A Survey of Forensic Pathologists Regarding Medicolegal Investigation of Perinatal and Stillborn Deaths

Alison Krywanczyk, MD, Nicole R. Jackson, MD, MPH,† Katherine Maloney, MD,‡ and James R. Gill, MD§*

Abstract: Stillborn and perinatal deaths may be referred to medical examiners and coroners for investigation and determination of cause and/or manner of death. One of the key questions is determining a live birth from a stillbirth. We surveyed 147 forensic pathologists to assess their investigative practices for these deaths and for their ability to diagnose a live birth and a stillbirth. The results of this survey demonstrate the wide variability of investigative practices and policies between offices within the United States. Clinical history, maceration of the fetus, and food in the stomach were the only 3 factors considered by a majority of forensic pathologists to reliably distinguish liveborn from stillborn infants. High-quality research and expert guidance from national organizations are needed to ensure standardized adoption of evidence-based practices. The investigation and certification of these deaths is complex, yet the determination of stillborn or liveborn and cause and manner of death can have significant legal implications for the mother.

Key Words: forensics, forensic pathology, stillborn, stillbirth, perinatal, pregnancy

(*Am J Forensic Med Pathol* 2025;46: 122–127)

Determining the underlying cause of a stillborn or perinatal death may be complex and involves an autopsy, placental examination, and toxicological analysis along with an investigation of the circumstances and medical history. Even the determination of whether an infant was born alive may be challenging, yet this can have important medical, familial, and legal ramifications. There are regional variations as to how these deaths are investigated and certified, and the requirements to report such deaths, accept jurisdiction, and the legal authority to investigate differ. Even the definitions of medical terms such as "stillborn" can vary.[1–3] Some of this is attributable to differences in national, state, and regional statutes, but there has been no systematic survey to assess these practices. Similarly, there is no clear professional agreement on what autopsy findings reliably distinguish a live birth from a stillbirth. This is important because how a death certificate is worded, or how a manner of death is selected, may influence the decision to file criminal charges. A thorough description of the varied practices of a broad geographic group of forensic pathologists may therefore provide helpful context to physicians, medical examiners/coroners, attorneys, and law enforcement agents as well as demonstrate areas needing further research and professional consensus.

MATERIALS AND METHODS

A 37-question survey using SurveyMonkey assessed regional and national variability in the investigation and evaluation of fetal and neonatal deaths among forensic pathologists. This survey was approved by the National Association of Medical Examiners (NAME) Data Committee and was distributed to the NAME membership via e-mail to 1732 people, 900 of whom are board-certified forensic pathologists. Although there was no restriction placed on who could complete the survey, for the purposes of this study, only responses by board-certified forensic pathologists were included in the analysis. The identity of each respondent remained anonymous. The complete survey can be viewed in Supplemental Data 1 (http://links.lww.com/FMP/A69).

Each question was in multiple-choice format, with a free-text option for anyone who selected the choice "other." The survey included demographic and jurisdiction-related questions, including whether their office accepted stillbirths or fetal deaths for investigation, and if so, under what criteria. The US Centers for Disease Control and Prevention's (CDC's) definitions of fetal death, stillbirth, and live birth were provided (Table 1),[1] and respondents were asked to indicate whether their office used the provided definitions. Questions were asked regarding typical investigatory procedures (eg, whether placentas were received for examination). Finally, opinions were solicited regarding the practitioner's valuation of various autopsy findings in distinguishing a live birth from a stillbirth. The underlying (proximate) cause of death is defined as the etiologically specific disease and/or injury that in a natural and continuous sequence, unbroken by any efficient intervening cause, produces the fatality and without which the end result would not have occurred. The manner of death is an explanation of how the cause arose and includes natural, accident, homicide, suicide, and undetermined.[4–7]

RESULTS

There were 170 respondents of which 147 (86.47%) were board-certified forensic pathologists, representing a 16% response rate from the forensic pathologist members of NAME. The other 23 respondents were excluded.

Practice Demographics

The demographics of the survey respondents are presented in Table 2. The respondents predominantly worked in medical examiner systems (96, 65%) or coroner systems (26, 18%). Fourteen (10%) of respondents selected "other"; of these, 9 (6%) indicated that they worked in a mixed medical examiner-coroner system.

Eighty-one (55%) respondents worked in a NAME-accredited office, and 8 (6%) worked in an IACME-accredited office. The majority worked in the United States (138, 94%). Most offices were not combined with a hospital morgue or academic autopsy service (124, 84.35%). The most common job title was associate or assistant medical examiner (46, 31%), followed by forensic pathologist

Manuscript received August 6, 2024; accepted September 29, 2024.
From the *Cuyahoga County Medical Examiner's Office, Cleveland, OH; †Department of Laboratory Medicine and Pathology, University of Washington, Seattle, WA; ‡Erie County Medical Examiner's Office, Buffalo, NY; and §Connecticut Office of the Chief Medical Examiner, Farmington, CT.
The authors report no conflict of interest.
Reprints: Alison Krywanczyk, MD, Cuyahoga County Medical Examiner's Office, 11001 Cedar Ave, Cleveland, OH 44106. E-mail: akrywanczyk@cuyahogacounty.us.
Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.amjforensicmedicine.com).

ISSN: 0195-7910/25/4602–0122
DOI: 10.1097/PAF.0000000000000998

TABLE 1. US CDC Definitions of Fetal Death, Stillbirth, and Live Birth[1]

Fetal death	Intrauterine death of a fetus at any time during pregnancy
Stillbirth	Death before or during delivery
Live birth	The complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which, after such expulsion or extraction, breathes, or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached. Heartbeats are to be distinguished from transient cardiac contractions; respirations are to be distinguished from fleeting respiratory efforts or gasps.

(42, 29%) and chief medical examiner (32, 22%). Number of years in practice was evenly distributed, with 17% (25) indicating up to 5 years, 23% (34) indicating 5 to 10 years, 30% (44) indicating 10 to 20 years, 18% (27) indicating 20 to 30 years, and 12% (17) indicating 30 years or greater.

TABLE 2. Demographics of Survey Respondents

	Percentage of Respondents (n)
Type of workplace	
Medical examiner	65% (96)
Coroner	18% (26)
Justice of the Peace	3% (5)
Other*	10% (14)
NAME-accredited	55% (81)
IACME-accredited	6% (8)
Affiliated with a hospital morgue/academic autopsy service	16% (23)
Geographic location	
United States	94% (138)
Canada	3% (5)
New Zealand	1% (2)
Australia	1% (1)
South Africa	1% (1)
Size of population served	
Greater than 1 million	56% (82)
250,000 to 1 million	33% (49)
25,000 to 249,999	8% (12)
Years in practice	
Up to 5 years	17% (25)
5 to 10 years	23% (34)
10 to 20 years	30% (44)
20 to 30 years	18% (27)
30 years or greater	12% (17)
Job title	
Associate/assistant medical examiner	31% (46)
Forensic pathologist	29% (42)
Chief medical examiner	22% (32)
Other†	18% (27)

*Other responses included mixed medical examiner-coroner system (9), retired (2), Department of Health (1), and a hybrid state-county system of forensic pathologists and death investigators (1).

†Other responses included deputy chief medical examiner (11), deputy coroner (2), chief forensic pathologist (2), medical examiner (2), chief coroner (1), per diem pathologist (1), recently retired (1), and additional variations on medical examiner or corner (7).

Most respondents (82, 56%) worked in a setting that served a population greater than 1 million people. Forty-nine (33%) served a population between 250,000 and 1 million, and 12 (8%) served a population between 25,000 and 249,999.

Jurisdictional and Definitional Criteria

The survey responses to questions of jurisdictional and definitional criteria are depicted in Tables 3–5. Fifty-seven (39%) respondents indicated their office would take jurisdiction of both known and suspected stillborn deaths, 16 (11%) indicated they only would take jurisdiction of suspected stillborn deaths, and 19 (13%) indicated they would not take jurisdiction of either. Fifty-five (37%) of respondents chose "other," and the free text answers often went into specific descriptions of when jurisdiction would be assumed. A follow-up question subsequently elicited these specific factors, but of note, 30 of the free text answers included some variation of the phrase "it depends."

The majority of respondents use the CDC definition of fetal death (139, 95%); of the 8 (5%) who do not, 5 mentioned the use of a 20-week gestational age cutoff, and 2 mentioned a weight. Two respondents indicated the definition used in their office was determined by legal statute; for one of these, gestational age and

TABLE 3. Jurisdictional Criteria and Definitions Used by Survey Respondents

	Percentage of Respondents (n)
Take jurisdiction over:	
Both known and suspected stillborn deaths	39% (57)
Only suspected stillborn deaths	11% (16)
Do not take jurisdiction of either known or suspected stillborn deaths	13% (19)
Other*	37% (55)
Use the CDC Definitions of:	
"Fetal death"	95% (139)
"Stillborn"	90% (131)
"Live Birth"	90% (131)
Existing laws or statutes governing jurisdiction of suspected stillborn death	
No specific statute	43% (63)
State law	40% (58)
Local law	3% (5)
Other†	14% (20)

*Other responses included "it depends" in 30; these factors were subsequently elicited in another question and are reported in Table 4.

†Other responses included unsure (11), national or provincial law (3), and state statute to report but not to assume jurisdiction (2).

TABLE 4. Factors Which Would Trigger the Office to Assume Jurisdiction of a Stillborn Death

	Percentage of Respondents (n)
Maternal trauma	86% (127)
Nonmedically supervised out-of-hospital birth	68% (100)
Maternal drug use	54% (80)
Suspected illicit termination of pregnancy	52% (77)
Complications of medical therapy	27% (39)
Need for DNA collection in suspected sexual assault-related pregnancy	25% (37)
Autopsy request by family	16% (24)
Gestational age greater than designated cutoff	17% (25)
Weight greater than designated cutoff	10% (15)
Absence of prenatal care	3% (4)
Other*	20% (29)

*Other responses included "it depends" (9), request by coroner or JP (6), request by law enforcement or district attorney (4), found outside of medical facility (2), attempt to conceal birth (1), "concern" by medical staff or investigators (1), whenever jurisdiction was assumed over the mother (1), and medical complications of therapy (1).

weight were included, and for the other "quickening" was mentioned.

The CDC definition of stillborn was used by 131 (90%) of respondents. Of the 15 (10%) who did not, 7 stated they only consider death "before delivery" as a stillborn. Three answered that there was no single definition or consensus definition they used, and 2 replied that they used fetal death and stillborn synonymously. Only 1 respondent mentioned a gestational age cutoff (greater than 28 weeks).

The CDC definition of "live birth" was also used by 131 (90%) of respondents. Of the 15 (10%) who did not, 4 stated they have no clear definition. Three use the CDC definition apart from the last sentence (which excludes transient/agonal cardiac contractions or muscle movements); 3 respondents used a gestational age and/or weight cutoff (20 or 26 weeks, greater than 500 g); for 3, the definition was provided in state statutes; and 1 respondent each noted reliance on heartbeat, APGAR score, and perhaps most pragmatically, the presence of a birth certificate.

Sixty-three (43%) indicated there was no specific statute that dictated when they took jurisdiction of a suspected stillborn death. Fifty-eight (40%) respondents indicated that state law determined their jurisdiction, whereas 5 (3%) indicated it is a local law that determined their jurisdiction. Twenty respondents selected "other" (14%), and of those, 11 were unsure whether there was a law that dictated their jurisdiction; 3 were governed by national or province-based legislation; and 2 noted there was a state statute to report the death, but assuming jurisdiction was still left to the individual office.

The most common factors that would cause respondents to assume jurisdiction over a stillborn death were maternal trauma (127, 86%), nonmedically supervised out-of-hospital birth (100, 68%), maternal drug use (80, 54%), and suspected illicit termination of pregnancy (77, 52%).

Despite only 25 respondents indicating they used a gestational age cutoff for assuming jurisdiction, 29 respondents provided a free text response as to what they used: 26 used 20 weeks and 1 respondent each used 19 weeks, 24 weeks, or 32 weeks.

Similarly, despite only 15 respondents reporting their office used a weight "cutoff," 20 respondents provided a free text response as to what their weight "cutoff" was: 8 used 500 g, 6 used 350 g, and 2 used 300 g. One respondent each selected 2500 g and 360 g; one indicated they "used to use 500 g, but it was now up to individual discretion"; and one noted there was no clear definition used, but that it must be "viable."

Forty-six (31%) respondents did not have access to a pediatric pathologist for consultation. Ten (7%) respondents had a pediatric pathologist available, and consulting them was required in stillbirth/perinatal autopsies. Ninety-one (62%) indicated a pediatric pathologist was available to them, but consultation was not required.

Ninety-two (63%) respondents indicated their office did not collect the umbilical cord for toxicology testing in the investigation of stillborn and perinatal deaths, whereas 37 (25%) "sometimes" collected the umbilical cord.

Maternal blood and/or urine samples were not collected (or requested from the hospital and/or police) by most respondents (117, 80%).

Forty-six respondents (31%) indicated their office "nearly always" receives the placenta when investigating stillborn and perinatal deaths, whereas 91 (62%) indicated they "sometimes" receive the placenta.

Death Certification

Most respondents (71, 48%) indicated their office uses a different death certificate for all fetal deaths, and 30 (20%) indicated

TABLE 5. Additional Materials Requested and/or Received During the Investigation of Stillborn and Perinatal Deaths

	Nearly Always	Sometimes	Never
Maternal blood and/or urine samples are collected.	7% (10)	14% (20)	80% (117)
Umbilical cord is collected for toxicology testing.	12% (18)	25% (37)	63% (92)
Placenta is received for examination.	31% (46)	62% (91)	2% (3) *

*An additional 7 (5%) receive the hospital pathology report for the placenta.

they use a different death certificate only for stillborn deaths. Eighteen (12%) were unsure, or another person/office issued the death certificates; 7 (5%) indicated they issue the same form of death certificate as for any death; and 5 respondents (3%) indicated there is no death certificate issued in such cases. Sixteen (11%) answered "other," with two replying "I don't know," and other responses mentioning a certificate is issued only if cremation is requested, or a certificate is issued only for the mother.

When a different type of certificate is used, most respondents (125, 85%) use stillborn certificates that do not include a manner of death. Twenty-two respondents (15%) work in areas where the stillborn certificate does include manner of death.

Interpretation of Autopsy Findings

Ninety-one (62%) respondents did not believe it was possible to distinguish liveborn from stillborn based solely on the autopsy findings. Fifty-six (38%) believed it was possible. Seventy-three (50%) of respondents had personally distinguished liveborn from stillborn based on the autopsy findings; the remainder had not.

The most common factors chosen as helpful in distinguishing liveborn infants from stillborn were clinical history (132, 94%), maceration (130, 92%), and food in the stomach (123, 87%) (Table 6). Less common but frequent answers included microscopic examination of the lung (49%), trauma with associated hemorrhage (53, 38%), the lung float test (docimasia) (47, 33%), postmortem plain film radiography (41, 29%), gross examination of the lung (40, 28%), umbilical cord findings (40, 28%), placental findings (36, 26%), and congenital malformations (36, 26%).

For these 2 questions, it was proposed that the number of years in practice may impact the experience and confidence of the pathologist. Therefore, the responses to these questions were stratified by years in practice (Figs. 1, 2); this showed no meaningful patterns or differences between the groups.

Note that for subsequent questions eliciting the specific helpful features of an autopsy finding or examination, respondents could select more than 1 answer. Of the respondents who thought gross examination of the lung was helpful, 29% (41) looked at the degree of gross expansion/contraction, 18% (26) looked at the color of the lungs, 11% (16) looked at the contour of the edges of the lungs (angular or rounded), and 8% (11) selected "other." Of the "other" responses, 2 mentioned crepitus of the lungs. Two respondents noted caveats to their previous answers: one that the findings were only useful in the absence of cardiopulmonary resuscitation, and one that the findings were only meaningful if negative/not present.

Of the 41 respondents who found plain film radiographs helpful, 31 (22%) thought air in the stomach in the absence of resuscitation attempts was helpful; 27 (19%) thought air in both the stomach and small intestine (in the absence of resuscitation attempts) was helpful; and 15 (11%) answered "other"—two of the "others" were actually written—in NA responses, but 8 indicated seeing air in the lungs was helpful. Two respondents clarified that any of the provided options, in the absence of decomposition, were helpful.

Of the 22 respondents who found CT scan findings helpful, 19 (13%) indicated air in the stomach (in the absence of resuscitation attempts) was helpful, whereas 18 (13%) indicated air in the stomach and small intestine (in the absence of resuscitation attempts) was helpful, and 15 (11%) also selected "other." Of the "other," 7 selected air in lungs; 2 clarified their responses were meant in the absence of decomposition; 2 stated their office did not have access to a CT scanner. Only 10 respondents (7%) found postmortem MRI scan findings helpful, with several respondents noting in the free text that they did not have access to postmortem MRI.

Regarding placental findings, 9 (6%) respondents indicated that anything potentially lethal would be helpful; 9 (6%) specifically mentioned chorioamnionitis, 8 (6%) specifically mentioned abruption, 4 (3%) each mentioned infarction or evidence of malperfusion, and 3 (2%) mentioned evidence of maceration.

Specific umbilical cord findings chosen as helpful were reddening and desiccation of the umbilical stump (16, 11%), deep red discoloration of the cord at the fetal insertion (5, 4%), and "other" (17, 12%). Of the "other" responses, 12 indicated some kind of microscopic vital response, in the form of acute inflammation or healing; 5 mentioned a true knot or complex knots; and 4 mentioned a nuchal and/or abdominal cord.

Microscopic lung findings noted as helpful included uniform alveolar expansion or collapse (64, 45%), neutrophils within the alveoli (24, 17%), hyaline membranes (30, 21%), and "other" (16, 11%). The "other" responses included pulmonary interstitial emphysema (3), food or foreign material aspiration (3), evidence of maceration or autolysis (2), degree of maturity (2), and presence of squamous cells and/or meconium within the alveoli (4).

TABLE 6. Factors Selected by Respondents as Being Helpful in Distinguishing Liveborn Infants From Stillborn Infants

	Percent of Respondents (Total)
Clinical history	94% (132)
Maceration	92% (130)
Food in stomach	87% (123)
Microscopic examination of the lung	48.94% (69)
Trauma with associated hemorrhage	37.59% (53)
Lung float test (docimasia)	33.33% (47)
Postmortem plain film radiographic findings	29.08% (41)
Gross examination of the lung	28.37% (40)
Umbilical cord findings	28.37% (40)
Placental findings	25.53% (36)
Congenital malformations	25.53% (36)
Postmortem CT scan findings	15.60% (22)
Fetal metabolic testing	8.51% (12)
Postmortem MRI scan findings	7.09% (10)
Fetal karyotype	6.38% (9)
Immunohistochemical studies	3.55% (5)
Other*	5.67% (8)

*No free text answers were provided by respondents selecting "other."

DISCUSSION

The evaluation of stillborn, intrauterine fetal death, and perinatal death is one of the more complex tasks facing forensic pathologists. This is the first study, to the authors' knowledge, speaking to the practices of forensic pathologists as they pertain to the complete process of medicolegal death investigation of potential stillbirths—from assumption of jurisdiction through death certification. An unfiltered search of PubMed using several relevant medical subject headings failed to find similar studies of the same topic. There is widespread variation in practice including which cases are accepted for investigation and the autopsy techniques and findings used for evaluation. This survey did not evaluate the utility or validity of the approaches taken because this is better assessed by evidence-based validation studies. Rather, the results illustrate the points of

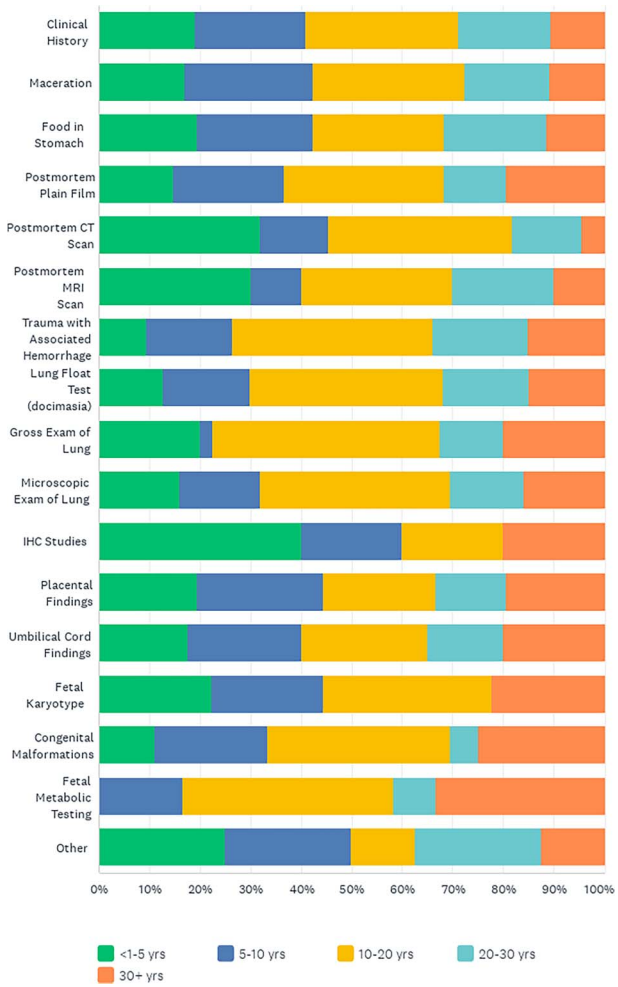

FIGURE 1. Factors selected by respondents as being helpful in distinguishing liveborn from stillborn infants, stratified by years in practice. IHC, immunohistochemistry.

contention among expert board-certified forensic pathologists, and the different conditions under which they practice.

Most of the forensic pathologists responding to this survey use a different type of death certificate for stillborn and intrauterine deaths; the overwhelming majority do not include a manner of death. Therefore, the cause of death sequence may be the primary information for the selection of the underlying cause of death by the vital records nosologist. There are a few jurisdictions required to assign a manner in these circumstances; however, there is no standard approach nor national guidance (eg from the CDC or NAME), despite the potential legal repercussions of these decisions. The Standard US Report of Fetal Death form does not have a place for the manner of death.[8]

Given the workforce shortage of forensic pathologists, it is pertinent to examine which deaths are investigated and why. Maternal trauma, as a cause of a known stillborn death, was the only indication accepted by greater than 75% of respondents. Out-of-hospital births, maternal drug use, and suspected illicit termination of pregnancy were indications selected by greater than 50% of respondents. Some respondents commented that some deaths are referred for autopsy by others (eg, law enforcement investigators, justices of the peace) or if the circumstances were "suspicious." Many free-text responses noted the use of a case-by-case approach when deciding on taking jurisdiction, and several mentioned that they, the survey respondent, were unsure of the criteria used in their office.

In the evaluation of a possible liveborn versus stillborn, three investigative and/or autopsy findings were selected by most pathologists as being helpful—clinical history, maceration, and food in the stomach. It is notable that these findings were the only three to obtain a majority consensus (a vast majority). The high degree of variability in the other findings may reflect the relative paucity of high-quality, evidence-based research into this question. Several techniques have been described in the literature[9–13] but have not yet been validated or reproduced on a large-scale basis. In contrast, clinical history is routinely relied upon in forensic pathology (and in all medical specialties) for diagnoses that have minimal or nonspecific autopsy findings.

A discrepancy was found in the number of pathologists who could distinguish stillborn from liveborn by autopsy findings alone, and the number who had done so in their career of practice. Although only 38% of respondents thought this was possible, 50% indicated they had done so in their practice. One possible explanation for this discrepancy is the use of the word "solely" in the stem of the first question, and not in the follow-up question. It also could be explained by changes in practice over time—or a combination of both.

Some responses raised the issue of insufficient access to resources and/or pertinent investigative information for various offices. Nearly one third of respondents had no avenue for a pediatric pathology consultation. All the survey cohorts were board-certified forensic pathologists, which includes board certification in anatomic pathology and thus have had exposure to placental and pediatric pathology during residency training. However, they are unlikely to encounter placentas in daily practice. Furthermore, identification of congenital conditions that may have contributed to death is critical when evaluating the relative contribution of other risk factors. Fewer than 50% of respondents said they "almost always" receive the placenta for examination, despite the importance of placental pathology in causing an intrauterine death.[14] Although a minority of respondents valued postmortem CT or MRI scan findings to distinguish liveborn from stillborn, these imaging techniques are not widely available. Similarly, a minority of respondents use immunohistochemical stains in their evaluation of potentially stillborn deaths, yet this resource is not readily available to most forensic agencies.

There are potential limitations of this study. The survey response rate of 16% was low, and it is possible the responses do not reflect the practice and experience of the majority of forensic pathologists. However, a large proportion of the responses were

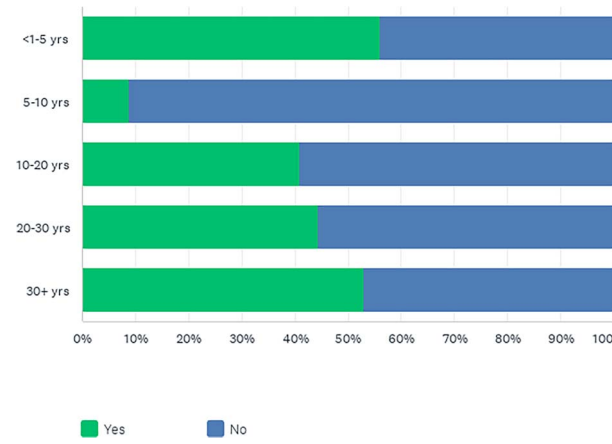

FIGURE 2. Survey responses as to whether it is possible to distinguish liveborn from stillborn infants based solely on the autopsy findings, stratified by years in practice.

from actively practicing (nonretired) forensic pathologists and from pathologists in positions of leadership (chief or deputy roles, for example). The variability in responses, as well, supports the notion that the sample size was sufficient to illustrate "problem" areas in the forensic investigation of stillborn and perinatal deaths.

The results of this survey are not meant to represent best practices, or to devalue the methods used by a minority of practitioners; rather, they are meant to serve as a benchmark of current practices and allow for comparisons across jurisdictions.

CONCLUSIONS

The investigation and certification of fetal and neonatal deaths is complex, yet the determination of stillborn or liveborn and cause and manner of death can have significant legal implications for the mother.

The results of this survey demonstrate the wide variability of investigative practices and policies between offices across countries and within the United States.

Clinical history, maceration of the fetus, and food in the stomach were the only factors considered by a majority of forensic pathologists to be reliable in distinguishing liveborn from stillborn infants.

Many forensic pathology offices lack access to investigative material and resources to fully evaluate these complex situations.

High-quality research and expert guidance from national organizations are needed to ensure standardized adoption of evidence-based practices.

REFERENCES

1. Kowaleski J. *State Definitions and Reporting Requirements for Live Births, Fetal Deaths, and Induced Terminations of Pregnancy (1997 Revision)*. Hyattsville, MD: National Center for Health Statistics; 1997: Available at: https://www.cdc.gov/nchs/products/other/miscpub/statereq.htm#:~:text=Current%20definition%20of%20live%20birth,Data%20Briefs. Accessed July 15, 2024.
2. Jackson M. Stillbirth and fetal death: time for standard definitions and improved reporting. *Obstet Gynecol*. 2015;125(4):782–783.
3. Phillips B, Ong BB. "Was the infant born alive?" a review of postmortem techniques used to determine live birth in cases of suspected neonaticide. *Acad Forensic Pathol*. 2018;8(4):874–893.
4. Hanzlick J, Hunsaker JC III, Davis GJ. *A Guide for Manner of Death Classification*. 1st ed. 2002: Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://name.memberclicks.net/assets/docs/4bd6187f-d329-4948-84dd-3d6fe6b48f4d.pdf. Accessed June 15, 2024.
5. Adams VI, Herrmann MA. The medical examiner. when to report and help with death certificates. *J Fla Med Assoc*. 1995;82(4):255–260.
6. Adams VI, Flomenbaum MA, Hirsch CS. Trauma and disease. In: Spitz WU, ed. *Spitz and Fisher's Medicolegal Investigation of Death*. 4th ed. Springfield, IL: Charles C. Thomas; 2006.
7. Charles C Thomas; 2006;436–59; National Center for Health Statistics. *Physician's Handbook on Medical Certification of Death*. Hyattsville, MD: National Center for Health Statistics; 2023.
8. Sondik E, Anderson J, Madans J, et al. *Medical Examiners and Coroners Handbook on Death Registration*. Department of Health and Human Services, Centers for Disease Control and Prevention: Hyattsville, MD; 2003.
9. Michiue T, Ishikawa T, Kawamoto O, et al. Postmortem CT investigation of air/gas distribution in the lungs and gastrointestinal tracts of newborn infants: a serial case study with regard to still- and live birth. *Forensic Sci Int*. 2013;226(1–3):74–80.
10. Barber JL, Sebire NJ, Chitty LS, et al. Lung aeration on post-mortem magnetic resonance imaging is a useful marker of live birth versus stillbirth. *Int J Leg Med*. 2015;129(3):531–536.
11. Lavezzi WA, Keough KM, Der'Ohannesian P, et al. The use of pulmonary interstitial emphysema as an indicator of live birth. *Am J Forensic Med Pathol*. 2003;24(1):87–91.
12. Whaley KD. A caveat concerning unequal aeration and pulmonary interstitial emphysema in fetal lungs. *Am J Forensic Med Pathol*. 2006;27(2):196.
13. Moar JJ. The hydrostatic test—a valid method of determining live birth? *Am J Forensic Med Pathol*. 1997;18(1):109–110.
14. Thompson BB, Holzer PH, Kliman HJ. Placental pathology findings in unexplained pregnancy losses. *Reprod Sci*. 2024;31(2):488–504.