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Estimating the Economic Impact of Endurance Running Events: Factors, Proxies, and Best Practices

Key Factors and Variables in Economic Impact Models

When modeling the economic impact of endurance running events (e.g. marathons, half-marathons, triathlons), a robust approach considers a wide range of factors. The **primary components** usually include **visitor spending by participants and spectators**, as well as **event-related operational spending**. Important variables and considerations include:

- **Number of Participants and Spectators:** The volume of attendees is a core driver. *Who* comes to the event and *where* they come from are critical. Out-of-town visitors bring **new money** into the host community, whereas local participants generally circulate existing local spending [1]. For example, a marathon's economic impact is largely determined by how many **non-local runners and spectators** attend, since their spending is additive to the local economy [1] [2]. Research shows that the **number of spectators** can be a key determinant of impact – at major events, more spectators usually mean greater economic benefit [3].

- **Origin of Attendees (Local vs. Non-Local):** Distinguishing local residents from visitors is essential. A **robust model excludes or down-weights local spending** because it is not new economic injection [1]. Only spending by visitors from outside the host region is typically counted as direct economic impact [1]. For instance, one marathon impact study included **only out-of-region runners and guests** in its calculations, noting that local spending is merely a recirculation of wealth unless it prevents "leakage" (locals traveling elsewhere) [1]. In practice, this means determining what percentage of participants are from outside the area. In the Boston Marathon, for example, the majority of participants and an even larger share of spectators came from outside the region, which drove the influx of new spending [4] [5].

- **Travel Party Size and Accompanying Visitors:** Many endurance athletes travel with family or friends who also spend money locally. A comprehensive model accounts for **supporters or travel companions**. Surveys often find that most runners do not come alone – e.g. Boston Marathon participants typically traveled with 2–3 people in their party [6]. Similarly, the St. George Marathon found each non-local participant brought an average travel group of about 4 people (friends/family), contributing to an estimated 21,419 supporters in addition to the runners [7]. These **spectators and accompanying persons** spend on hotels, meals, and shopping, significantly boosting the total impact.

- **Length of Stay (Event Duration):** The duration of the event (single-day vs. multi-day) influences how long visitors stay and spend. Multi-day events (e.g. a marathon with an expo and multiple races over a weekend) encourage longer stays. A robust model will estimate **average nights stayed** for

visitors. For example, an economic impact study might assume out-of-town runners stay *X* nights on average (often 2–3 nights for a big marathon weekend) and day-trip visitors (if any) have no overnight stay [8] [9]. In one study, local participants were counted for only a single day of spending (with no lodging), while visiting participants were assumed to spend 2.5 days (including lodging) in the host city [8]. **Event scheduling** (e.g. a Friday expo + Saturday race) and travel distance will affect these assumptions.

- **Spending Categories:** Visitor expenditures are typically broken down into key categories: **lodging, food and beverages, transportation, shopping/retail, and entertainment/activities** [8] [10]. A model should include each relevant category of spending to capture the full direct impact. The table below illustrates a typical per-person daily spending breakdown from a marathon impact study, distinguishing local and non-local participants:

Spending Category	**Local Participant** (per day)	**Non-Local Participant** (per day)
Lodging	$0	$257
Food & Beverage	$99	$99
Transportation	$124	$124
Activities/Entertainment	$85	$85
Shopping/Retail	$61	$61
Total	**$369**	**$626**

Example: Average daily spending per person for local vs. visiting runners (St. George Marathon study) [10]. Local participants spend money on food, transport, etc., but **do not require lodging**, whereas an out-of-town visitor's budget is much higher due to accommodation costs. These per diem figures can be multiplied by the number of people and days to estimate total direct spending.

- **Event Organizer and Vendor Spending:** A comprehensive model also considers **expenditures by event organizers** and vendors in the local economy. Hosting a race involves operational spending (e.g. on local suppliers, staff, security, medical, equipment rentals). If the race organization or expo vendors spend money locally (and those funds come from outside sources such as entry fees or sponsor money), it contributes to the impact. For instance, studies will include the race budget spent on local services and any **vendor fees** or **charitable donations** that stay in the area [11]. This organizer spending is typically smaller than visitor spending but can still add jobs or income locally. (It's important to net out any local funding of the event to avoid double counting – only the portion of the budget that is **net new** to the region should count [12] [13].)

- **Multipliers and Indirect Effects:** In a robust economic impact model, direct spending is often fed into an input-output model or multipliers are applied to estimate **indirect and induced effects**. Indirect effects arise from local businesses purchasing additional supplies or services due to the event (e.g. a hotel buying more food from local distributors), and induced effects come from employees spending their wages in the local economy. Tools like **IMPLAN** or RIMS-II multipliers are commonly used to quantify these ripple effects [14] [15]. For example, the St. George Marathon study used the IMPLAN software to estimate how initial spending translated into local employee

compensation and proprietor income [16]. If precise local multipliers are unavailable, one might use a reasonable proxy multiplier (e.g. a general tourism multiplier ~1.5 or as suggested by regional models) with caution. It's crucial, however, to apply multipliers only after accurately calculating direct spending; otherwise, errors get magnified in the total impact.

- **Geographic Scope (Host Economy Definition):** Clearly defining the **host region** for impact analysis is another key factor. Whether the "economy" is the city, county, or state will affect which spending is counted as new. A robust method sets a geographic boundary and treats anyone from outside that boundary as an external visitor [17] [18]. For example, if the host economy is defined as a city, then participants from the metro area might be considered local, whereas if defined as a state, only out-of-state visitors are "new." The choice should be logical (covering the main area that sees spending) and consistent.

In summary, a solid economic impact model for a running event will capture **who comes** (participants vs. spectators, local vs. non-local), **how many** attend, **how long they stay**, and **how much they spend in various categories**. It will also incorporate any **event-related expenditures** and consider **multipliers** for wider effects. All these variables work together to estimate direct economic contributions, which can then be expanded to total impact if needed [19] [20]. Ensuring each of these factors is accounted for (or at least acknowledged) makes the model more robust and realistic.

Using Proxies and Standard Data in the Absence of Direct Information

In practice, we often lack some direct data (such as actual business revenue or detailed tourism statistics). To build a useful model with limited inputs, analysts rely on **proxy data, benchmarks, and assumptions** grounded in industry standards or similar events. Common strategies include:

- **Average Spending Benchmarks:** If you cannot survey participants' spending directly, use data from comparable events or tourism studies. Prior research and industry reports provide **typical spending per visitor** for similar races or sports events. For example, Gibson et al. (2012) documented average daily spending per travel party for various amateur sporting events (segmenting overnight vs. day-trip visitors) [21] [22]. These kinds of benchmarks can serve as proxies. A small-city marathon might use spending figures from another marathon of similar size. Many economic impact analyses assume visitors spend on average a certain amount on lodging, food, transport, etc., based on either regional tourism averages or event-specific studies [23] [24]. If you know, say, that marathon visitors typically spend **$150 per person per day** (just an example), this can be applied in absence of direct receipts.

- **Travel Distance as a Proxy for Lodging and Stay Length:** When you lack direct data on overnight stays, the participants' home location can be a valuable proxy. You can infer that participants traveling beyond a certain distance (e.g. >50 or 100 miles) likely require accommodation. For instance, participants from out of state or a far city are assumed to stay in hotels for one or more nights, whereas those from a nearby town might drive in on race day. Using the **travel distance or origin of each participant** (which the user has) allows the model to estimate how many will incur lodging and for how long. This can be refined by event type – e.g., for a one-day race, a runner traveling 200 miles might stay 1–2 nights; for a multi-day event, even locals might stay on-site. Some

studies simply categorize visitors as “overnight vs. day-trip” based on distance or survey data, then assign average spending to each group [25] [26]. If actual hotel night counts are sporadic, you can extrapolate: for example, if 10% of participants reported booking a hotel, you might assume a similar rate among all non-locals or use it to calibrate the distance rule.

- **Per Diem and Tourism Data:** In absence of business revenue figures, regional tourism boards often have **average tourist spending** figures that can be used. For instance, if the local convention and visitors bureau says an average visitor spends $X per day on lodging and $Y on food, those figures can guide your estimates for race participants and spectators. National or state travel surveys might provide proxies for categories like average hotel nights per trip or average party size. *Standard multipliers* can also be borrowed: if you cannot run a full input-output model, you might use a generic multiplier (e.g., 1.3 for conservative or 1.5 for moderate impact) to estimate indirect effects. Government guides and academic papers often publish such multipliers or ranges for different sectors (accommodations, restaurants, etc.).

- **Participant Surveys from Other Events:** If you have no local survey, consider the results of **surveys done at similar events elsewhere**. For example, the economic impact report of the Boston Marathon (a much larger event) or a mid-sized city’s marathon might be public. These reports typically include data like average party size, spending per person, percentage staying in hotels, etc. Those ratios can be adopted as proxies. In one analysis method, researchers compiled data from 30 different sports events across multiple cities to derive typical **non-local attendance percentages and spending patterns** [27] [28]. Similarly, a study of the Cincinnati Flying Pig Marathon provided the proportion of local vs. visiting runners, which can be applied to other marathons of similar draw [29]. Using such external benchmarks, while not perfect, is a *cost-effective way to estimate economic impact with limited direct data* [30] [31].

- **Proxy for Spectator Spending:** When direct spectator spending data isn’t available, a proxy approach is to assume each non-local spectator spends similarly to a non-running visitor (minus any race-specific costs like registration). For example, if we know an average visitor spends $100 on food and $150 on lodging per day, we can apply that to each out-of-town spectator as well. If spectators tend to be friends/family of participants, their spending might mirror the participant’s party spending (which often is reported per travel party, covering both runner and their guests). Some event impact toolkits provide default values or calculators where you input spectator counts and it applies average spend per spectator based on event type [32] [33].

- **Use of Tourism Multipliers and Tax Rates:** In lieu of detailed local economic data, standard economic ratios can fill the gap. For instance, **tax impacts** can be estimated by applying the local sales tax or hotel tax rate to the estimated spending in relevant categories (e.g. apply an 8% sales tax to retail/food spending and, say, a 5% hotel tax to lodging spending to estimate fiscal revenue). Likewise, job impacts can be approximated using tourism industry averages (e.g. $X direct spending supports 1 job in hospitality). These proxies are coarse but give a sense of wider impact when precise models aren’t available.

It’s important to note that using proxies introduces uncertainty. Therefore, when employing borrowed data or rules of thumb, it’s wise to **err on the conservative side** to avoid overestimation [34] [17]. Clearly document assumptions (e.g., “assuming 1.5 accompanying persons per runner based on similar races”) so that the model can be refined when better data becomes available. By combining the best available proxy

data with the known participant demographics, you can still produce a reasonable estimate of economic impact [23] [2].

Addressing Data Gaps: Spectator Numbers, Local Spending, and Other Missing Pieces

Data gaps are common in event impact analysis. Two frequent challenges are **estimating spectators** and **untracked spending** when only partial data is collected. Here are ways to tackle these gaps:

- **Estimating Spectator Attendance:** Many endurance events (road races, triathlons) are unticketed and spread over open courses, making spectator counts difficult. If you don't have an official spectator tally, you can **estimate spectators using known ratios or surveys**. One approach is to leverage participant data: for instance, surveys might ask runners how many people accompanied them. If such a question wasn't asked, you might assume an average based on event type (e.g., for marathons, it's not uncommon to assume 1–2 spectators per runner). Indeed, research shows most marathon spectators are there to support a runner (often family or friends) [6]. The St. George Marathon example above used participant responses to calculate about *4 supporters per out-of-town athlete* [7]. Large urban marathons might have an even higher spectator-to-runner ratio (major city marathons often report hundreds of thousands of spectators for tens of thousands of runners [35]). For smaller races, the ratio might be lower. **Proxy methods** include: using volunteer estimates (course marshals counting crowds in key spots), analyzing photographs or finish line crowd density, or referencing similar events (e.g., if a 5K fun run usually has 0.5 spectators per runner whereas a city marathon has 3 per runner). It's also important to adjust for **repeat spectators** if an event lasts multiple days or has multiple viewing opportunities – count unique individuals rather than aggregate turnstile counts [36] [37]. If a spectator attends both Saturday and Sunday of a race weekend, they should be counted once when estimating spending.

- **Partial Data on Spectators:** Sometimes you have *some* data – for example, maybe volunteer counts of spectators at the finish line but not along the course, or ticket sales for a pasta dinner that included spectators. In such cases, you can treat the partial data as a minimum and then estimate the rest. For instance, "We had 5,000 spectators at the finish festival, but likely more along the route," so you might inflate that number by a factor (based on experience or other events) to approximate total unique spectators. Always be transparent about how these figures are derived, as spectator numbers can greatly influence the impact calculation [18] [38]. Research in the UK has noted that **upscaling visitor numbers is an area with high risk of error**, underscoring the need for careful estimation and not exaggerating attendance [17]. In absence of perfect data, provide ranges (e.g. 5,000–8,000 spectators) and possibly calculate impact under different scenarios (low/high) to reflect this uncertainty.

- **Estimating Unmeasured Spending:** If only partial spending data is collected (e.g., you have data for hotel nights from a few hotels or a subset of participants), you'll need to extrapolate or fill gaps. **For lodging:** suppose you only know that 100 hotel room nights were booked via a partner link – obviously total might be higher. You could use participant origin info to guess the total room nights (e.g., if 200 runners came from far away, and assuming 1.5 nights each on average, that's ~300 room nights). **For local spending on food and entertainment:** if you didn't survey it, consider national averages or data from other events for how much a visitor spends on meals, etc. It may be

reasonable to assume each visitor will buy at least a certain number of meals per day, so you can multiply that by a typical meal cost. **For retail and miscellaneous purchases:** you might apply a flat assumption (e.g. each travel party spends $X on souvenirs or local attractions, based on similar events). The Blue Ridge Marathon study, for example, gathered spending in categories like fuel, meals, retail, and admissions from a sample of visitors, then used those averages to compute totals [39] [40]. If you lack such survey data, using averages from that or other studies as proxies can plug the hole.

- **Dealing with Missing Local Business Data:** Without direct input from local businesses (restaurants, shops, etc.), you can approximate their revenue boost by focusing on visitor spending as outlined. Each dollar a visitor spends at a local business is essentially the revenue to that business attributable to the event. In place of detailed sales data, use the spending model to infer business impacts. For example, if your model estimates $500,000 was spent on food and beverage in the city due to the event, that is the collective increase for restaurants/bars (before any multipliers). For a finer guess, you might distribute that spending across sub-sectors proportionally (say 70% restaurants, 30% grocery/others, if known). **Tax data** is often unavailable, but you can estimate tax generation by applying tax rates to your spending estimates as noted above. Local tourism bureaus sometimes have **"average spend per visitor" and "average tax per visitor"** figures that serve as sanity checks.

- **Adjusting for Known Biases in Partial Data:** Partial data can introduce bias. For example, if only a small subset of participants reported their spending or only certain hotels reported bookings, the sample might skew towards certain types of visitors (perhaps more enthusiastic ones or those who used official channels). If you suspect a bias (e.g., perhaps only upscale hotels reported data, missing those who used Airbnb or stayed with friends), try to adjust by supplementing with secondary information. You could say, "Official hotel reports show 100 room nights, but we know many people likely used short-term rentals; based on participant surveys from elsewhere, 30% of visitors might choose non-hotel lodging – so we add an estimate for those." Likewise, if only **sporadic hotel data** is available, you might cross-check it against expected ratios (e.g., if only two hotels gave data, consider how many total hotels are in town and occupancy rates). Utilizing any **available proxy** (like a spike in occupancy or airport arrivals on race weekend, if accessible) can help triangulate the missing pieces.

- **Local vs. Visitor Spending (Import Substitution):** A specific gap is often how to treat local attendees' spending. If you only collected data on visitors, you might worry about locals. Generally, as mentioned, local spending isn't counted as new economic impact. However, if there's reason to believe the event caused locals to spend more locally than they otherwise would (or kept them from traveling out of town that weekend), this is called **import substitution** – but it's hard to quantify without surveys [41] [42]. Most models simply acknowledge this possibility but exclude locals to be safe [1]. If an impact study absolutely needs to show total economic activity including locals, one could report it separately (e.g., "local residents spent an estimated $X at the event, but this is not included as new impact"). With partial data (say you know how many locals participated but not what they spent), you can estimate their spending similarly to visitors (minus lodging) to get a figure for local economic *activity* if needed. Just be clear that it's not net new spending.

In summary, **filling data gaps** involves a mix of reasonable assumptions, external benchmarks, and careful reasoning. Always perform a reality check on these estimates – e.g., ensure that estimated spectators aren't wildly unrealistic for the venue, or that implied average spending makes sense for the demographic and

location. Documenting the approach (perhaps as footnotes or scenarios) will improve the credibility of the model when precise data is lacking.

Limitations of Relying Only on Participant Demographics and Hotel Data

Building an impact model solely from participant demographics and a bit of hotel data introduces several potential weaknesses. It's important to recognize these limitations and understand how they might bias or constrain the results:

- **Omission of Spectator and Companion Spending:** If the model only uses participant info, it risks **underestimating total impact** by ignoring spectators. Endurance events often attract significant spectator turnout (friends, family, locals cheering). These spectators spend on food, drinks, parking, maybe souvenirs – sometimes *at levels comparable to or exceeding the runners themselves*. For example, the Boston Marathon study explicitly noted that the event "brings in more than just the participants; it brings in a crowd of supporters who add to the overall spending" [6]. By focusing only on registered participants, a model would miss that additional expenditure. This undercount can be substantial: if on average each runner brings one paying spectator, the model could be off by roughly 50% of the direct spending (since you'd be ignoring half the visitors).

- **Limited Spending Insight from Demographics:** Knowing participants' age, gender, or even home city is useful for estimating **who travels** and perhaps how far, but it doesn't directly tell us **how much they spend**. Two 30-year-old male runners might have vastly different spending habits (one might travel with his family and make a vacation of the event, another might drive in alone and leave immediately after). Thus, relying on demographic profiles can introduce **uncertainty or bias** if one assumes spending based on those traits. There is little evidence that age or gender alone strongly predict event spending [43] – rather, spending is driven by travel behavior (distance, income level, trip purpose). If our model naively assumes, say, younger runners spend less or that all non-local runners spend a fixed amount, we could be off the mark for many individuals. Demographics can help segment the data (perhaps elite athletes vs recreational, or families vs single travelers), but by themselves they are weak proxies for economic activity [44] [45]. The model might therefore **oversimplify** spending patterns and miss nuances (e.g., international participants might stay longer and spend more than domestic ones, etc., which raw demographics wouldn't capture unless correlated with origin).

- **Inaccuracy from Incomplete Hotel Data:** Having sporadic hotel data (e.g., only some hotels reporting or only the number of room nights without spending amounts) can lead to **biased estimates**. If we base lodging impact only on partial data, we might **underestimate** if not all hotels are included, or **overestimate** if we improperly scale up a non-representative sample. For instance, if luxury hotels reported 100 rooms booked but budget hotels didn't report, and we extrapolate from the luxury segment, we'd likely overstate total lodging spending. Conversely, if we only know some participants stayed in hotels, we might miss those who stayed in private rentals or with friends. Also, focusing on hotel nights doesn't capture **day-trip visitors** who still spend on fuel and food. In short, sporadic data can skew the picture if treated as complete. The model might also ignore **leakages** – e.g., if many visitors stay outside the city due to limited hotels, a participant-based approach might not catch that (you'd count them as coming, but their lodging dollars go to another town).

- **Bias Toward Direct Effects Only:** A model built from just participant counts and hotel nights is likely computing only **direct spending** (and even that, not fully). It probably doesn't account for **indirect effects** (since local business purchases or wages aren't measured) or **induced effects** (spending of wages). This means the model would report only the immediate spending and miss the multiplier effect, thereby **underestimating the total economic impact**. While it's often prudent to be conservative, stakeholders might be interested in those broader effects. Without local business data or an input-output model, the analysis remains incomplete on that front. Conversely, if one *does* try to apply a generic multiplier to a shaky direct estimate derived from demographics, it could **magnify errors**. Any bias or mistake in the direct spending estimate would carry through and be amplified in the indirect/induced figures [18] [38]. So there's a trade-off: excluding multipliers understates total impact, but using them without solid data can overstate it.

- **Ignoring Event Operations and Ancillary Spending:** Focusing narrowly on participants means the model may **omit other sources of economic contribution**. Examples include event organizers' spending (on local vendors, temporary staff, police overtime), sponsor activations, expo sales by vendors, and so on. These can be significant, especially if the race has a health expo or if the organizing committee is renting facilities and equipment locally. A demographics-only approach might also overlook **pre- and post-event tourism** – e.g., a runner (or spectator) might spend extra days in the city visiting attractions, which wouldn't be captured if the model only looks at race-day or registered activities. This leads to a **limited scope** that potentially undercounts the full impact. The model results would thus have to be presented with the caveat that it's a partial estimate.

- **Potential Misallocation and Overgeneralization:** Using limited data forces one to make blanket assumptions (e.g., "all non-local runners behave the same"). This can introduce biases if, for example, the event has distinct segments (maybe an elite field vs recreational runners vs charity runners). If only aggregate demographics are used, the model might not account for differences in spending among these groups. Perhaps charity runners are more likely to have fundraising dinners or group travel (higher spending), or elites have expenses covered (lower personal spending). Without granular data, the model may **overlook such variations**, leading to either underestimation or overestimation for certain subgroups. Moreover, if the demographic profile of participants in one year is unusual (say an older crowd one year), a model that doesn't consider that might mis-predict their spending if it's correlated.

In essence, relying solely on participant demographics and patchy hotel info yields a **simplified model** that can miss large portions of the economic picture. It tends to focus on a narrow slice (the runners' immediate expenditures) and may misestimate even that slice due to lack of direct evidence. The results will have **limited accuracy and scope**, and likely a bias toward under-counting total impact (especially missing spectators and indirect effects), although certain assumptions could also cause overestimation in parts. Recognizing these weaknesses is important so that one can either improve the data inputs over time or clearly communicate the uncertainties to decision-makers. It underscores why best-practice studies endeavor to collect primary data from multiple sources (participants, spectators, organizers, businesses) – a comprehensive approach reduces these biases.

Best Practices and References for Modeling Economic Contributions of Sporting Events

Fortunately, there is a body of research and guidelines on how to properly assess the economic impact of sporting events. Drawing on **existing studies, government guides, and academic sources** can greatly enhance the reliability of your model. Here are some best practices and references:

- **Follow Established Methodologies:** Organizations like **Sport Tourism Canada** and the UK's **EventIMPACTS** initiative have published frameworks for event economic impact studies. For example, Sport Tourism Canada's STEAM model (Sport Tourism Economic Assessment Model) and the UK EventIMPACTS toolkit both lay out step-by-step processes. These guides emphasize: accurately defining the host region, distinguishing between visitor and local spending, collecting data via surveys, and applying multipliers carefully [46] [12]. They provide checklists such as removing local residents and casual attendees from impact calculations, and ensuring you count **unique visitors** rather than just admissions [47] [48]. Adhering to such structured approaches helps avoid common pitfalls. Notably, the EventIMPACTS guide warns that **upscaling spending to incorrect attendance figures is a major source of error**, highlighting the need for good attendance data [17].

- **Use Academic Research as Benchmarks:** There are numerous academic studies examining economic impacts of events, ranging from small-scale tournaments to mega-events. For instance, **John L. Crompton**, a leading scholar in this field, has written about the "**eleven sources of misapplication**" in economic impact analysis [49]. Key takeaways include: do not include local "time-switchers" or casuals (people who would be in town anyway) as new impact, avoid inflated multipliers or confusing gross spending with net benefit, and account for opportunity costs [50] [51]. Another relevant study, *Cobb & Olberding (2007)*, specifically looked at marathons and discussed **import substitution** – acknowledging that some local runners might have traveled to spend money elsewhere if the local race didn't exist (thus the local race retains that spending) [52]. While tricky to measure, this concept is discussed in academic literature as a nuance in impact analysis. By reviewing such literature, you can align your model with **best-practice assumptions** (like excluding locals, unless justified) and learn from real-world cases. The *Journal of Sport Management*, *Journal of Travel Research*, and *Event Management* are examples of journals that have published guidelines and case studies.

- **Consult Government and Tourism Bureau Guides:** Many government agencies and tourism boards have practical guides for event impact assessment. For example, the **Michigan State University Extension** published a bulletin on **"Quantifying the Economic Impact of Community Events,"** which provides a detailed yet accessible methodology [53] [54]. It walks through defining direct impact, surveying visitors, and using multipliers in a community context. Likewise, city or state tourism departments often release reports on events (e.g., a city's sports commission might have an impact study template). The **U.S. Travel Association** or regional economic development agencies sometimes offer calculators or parameters for events. Leveraging these resources can provide standardized values (like average daily visitor spend) and ensure your approach is credible. Destinations International's **Event Impact Calculator** is another tool used by many cities – it's essentially a repository of industry averages and multipliers that can be tailored by event type [55]. While proprietary, the logic behind it reflects best practices (count visitors, use average spend, apply appropriate multipliers, and estimate tax returns).

- **Case Studies of Similar Events:** Reviewing existing economic impact studies of endurance events can be extremely instructive. Many large races publish highlight figures, and some make full studies available. For instance, the **Boston Marathon 2024 Economic Impact Study** by UMass Donahue Institute is a comprehensive example [56]. It details how they surveyed nearly 6,000 runners and 3,500 spectators, collected data on spending, and calculated direct and indirect impacts. The study found that *90% of participants stayed overnight (typically ~3 nights)* and that those staying in Boston spent ~70% more per day than those who did not stay overnight [57]. It's a good model of thorough data collection and analysis, illustrating the payoff of capturing data beyond just registration info. Other examples include studies of city marathons (Chicago, New York, London), triathlons, or multi-sport events – often commissioned by local governments or race organizers. These studies commonly use **input-output modeling** to translate spending into jobs, GDP, and taxes, and they usually discuss their methodology openly. By examining a few such reports, you can identify **standard practices** (e.g., surveying at the expo and finish line, differentiating spending by overnighters vs. day visitors [39] [40], excluding locals as done in the Blue Ridge Marathon study [1], etc.) and even borrow some of their assumptions or coefficients if needed.

- **Validation and Sensitivity Analysis:** Best practices involve not only computing an impact estimate but also validating it. This could mean cross-checking the model's output against any real data available (for example, comparing your estimated hotel nights to actual hotel tax receipts for that weekend, if obtainable, or checking if restaurant sales reportedly spiked by a percentage consistent with your food spending estimate). Additionally, performing a **sensitivity analysis** is advisable: adjust key assumptions (like average spending per person, or number of spectators) up or down to see how much the impact figure changes. If your model is very sensitive to a particular assumption, that's a sign you should firm up that data or at least report a range of outcomes. This approach of transparently showing low, medium, and high scenarios is recommended in some guides to account for uncertainty and demonstrate a responsible analysis [17] [58].

- **Ethical and Realistic Reporting:** Many experts (and critics) have pointed out that economic impact studies can be misused to justify events, sometimes inflating numbers. A best practice is to be **conservative and honest** in your modeling. Acknowledge what you're not counting (e.g., "We did not include locals' spending in our core impact, in line with standard methodology") and any data limitations. Citing reputable sources helps bolster credibility – for instance, you might note, *"Our approach is consistent with guidelines by EventIMPACTS in the UK and research by Crompton (1995) on excluding local expenditures [1]."* By grounding your report in established references and avoiding the known "pitfalls" (such as overestimating multipliers or assuming every hotel dollar is net new), you produce a more **trustworthy analysis** [49] [50]. The goal is to provide a realistic estimate that policymakers and stakeholders can rely on, rather than an overly rosy figure that could be later discredited.

In conclusion, modeling the economic contribution of sporting events like endurance races involves combining available data with informed assumptions. A robust model considers a variety of factors (participants, spectators, spending categories, duration, etc.) and compensates for data gaps with reasonable proxies. It also openly addresses its own limitations. By consulting established best practices and studies, one can refine the approach – ensuring the analysis is methodologically sound and the results are presented with appropriate context and confidence intervals. Following these guidelines will help your Python-based algorithm generate credible and insightful estimates of economic impact for the municipalities hosting these endurance events.

Sources:

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- Blue Ridge Marathon Impact Analysis – visitor spending categories and rationale for excluding local spending [39] [1]
- UMass Donahue Institute (2024). *Boston Marathon Economic Impact* – example of participant and spectator survey findings [6] [5]
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- EventIMPACTS Toolkit (UK) – guidelines for event impact calculations and common sources of error in estimates [17] [48]
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