette Fillastre and Nicole Guérin, accounted for the transformation of the department specialized in the standardization of BCG into a team dedicated to the simplification of children’s immunization.⁷⁹ Their testimony points to the 1959 Paris conference as a trigger. It also reveals the ICC’s particular institutional culture, organized around the revered figure of Robert Debré, who pushed the heads of the Station Pilote toward a focus on immunization schedules.

Between 1960 and 1964, tests were carried out to improve infant blood sampling techniques, while contacts were sought with physicians working in pediatric dispensaries in the poorest part of the eastern Paris region. Interestingly, the ICC team did not plan to work in the wealthy Paris suburbs neighboring the Bois de Boulogne, where the headquarters of the organization were located, but in cities already characterized, in the 1960s, by high rates of immigrants from Southern Europe and North Africa. Consent was a primary concern, as the experimental work on schedules was not favored, differently from the BCG trials, by a specific legal context.⁸⁰ Additionally, the vaccine against pertussis, mostly used in the combination vaccine DPT in the ICC protocol, was not mandatory.

The trial on the “multiple immunization of infants” that started in 1964 did not assess the qualities of a particular vaccine. As explained in a report,

75. Report of activities 1966, ICC records, Angers University, ICIDEF14.

76. Colette Fillastre’s letter to an attorney, October 1984, ICC records, Angers University, ICIDEF483.

77. Fillastre and Guérin, *Centre international de l'enfance* (n. 73), 102.

78. Interview with Nicole Guérin, January 26, 2012, Paris.

79. Fillastre and Guérin, *Centre international de l'enfance* (n. 73).

80. Colette Fillastre, “Simplification des calendriers vaccinaux,” 1975, ICC records, Angers University, ICIDEF488.

“This meticulously planned study does not aim to compare the value of antigens, but to set an apparatus that would allow us to assess, firstly, the infant’s immunizing abilities in the first months of life, and secondly, the correlation between a same infant’s reactions to various injections.”⁸¹ The Station Pilote later specified, “vaccinations have to follow a certain order and a certain rhythm in order to properly immunize an infant. The aim of the ICC’s study is to define this order and this rhythm through the systematic and repeated study of the antibodies evolution.”⁸² The 1959 conferences emphasized the newborn’s complex immune system, which inherits antibodies from its mother and progressively acquires the ability to produce its own antibodies. The interaction between vaccines and a newborn’s immunological system was said to change from one month to another. This fluctuating relationship was precisely the focus of the trial that started in 1964. The concept of a “good vaccine,” if not totally abandoned, lost its absolute character, as a good vaccine might be proven useless if administered too early or badly associated.

In the medicalized setting of Seine-Saint-Denis pediatric dispensaries, the Station Pilote team did not renew the propaganda efforts of the BCG trials. Local pediatricians were tasked with informing the families of newborns about the trial. Three different schedules structured around two combination vaccines—the DPT and DT-Polio—were tested in the initial 1964 protocol. Newborns were randomly divided into three groups, one for every schedule. Blood samples were collected at five different moments until the newborn reached the age of two. The ICC laboratory was tasked with carrying out the serologic analyses that laid out antibodies’ evolution. None of the vaccine preventable diseases presented the same immunological mechanisms, a major difficulty for the titration of antibodies. Furthermore, two vaccines included in the schedules—the vaccines against smallpox and tuberculosis – lacked a serological test. These tests were long and expensive—involving the use of guinea pigs—and their validity, especially in the case of pertussis and poliomyelitis, remained subject to discussion.

Unlike the BCG trials, the study on schedules involved the active participation of the ICC laboratory. When the laboratory shut down in 1976, victim of a budgetary crisis, vaccine producers—the Mérieux Institute, the Paris Pasteur Institute, and African Pasteur Institutes—offered to carry out the serological analyses (they were already providing the vaccines for free). A couple of decades later, the former head of the Station

81. Report of activities 1965, ICC records, Angers University, ICIDEF14.

82. Mande et al., “Données nouvelles” (n. 22), 155.

IMMUNITÉ ACQUISE PAR DIFFÉRENTS TYPES DE VACCINATION

MOIS	GROUPE I		GROUPE II		GROUPE III	
	VACCINS	DOSAGES	VACCINS	DOSAGES	VACCINS	DOSAGES
1	GROUPE A B. C. G.					
3	COQUELUCHE (1ère) COQUELUCHE (2ème) COQUELUCHE (3ème)	DT COQ POLIO	DTC POLIO (1ère)	DT COQ POLIO	DTC POLIO (1ère) DTC POLIO (2ème) DTC POLIO (3ème)	
4			DTC POLIO (2ème)			
5			DTC POLIO (3ème)			
6	DT POLIO (1ère) DT POLIO (2ème) DT POLIO (3ème)	DT COQ POLIO		DT COQ POLIO	DTC POLIO (1ère) DTC POLIO (2ème) DTC POLIO (3ème)	DT COQ POLIO
7						
8						
9	VARIOLE	DT COQ POLIO	VARIOLE	DT COQ POLIO	VARIOLE	DT COQ POLIO
10	GROUPE B B. C. G.					
12	CONTROLE B. C. G.		CONTROLE B. C. G.		CONTROLE B. C. G.	
20	RAPPEL DTC POLIO	DT COQ POLIO	RAPPEL DTC POLIO	DT COQ POLIO	RAPPEL DTC POLIO	DT COQ POLIO
24	CONTROLE B. C. G.	DT COQ POLIO	CONTROLE B. C. G.	DT COQ POLIO	CONTROLE B. C. G.	DT COQ POLIO

- C. I. E. -

Calendrier utilisé de Septembre 1964 à Avril 1966

Figure 6. Schedules tested by the Station Pilote between 1964 and 1966. ICC records, Angers University, ICIDEF 486.

Pilote acknowledged that the situation might be equated to a conflict of interest: “some of these producers might have been financially interested, but the protocols established by our statisticians would not permit any misunderstanding.”⁸³ The ICC statistician Evelyne Orssaud, sometimes advised by Debré’s nephew and pillar of modern French epidemiology Daniel Schwartz, was indeed a central figure of the studies on immunization schedules. She co-authored several publications on the topic, not only correcting the design of the protocol, but also establishing statistical relationships between immunological reactions to the different antigens administered. Her calculations demonstrated a strong relationship between the immunological responses to the tetanus and diphtherias antigens.⁸⁴ In the first major collective publication on the trial, she also showed that the vaccine against pertussis provided longer protection when administered separately than in combination, a finding that did not receive further explanation.⁸⁵

The emphasis on statistics and randomization reflected an adhesion to the emerging rules of modern epidemiology. It also illustrated the power projected on rationalization in a context of concurrence around simplification procedures. Between the 1960s and 1986, the year the national advisory committee on vaccination was instituted, no exclusive authority was tasked with the creation of an immunization schedule. The choice of vaccine combinations was also left to the market. The ICC claimed an autonomous and impartial position on that matter thanks to its statistical rigor:

There is no unique official vaccine programme in France, differently from other countries. Several variations are offered, that differ from one another according to the articulations between vaccines against pertussis, diphtheria (-tetanus) and poliomyelitis. To monitor the results of the different “schedules” and to choose among them, the best was to test them on the field in rigorous conditions.⁸⁶

In 1966, while fifty percent of Station Pilote’s work time was already dedicated to this trial, a schedule showing disappointing results was removed from the protocol. In 1968, the Station Pilote abandoned the Salk vaccine against poliomyelitis, resulting again in a protocol update.

83. Fillastre and Guérin, *Centre international de l'enfance* (n. 73), 104.

84. “Coefficient de corrélation,” December 9, 1970, ICC records, Angers University, ICIDDEF 486.

85. Mande et al., “Données nouvelles” (n. 22), 177.

86. “Les programmes de vaccination en France,” 1973, ICC records, Angers University, ICIDDEF 488.

Smaller studies were progressively incorporated into it—such as a trial on the immunization of newborns under three months. In theory, the trial on the multiple immunization of children would never end: it was bound to test new combinations and associations that would continuously change, following the pace of vaccine innovations. In 1970, the Station Pilote announced that it would incorporate a quintuple vaccine in the protocol (diphtheria-tetanus-pertussis-poliomyelitis-measles). The most significant changes were related to the subject of experiments, though, not to the protocol itself. Following the invitation of a Franco-African intergovernmental organization run by French military physicians, the Organisation de coordination pour la lutte contre les endémies en Afrique centrale (OCEAC), the Station Pilote started a trial to test a simplified immunization schedule in Cameroun in 1970, inaugurating two decades of intense work in Francophone Africa. René Labusquière, the head of OCEAC, elaborated in the mid-1960s a doctrine of vaccine simplification that linked the rhythm of vaccine injections with the passage of mobile teams, a *modus operandi* inherited from the fight against sleeping sickness established by the French in the interwar-period.⁸⁷

The presence of the Station Pilote in the Paris region decreased with its work in Francophone Africa: in 1977, its field sites for trials and data collection were limited to the city of Blanc-Mesnil in the Paris suburbs. However, the trial in mainland France did not stop; for the next two decades, the program of schedule simplification ran in parallel between the Paris region and various countries of Francophone Africa, leading to different kinds of experimental comparisons between the two contexts. The lack of resources in Francophone Africa was offered as a strong argument for further simplifying.⁸⁸

Can we draw lessons from the case study of the Station Pilote's experimental work, and define simplification with regard to the notions of standardization and innovation? Drawing on the work of technology historian David Edgerton, "simplifying" refers to the adaptation of a technic that is already "in use."⁸⁹ We leave the realm of the creator to consider

87. René Labusquière "Vaccinations," 1966, National Archives at Atlanta, 69-0885/3; Guillaume Lachenal, *The Lomidine Files: The Untold Story of a Medical Disaster in Colonial Africa* (Baltimore: Johns Hopkins University Press, 2017); Jean-Pierre Dozon, "Quand les Pastoriens traquaient la maladie du sommeil," *Sciences Sociales et Santé* 3 (1985): 27–56.

88. Gaëtan Thomas, "La France et l'Afrique, en parallèle: Les essais vaccinaux de la station pilote du Centre international de l'enfance dans les années 1970," in *Le Centre International de l'enfance (1949–1997): Des archives à l'histoire*, ed. Yves Denéchère and Patrice Marcilloux (Rennes: Presses universitaires de Rennes, 2016), 155–70.

89. David Edgerton, "De l'innovation aux usages. Dix thèses éclectiques sur l'histoire des techniques," trans. Dominique Pestre, *Annales. Histoire, sciences sociales* 53 (1998): 815–37;

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ANNEES	I	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AGES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
ROUGEOLE	0	0	0	0	0	0	0	0	0	0	0	0	0	I	2
17.D	0	0	0	0	0	0	0	0	0	0	0	0	I	2	3
FJ-DAKAR	0	0	0	0	0	0	0	0	0	0	0	I	2	3	4
VARIOLE	0	0	0	0	0	0	0	0	0	0	I	2	3	4	5
BCG	0	0	0	0	0	0	0	0	I	2	3	4	5	6	7
	0	0	0	0	0	0	0	I	2	3	4	5	6	7	8
	0	0	0	0	0	0	I	2	3	4	5	6	7	8	9
	0	0	0	0	I	2	3	4	5	6	7	8	9	10	11
	0	0	0	I	2	3	4	5	6	7	8	9	10	11	12
	0	0	I	2	3	4	5	6	7	8	9	10	11	12	13
	0	I	2	3	4	5	6	7	8	9	10	11	12	13	14
	I	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Figure 7. Immunization schedule adapted for mobile medical teams, revisiting the same locations in Francophone Africa every three years. "Vaccinations," René Labusquière, 1966, National Archives at Atlanta, 69-0885/3

how products have been reshaped in order to last. The notion of scientific anteriority becomes totally peripheral. “None of its components is new,” stated a report on a combination vaccine.⁹⁰ Like most combination vaccines, immunization schedules were not associated with someone’s name. In the dual operation—use/innovation—suggested by Edgerton, both simplification and standardization fall along the side of use. However, the Station Pilote’s shift from BCG standardization to immunization schedule trials highlights differences in nature between simplification and standardization.

Innovation is a notion relatively easy to approach—it refers to the creative process and its result or, to quote Edgerton, to “the first use of a new idea.”⁹¹ Used in the context of the history of immunization, this notion tends to disconnect new vaccines from the rest of immunization: they are often presented separately, one after another, though an important aspect of this history relates to the project of integrating them into a preexisting framework through combination and rationalization. While standardization could sometimes be envisioned as form of innovation—the first use of a standardizing method might be labeled innovation—it refers to the maintenance through time of an instable product’s qualities: efficiency and innocuity in the case of pharmaceuticals. Historians stress that biological standardization is a historical term associated with the turn of the twentieth century.⁹² Industry scientists standardized biological products, which were characterized by their constituent variability and instability, as in the case of vaccines and the emblematic example of insulin.⁹³ These products were largely distributed after biological assays defined the proper doses and the degree of attenuation of active substances. Standardization became increasingly associated with the notion of the standard, defined by historian Thomas Söderqvist as “a definitive sample of a well-guarded substance.”⁹⁴ Vaccines had to conform to the industrial requisites of

David Edgerton, *The Shock of the Old: Technology and Global History since 1900* (Oxford: Oxford University Press, 2007).

90. “Rapport sur un vaccin tétravalent antidiphthérique, antitétanique, anticoquelucheux et antipoliomyélique,” March 1965, French National Archives, 19810568-2.

91. Edgerton, *The Shock of the Old* (n. 89), ix.

92. Jonathan Simon and Christoph Gradmann, eds., *Evaluating and Standardizing Therapeutic Agents, 1890–1950* (New York: Palgrave Macmillan, 2010); Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1996).

93. Christiane Sinding, “Making the Unit of Insulin: Standards, Clinical Work, and Industry, 1920–1925,” *Bull. Hist. Med.* 76 (2002): 231–70.

94. Thomas Söderqvist, *Science as Autobiography: The Troubled Life of Niels Jerne* (New Haven: Yale University Press, 2003), 218.

stability, homogeneity, and reproducibility.⁹⁵ In turn, the ability to standardize these substances granted the producers an initial monopoly. It is often remarked that standardization was a bottomless pit: production practices started to be standardized to standardize the product itself, then the assessment methods were standardized, and every modification introduced a new layer of standardization.

In the second half of the twentieth century, simplification shifted the emphasis from the standard to the interactions between two changing entities—the expanding number of vaccines and the pace of a newborn’s growth. Like standardization, simplification could be an endless process: it consisted of continuously managing an increasing level of complexity. But differently from standardization, simplification did not aim to produce a stable, lasting entity. Combination vaccines and schedules never stopped changing in response to the speed of vaccine innovation and to the pressing need to continue further simplification. Furthermore, while the literature on standardization highlights the coproduction of quality control through manufacturers’ protocols as well as regulations established by states and international organizations, simplification involved a different configuration of actors. The interactions between individual ingredients made combination vaccines harder to develop, hence they required greater quality control than single vaccines. State agencies continued to be strongly involved though neither they nor international organizations set any standards for simplicity. The manufacturers’ quest for simplicity was primarily a commercial process instigated by the projected needs of consumers (i.e., parents of newborn children), which in turn were articulated in expert discourses on “vaccine acceptability.” In the case of schedules, simplification was measured, between the 1960s and the 1980s, as a function of subjects’ changing immunological systems. In other words, the standard was replaced in the process of simplification by the subject or, more accurately, by a norm. “[A] norm,” state sociologists Nikolas Rose and Mariana Valverde, “appears—or claims—to emerge out of the very nature of that which is governed.”⁹⁶

Epilogue: Achieving a National Schedule (1986–1997)

The rationalization carried out by the Station Pilote failed to contain the multiplicity of schedules. Rather, competition between schedule makers

95. Maurice Cassier, “Producing, Controlling, and Stabilizing Pasteur’s Anthrax Vaccine: Creating a New Industry and a Health Market,” *Sci. Context* 21 (2008): 253–78.

96. Nikolas Rose and Mariana Valverde, “Governed By Law?,” *Soc. Legal Stud.* 7 (1998): 541–51, quotation on 544.

intensified in the 1970s, according to correspondence accessed in the French National Archives. In April 1971, the head of a pediatric dispensary complained to health officials about pressures exerted by the Pasteur Institute in Paris to replace a vaccine against poliomyelitis included in the dispensary schedule.⁹⁷ In December 1975, a senior official at the Ministry of Health asked the Mérieux Institute to justify an early injection in the producer's schedule, a recommendation at odds with ICC's published results.⁹⁸ The ICC might have failed to implement a single national schedule, but the trial on the multiple immunization of children gave the Station Pilote an authoritative standing. In 1984, it was designated the national reference center for the immunization of children. Its influence reached an apex in 1986, when the Station Pilote became a permanent member of the newly founded Comité technique des vaccinations (CTV), the national advisory committee for immunization programs. Tasked by the Ministry of Health with publishing an updated schedule every two years, the CTV quickly became the most important French body for immunization policies. Its existence brought an end to the situation of schedule multiplicity, as its direct affiliation with the state granted it, "the viewpoint on viewpoints," to use Pierre Bourdieu's terminology.⁹⁹

The seizure of the schedule by the state did not radically transform the interplay between this technology and the law. The making of schedules continued to circumvent a legal rationale. The CTV's focus on schedules even revived the idea that legal coercion was not suited to modern immunization policies.¹⁰⁰ Irritated with the legal difficulties in repealing the obligation to vaccinate against smallpox (achieved in 1984), CTV members considered that the rhythms of Parliament did not fit with epidemiological changes and vaccine innovations. Legal constraints were also said to lower vaccine "acceptance." However, the stance on obligation remained transactional, as there was no project to undo the existing laws. Furthermore, CTV members chose not to distinguish clearly, in the schedule, between recommended and mandatory vaccines—"this differentiation is dangerous," claimed the head of the Station Pilote. "Recommended vaccines could be perceived as non-important."¹⁰¹ Even if the law was limited in scope and not well enforced, it was expected to symbolically remind the population of immunization's importance.

97. Correspondance, French National Archives, 19810568-15.

98. Correspondance, French National Archives, 19810568-15.

99. Bourdieu, *On the State* (n. 40), 28.

100. CTV, April 11, 1986, Ministry of Health's Records, 2005/006-3.

101. CTV, October 10, 1986, Ministry of Health's Records, 2005/006-3.

Simplicity was much less a subject of discussion at the CTV than in other contexts examined in this article. However, the idea that combination vaccines should be prioritized in order to make any additions to the schedule smooth and nearly imperceptible, persisted.¹⁰² A distinct principle emerged from the committee's minutes that ultimately became the most significant criteria for the addition of a new vaccine to the schedule: cost assessment. Cost-benefit calculations superseded most considerations, even though most CTV members were trained physicians. The creation of the CTV coincided with the popularization in France of cost-benefit analyses applied to immunization and reflected the transformations of the market, triggered by the introduction of the Hepatitis B vaccine at an unusually high price in the early 1980s.¹⁰³

The CTV quietly pursued its work on schedules for a decade. A former member recalled, "Everyone was satisfied, there was the CTV, a national reference center [*the ICC*], and nobody reclaimed more. The CTV's functioning was not even socially criticized."¹⁰⁴ Cloaked in state bureaucracy and distant from the media, the CTV was responsible for an object that had escaped public scrutiny thus far. Contrary to vaccine laws, schedules did not prompt public discussion on the limits of coercion in liberal democracies. They produced a soft, unfettered push to vaccinate against a large range of diseases. Interestingly, they were not discussed by the *Ligue nationale pour la liberté des vaccinations*, the main organization opposing vaccination in France. Between its creation in 1954 and its decline in the late 1980s, the organization failed to criticize any sociotechnical tools outside the legal and administrative mechanisms that traditionally support immunization.

The status quo was disrupted by a controversy that erupted in 1996 and lasted several years, fueled by allegations that the vaccine against Hepatitis B caused a range of demyelinating diseases including multiple sclerosis. It took experts by surprise, as no major vaccine controversy had been documented in France since the interwar period. In 1997, the CTV was fully reformed following the mismanagement of the crisis. All members were dismissed with the exception of the Station Pilote director. Seemingly mundane at first glance, the prerogative of powerful physicians

102. "Synthèse des données sur l'hépatite B adressée par les membres du CTV," December 1996, Ministry of Health's Records, 2005/006-4.

103. Farah Huzair and Steve Sturdy, "Biotechnology and the Transformation of Vaccine Innovation: The Case of the Hepatitis B Vaccines 1968–2000," *Stud. His. Philos. Sci. Part C* 64 (2017): 11–21. On the commodification of vaccines: Stuart Blume, *Immunization: How Vaccines Became Controversial* (London: Reaktion Books, 2017).

104. Interview with Daniel Lévy-Bruhl, March 11, 2014, Saint-Maurice.

with regard to dates and schedules transformed, in the context of controversy, into a political problem, a sign of the excessive power of experts over immunization.¹⁰⁵

The late 1990s appear as a period of larger institutional turmoil, as the ICC was also shut down in 1999. An entire generation of pediatricians, either trained by Robert Debré or pursuing his legacy, were upstaged by a new generation of public health experts. However, a significant contribution of this retiring group of experts to the normalization of immunization, that is, its coding as an intervention targeting newborns, a category of subjects devoid of agency whose health and growth were already scrutinized on a regular basis, remained solidly in place. Furthermore, while the rationale behind schedules began to be scrutinized by journalists, the actual immunization schedule remained unaffected by the uproar as the new CTV did not displace the controversial Hepatitis B vaccine.¹⁰⁶

Conclusion

The history of the immunization schedule is consistently marked by the anticipated disciplinary effects of simplification. Vaccines were ordered and combined in order to put to an end the practice of homemade mixes and to give general practitioners straightforward guidelines. Bundling antigens into a combination vaccine without regard to their differing legal statuses (either mandatory or recommended), then ordering these vaccines into rationalized schedules purposely limited the options offered to individuals. Parents and physicians were presented with clusters of products in place of individual vaccines. Simplification shaped the way immunization has been considered by the public, rendering it no longer a series of discrete, unrelated products. It became a unified, coherent, almost indivisible series of interventions. Historian Mark Largent has termed this tendency to relate singular vaccines to immunization in general as, “the all or nothing approach to vaccination.”¹⁰⁷ As shown by this article, this approach was not an incidental matter emerging from public health discourses, it resulted from the meticulous intertwining of shots since the late 1950s.

While public health experts and the industry envisioned the advantages of the constraints produced by an object (the combination vaccine) and a technology (the immunization schedule), simplifying was not an

105. “Note du Sous-directeur de la veille sanitaire à l’attention de M. le Directeur général de la santé,” April 25, 1996, Ministry of Health’s Records, 2005/006-4.

106. Régis Pluchet, “Le Calendrier Vaccinal,” *Alternative Santé - Hors-Série*, 2000.

107. Largent, *Vaccine* (n. 1), 166–68.

unruly process. As exemplified by the ICC's clinical trials, simplification procedures were informed by modern epidemiology and emerged from contexts concerned with biological standardization. However, the logics and operations of simplification differed greatly from standardization, as simplification did not aim at producing a universal, long lasting product resembling a standard. Simplification was about establishing the simplest scheme—a national schedule subject to regular modifications—out of the complex interaction between a continuously expanding set of injections and the changing immunity of growing newborns.

Returning where we began, one can wonder how schedules came to epitomize parents' malaise in the mid-2000s after having been a largely overlooked vector of vaccine expansion. The actual multiplication of vaccines offers one possible explanation: crowded schedules could not accommodate more shots. However, the novelty of such a problem should be challenged, as the threat of an excessive number of injections was already articulated by experts in the 1950s without materializing in public criticism. Equally problematic is the idea that the new vaccines of the 1990s and 2000s appeared as superfluous additions to the schedule. Historian Elena Conis has demonstrated how the vaccines of the previous decades, often considered unnecessary at their time of adoption, created "imperatives to vaccinate."¹⁰⁸ Specific to the 1990s and 2000s in France is the dismantling of the social world that produced and promoted schedules, as well as the recent state's monopoly over them. As the followers of Robert Debré exited the public stage, schedules lost an important source of legitimacy and were exposed to broader, and relatively new, arguments against the state's failures in matters of public health and its alleged alliance with the pharmaceutical industry.



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108. Conis, *Vaccine Nation* (n. 5), 252.